THE

ENGINEERING JOURNAL

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

"TO FACILITATE THE ACQUIREMENT AND INTERCHANGE OF PROFESSIONAL KNOWLEDGE AMONG ITS MEMBERS, TO PROMOTE THEIR PROFESSIONAL INTERESTS, TO ENCOURAGE ORIGINAL RESEARCH, TO DEVELOP AND MAINTAIN HIGH STANDARDS IN THE ENGINEERING PROFESSION AND TO ENHANCE THE USEFULNESS OF THE PROFESSION TO THE PUBLIC"

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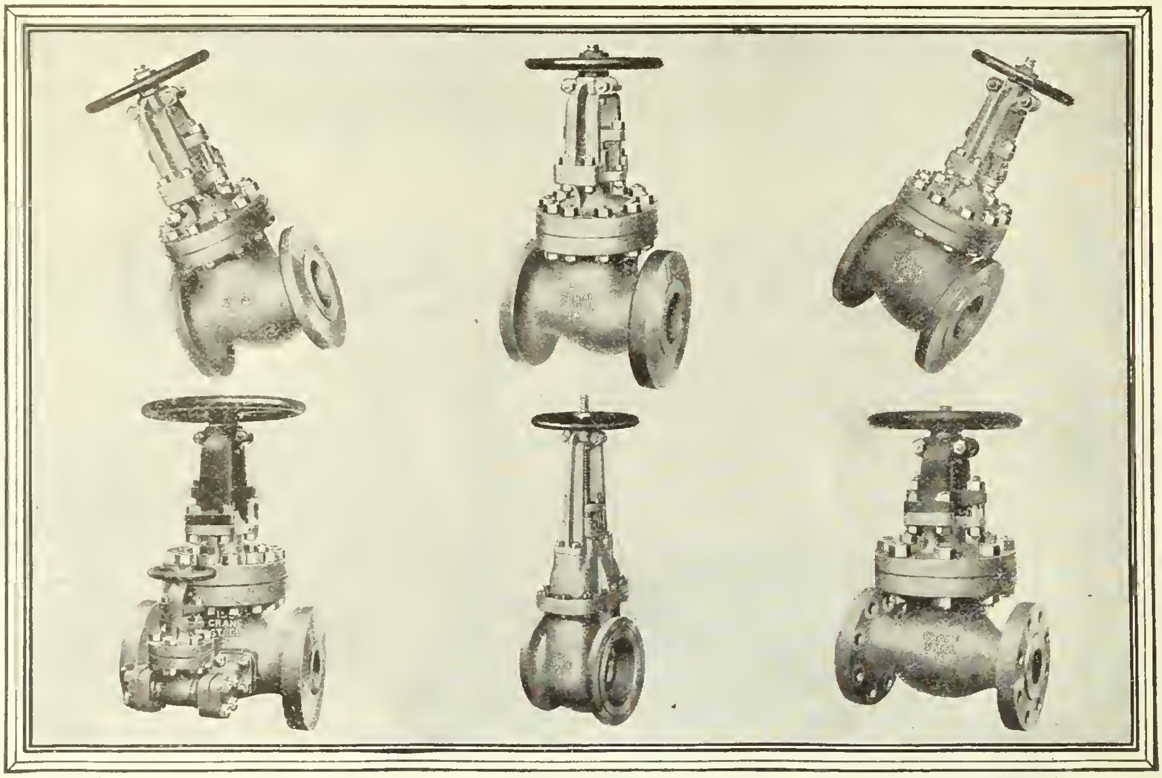

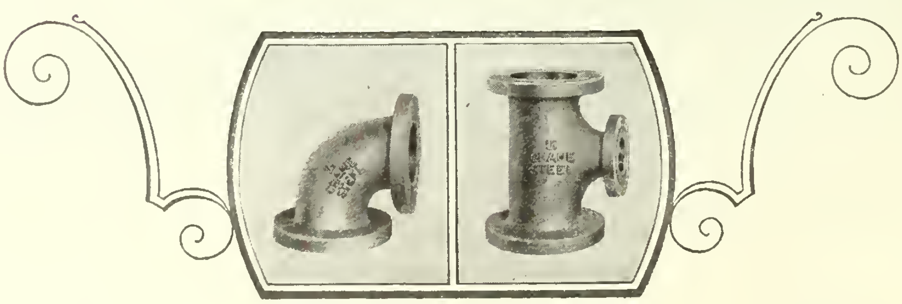

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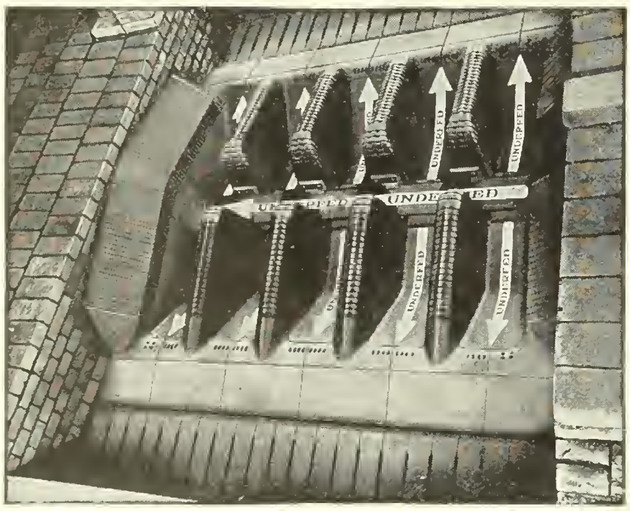

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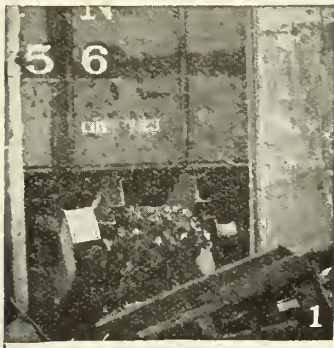

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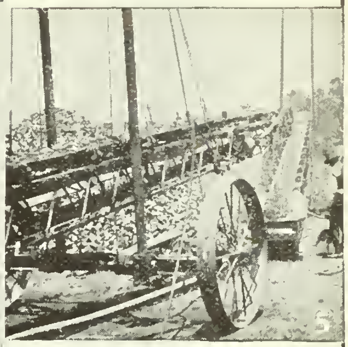
3—A Barber-Greene Conveyor coaling a ship at the Tampa Coal Co. Before noon, this and two other Barber-Greenes had loaded a car with gravel, coaled a ship, and unloaded and stored a car of coke.



4—Showing how a single Barber-Greene Conveyor has enabled the D. L. & W. Coal Co. to increase their storage 75,000 tons. It will handle at least 25 cars a day.

5—Barber - Greene Conveyors unloading a car of coke at the Tampa Coal Co.—one of three widely differing jobs completed in five hours.

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The layout is instructive. The photograph above shows the 30-foot Barber-Greene shortly after installation. It was placed on top of an 85-foot coal pile, and laid horizontally on rollers so that it could be pushed out as the pile advanced. Taking the coal as it came from the "trimmers," it distributed it well out over the pile.

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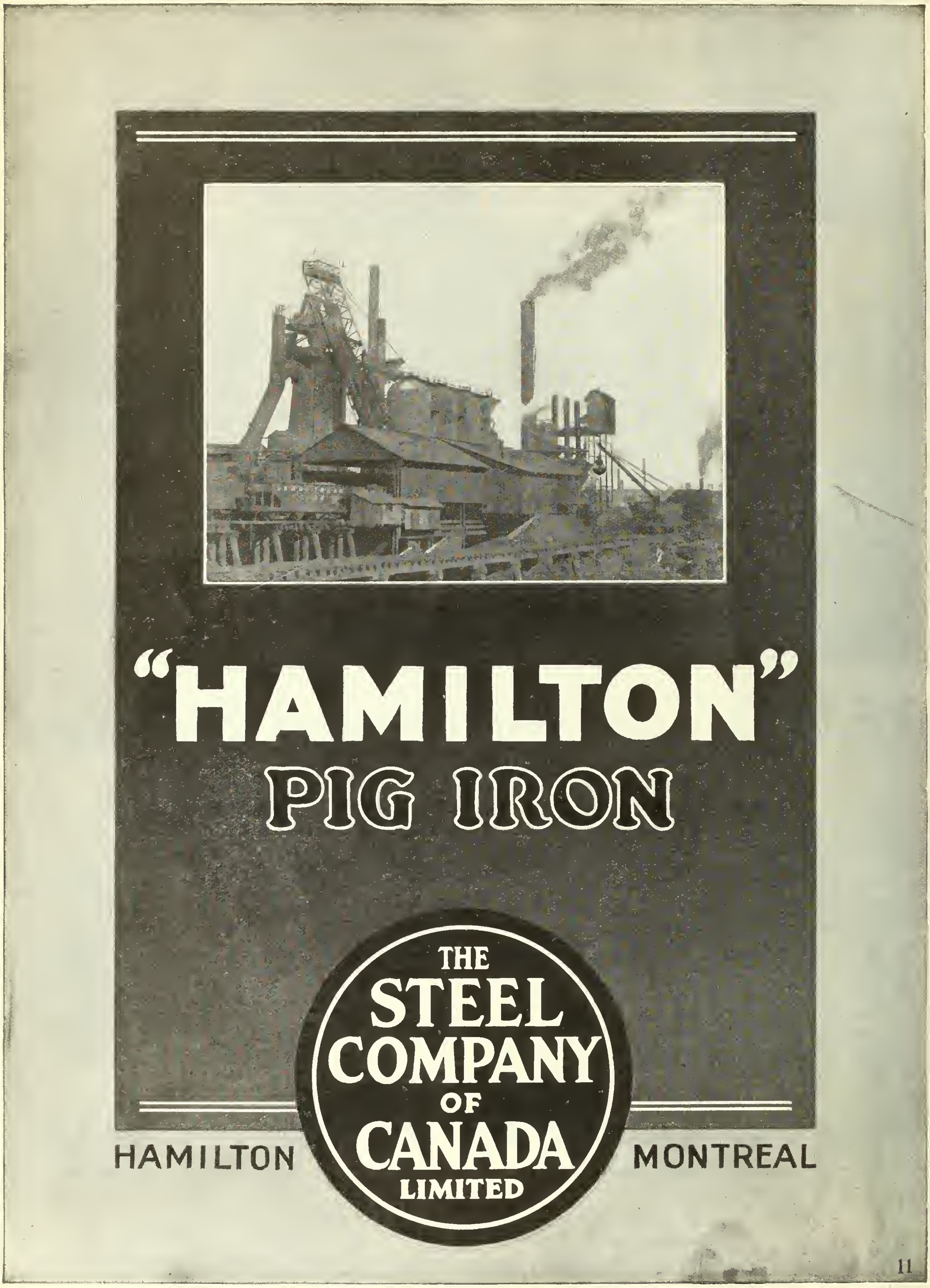
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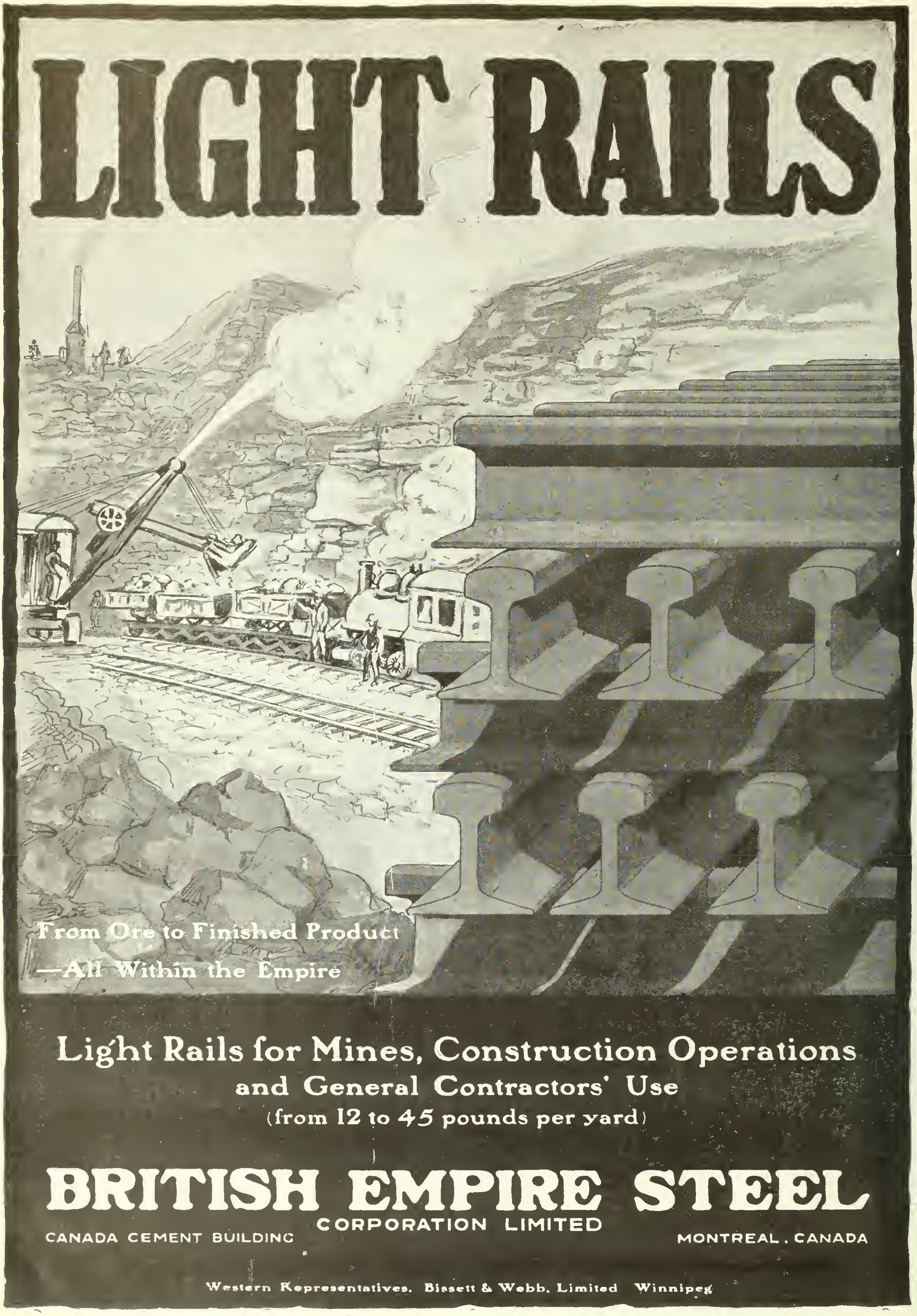
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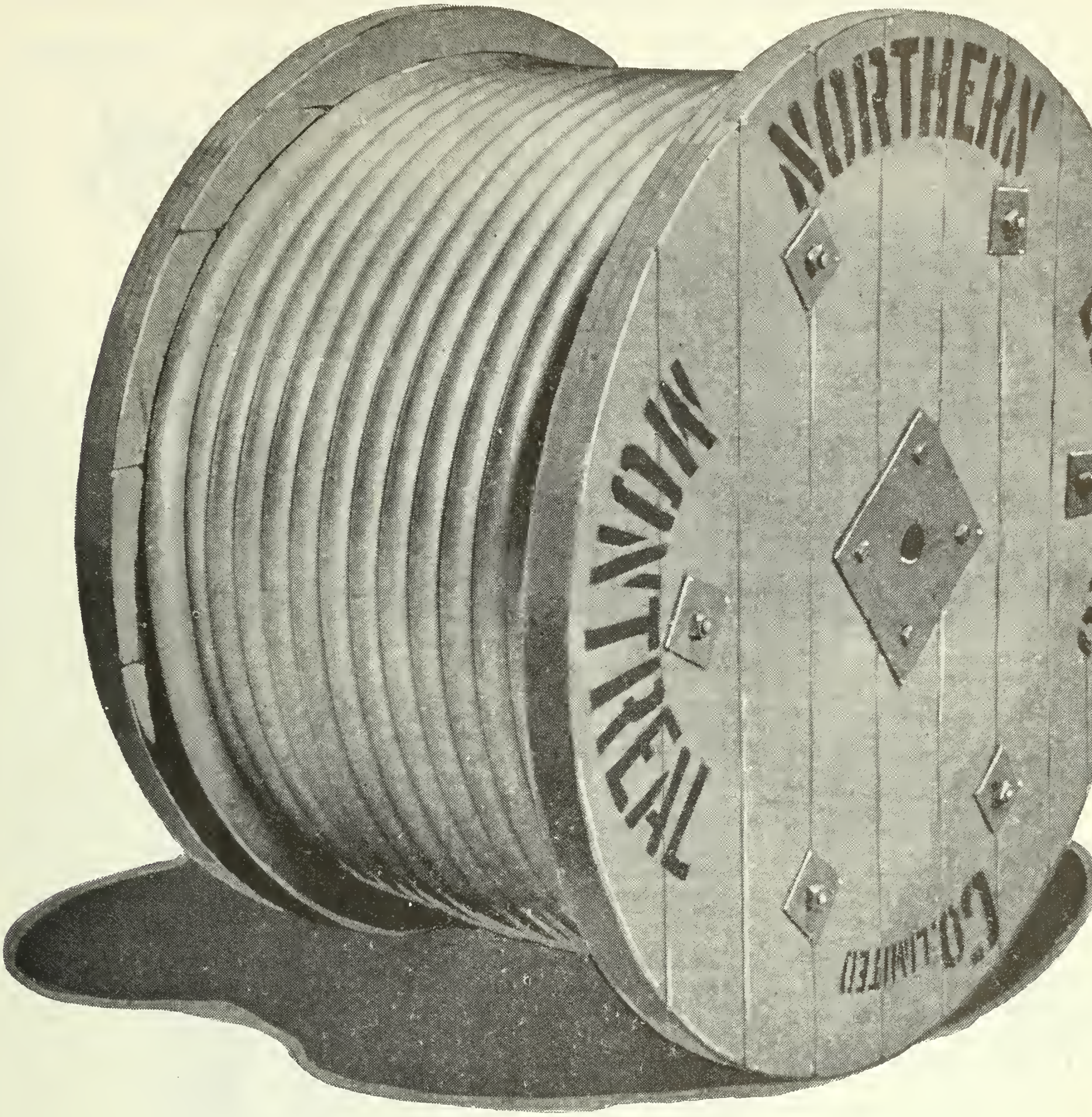
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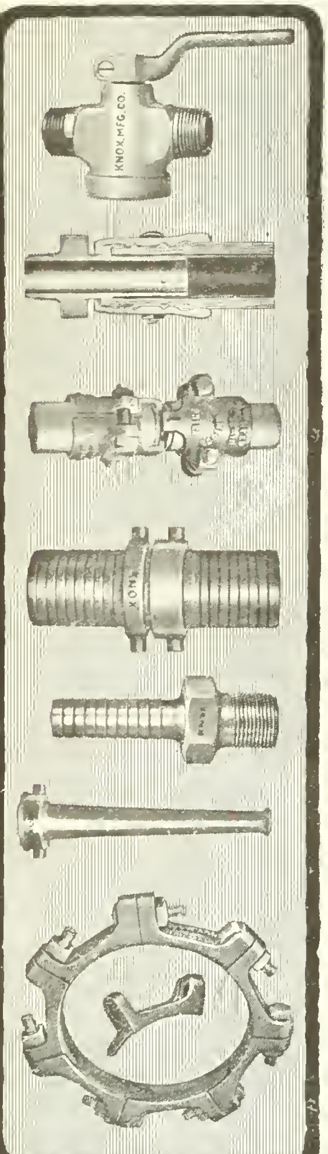

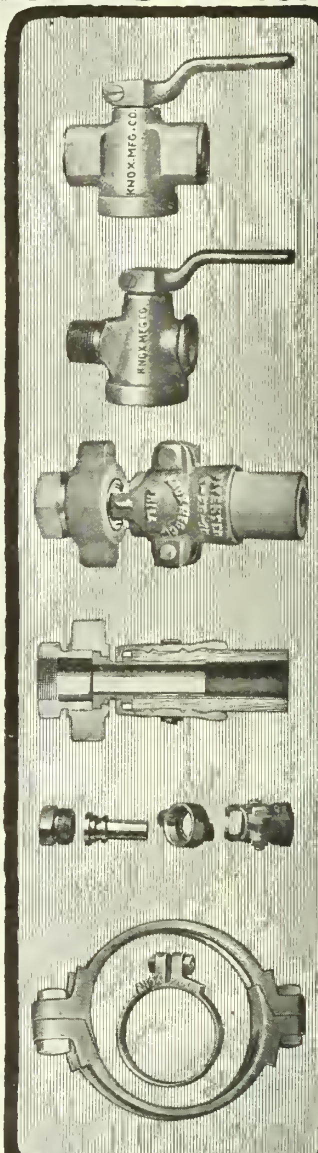

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Portland Cement

Its discovery, early uses, development, and extensive present day application.

J. M. Oxley, M.E.I.C.
Architect, Toronto, Ont.

***Paper read before the Toronto Branch, The Engineering Institute of Canada, October 16th, 1924.**

There was recently unveiled in the city of Leeds England, a bronze tablet bearing the following inscription:—

> "*In memory of Joseph Aspdin, of Leeds, bricklayer, 1779-1855, whose invention of Portland Cement, patented in its manufacture and use, has made the whole world his debtor. This tablet was presented by the American Portland Cement Association, on the occasion of the united celebrations with the British Cement Makers' Federation, of the centennial of the invention, October, 1924.*"

The antecedents of Portland cement, namely hydraulic cements of several types, take us back to the dawn of history, and we can only view with profound respect the strength and permanence of some of these cements for the uses to which they were put by the engineers of those days. It is worthy of note that the word "cement" which we now use for the binding element in a concrete mixture originally meant what we would now call the coarse aggregate; the Latin "cæmentum", rough pieces of stone, being the apparent parent of our present word. It is not difficult to see how from that meaning it came to be applied to the complete mixture, and then to the living element in the mixture, the binding material, which makes of the whole a coherent mass of almost inestimable value in its plasticity while being moulded, and of permanent form when once hardened.

Early use of Cements

It is doubtful if any hydraulic cements were knowingly employed before the Roman era, although some of the mortars used by the Egyptians evidently contained lime of hydraulic properties. The hydraulic property of the mortar used by the Romans was due to the mixing with slaked lime of fine particles of burnt earth or volcanic cinders found at Pozzuoli, near Vesuvius. Later as their knowledge widened other products of volcanic origin were used.

The function of these volcanic earths was to provide silica in an active condition which united with the lime and formed a silicate of lime capable of resisting the action of water. These pozzuolanic cements can be made and are made to a small extent to-day. When properly made they eventually attain a strength scarcely inferior to that of Portland cement. Although cheap and suitable for many purposes their use tends to decrease, probably on account of their variability and the fact that Portland cement is now so well standardized and universally available that other products are not seriously considered for large works.

We naturally admire the cement of the Romans when we consider that many of their structures, depending largely upon cement for their stability and permanence, are standing to-day, after two thousand years or more of exposure to the elements and to man's destructive tendencies. In the case of many buildings the only element remaining to-day in sufficient completeness to trace the plan and purpose of the structure is the concrete core or foundation. This may be partly due to the fact that the surface and superstructure of marble or other decorative stone has been used in the passing centuries as a source of supply for later buildings, but in any case it serves to show what a substantial material the Roman concrete was. A description of the construction of a heavy wall of concrete in Roman times would almost fit modern methods:—

> "Under the Empire the concrete used was made with broken travertine or lava for foundations, tufa or pumice-stone, (for the sake of lightness), for vaults. Massive walls were cast in a mould; upright timbers,

*This paper was presented by J. M. Oxley, M.E.I.C., as his inaugural address as chairman of the Toronto Branch.

about 6 by 7 inches and 10 to 14 feet long, were set in rows on each face of the future wall; planks 9 to 10 inches wide were nailed to them so as to form a case into which the semi-fluid, (the cement-water ratio or slump is not stated), mass of stones, lime and pozzolana was poured. When this was set the timbers were removed and refixed for the next lift, concrete poured, and the process repeated until the wall was raised to the required height. The progress of the work, judging from pouring planes still visible, would appear to have averaged about three feet per day."

For nearly all work with surfaces exposed above ground the wood moulds were lined with blocks of tufa, pepperino, lava or burnt bricks having a plane face next the forms and pointed ends bonding into the concrete. The purpose of this facing is not evident as it was usually covered again with applied stucco, and did not give as good a bond for the stucco as the concrete itself would have done.

The famous Roman roads were also generally laid on a concrete base, and here again there is something of a puzzle in the fact that the polygonal blocks of lava used for the surface are not as hard as the concrete under them. Of course, that concrete has now had a millenium or two to set in and possibly the Romans were not patient enough to wait for such hardness by the mere passage of time.

An outstanding example of Roman concrete work is the Pantheon. The walls and vault of this glorious structure are built of concrete, which, although surfaced with brick and tile, is the true structural element. The walls, 73 feet in height to the springing of the hemispherical vault or dome are 20 feet 6 inches in overall thickness, but this is much lightened by numerous cells in the thickness of the wall, some of them being as large as 10 by 34 feet and extending from the floor to within 10 feet of the springing. The first thirty feet of the height of the vault is as thick as the walls but above this it is tapered down and that portion spanning the central 106 feet in diameter is only 5 feet thick. The clear span of the vault is 142 feet 6 inches, with a rise in the soffit of half this amount, and an opening to the sky 30 feet in diameter in the centre.

In the construction of this work it is evident that the brick and tile arches and wall facings were depended on for forms and temporary support of the concrete, but their thickness is so small, in comparison with the great masses which they enclose, that their structural value was negligible once the concrete had set.

According to one eminent authority, "the material which contributed more than any other to the magnificent conceptions of the Roman Imperial style was that known as pozzolana, which, mixed with lime, formed an hydraulic cement of great cohesion and strength."

"The Romans themselves do not seem to have realized the tenacious properties of this cement, for, although they had solved the problem of covering over large spaces with a permanent casing indestructible by fire, they attempted to employ the same plan all through the Empire, and in some cases where pozzolana was not to be found. In Syria, where stone was plentiful and could be obtained in great dimensions, they attempted to erect vaults of great span similar to those in Rome. These often collapsed, sometimes before the building was finished, and were replaced by roofs in wood. However, even their cement was not always good. Pliny tells us that the Roman mortars were very bad and that: "The cause which makes so many houses fall in Rome resides in the bad quality of the cement." The building by-laws of Rome, (for they had them even then), lay down some very stringent rules for the slaking of the lime and mixing of it with the pozzolana. If such laws were necessary it is apparent that there were builders whose operations required inspection.

Efforts to Reproduce Roman Cement

We can now jump many centuries and touch on the efforts made in the eighteenth century to discover a cement equal to the Roman, the secret of which had been totally lost.

In 1779, Dr. Bryan Higgins secured through letters patent exclusive right for the manufacture of his cement. Its relative qualities we do not know, but the resolution which led to its development is stated by the inventor as follows:—

> "I resolved in the beginning of the year 1775 to investigate more closely than I had hitherto done, the principles upon which the induration and strength of calcareous cements depend; not doubting that this would lead me by an untried path to recover or to excel the Roman cement, which in aqueducts and the most exposed structures has withstood every trial of fifteen hundred or two thousand years."

An even earlier and successful effort was that of John Smeaton, who in 1756 secured a material that would harden under water, and discovered a method of testing that would show whether a given lime was suitable for his purpose, in fact he solved the secret of hydraulic lime.

Roman cement comes to light again in 1796 in the invention of James Parker. This was not true Roman cement and was not so called by its inventor, but it achieved the name through its excellent qualities. It was manufactured by calcining and powdering an indurated marl occurring naturally in nodules. It is still in use, although only for special purposes where a quick setting cement is required. It resists the action of water, salt or fresh, very well. The high percentage of alumina causes the initial set to occur in about five minutes. This fact and the small amount available makes its use very limited.

Other steps leading to the development of a true and dependable hydraulic cement capable of commercial manufacture were made by Collet-Descotils of the Ecole des Mines in 1813; L. J. Vicat in 1818; and James Frost in 1822. In 1818, St. Leger was granted a patent in France for making hydraulic lime by calcining a mixture of chalk and clay.

First Production of Portland Cement

The great requirement was to produce an artificial substitute in some generally available materials for the natural mixtures containing suitable proportions of calcium carbonate and clay. This was accomplished by Joseph Aspdin, bricklayer of Leeds, who in 1824 obtained his patent for "An Improvement in Modes of Producing an Artificial Stone". His application describes a method of making a cement or artificial stone for use in waterworks, cisterns, stuccoing buildings or any other purpose to which it was adapted. He hardly seemed to realize to what a wonderful variety of uses it was to be adapted in the century to follow. His method was to make a specific mixture of clay and finely ground limestone, calcine the mixture until the carbonic acid was expelled and grind the product to a fine powder. This product he named "Portland Cement", although the only connection between this cement and the place Portland is that the cement when set somewhat resembles in colour and texture the building stone quarried on the Isle of Portland. A year after the granting of his patent, Aspdin established a factory. Three years later his cement was used in the Thames tunnel, and within twenty-five years after his invention its manufacture was well established in England.

In 1872 the first Portland cement manufactured in the United States was produced by David O. Saylor at Coplay, Pa., but not until the beginning of the twentieth century was American cement generally considered as good as some of the English and European brands. In fact, as late as 1910, we find an eminent authority stating in a great reference work that, "The best varieties of this material are made in England, the country of its origin, much of the continental and American product being deficient in the qualities which combine to make a good cement". Our good friends across the line, or for that matter, our confidence in our home product, would hardly endorse that opinion to-day.

The development of methods of manufacture has passed through many stages and improvements, of which the most important are probably those affecting the burning of the mixed raw material.

The early vertical or shaft kilns were economical of fuel but small in output and extravagant of labour. Chamber kilns, consisting of a vertical circular burning chamber, from which the hot gases were led through a long, wide horizontal flue, in which the next charge of slurry was dried; stage kilns, in which the burning zone was between a lower shaft containing hot freshly burned clinker, and an upper shaft containing raw material being dried and heated, and ring kilns, which have a similar disposition of the stages, but arranged horizontally instead of vertically, are all types of regenerative kilns which have been used successfully but are now obsolescent. One great weakness was that they were all periodic in operation, requiring a cessation of operations to empty and recharge the chambers.

Invention of Rotary Kiln

The invention of the rotary kiln by Frederick Ransome in England in 1885, began a revolutionary change in the manufacture of Portland cement. Although you are all probably familiar with it a short description of this process may not be out of place. The rotary kiln consists of a long circular tube of rivetted steel plate 6 to 12 feet in diameter, and 60 to 200 feet long. Recently some of even larger dimensions have been used. In some cases the tube is tapered to a smaller diameter in the upper third of its length. This tube is lined with refractory fire brick, and is supported at an inclination with the horizontal of about ¾ inch per foot. The supports consist of heavy steel tires rotating on roller bearings, and at one support near the middle of the length rotation is imparted by a toothed girth gear operated by a motor. The speed of rotation is from 30 to 40 revolutions per hour. The lower end of the kiln is covered by a detachable hood with two openings. Through one of these is inserted a nozzle for the admission of fuel, and the other enables the operator to observe the interior during operation. The upper end of the tube enters a flue through which the products of combustion escape to the stack.

Manufacturing Process

The raw materials, having been prepared by crushing, drying, mixing and pulverizing are fed to the kiln by an inclined spout passing through the flue. For the dry process, which is that most generally in use, they are in the form of a fine powder, about 95 per cent passing a number 100 mesh. The fuel, powdered coal, is blown through the nozzle at the lower end by an air blast, producing a temperature of about 3,000 deg. F. The material moves gradually toward the lower end owing to the rotation and inclination of the kiln. Soon after its entrance it begins to ball up into smal marble-like particles. During the first half of its passage any entrained water is evaporated and the carbon dioxide is driven off. By the time the material has reached within a few feet of the lower end its temperature has risen to about 2,700 deg. F., carbon dioxide, sulphur and organic matter have been expelled, and the marble-like yellowish brown balls have partially fused into hard, greenish-black clinker. As in some other large scale industrial process the degree of burning or calcination is largely left to the skill and judgment of the burner, who regulates the speed of rotation so that the zone of clinkering is kept back a few feet from the discharging end. He judges of the position of this zone by the colour of the flame emitted when the clinker begins to form. The passage through the kiln takes about one hour, and at the end the clinker falls out through a trap in the lower side of the hood, whence it is conveyed to a cooler. The clinker is quite irregular in shape and varies in size from that of a hen's egg to buckshot. It is very hard, has some vitreous lustre and is generally black or greenish black in colour. A modern large kiln will produce the clinker for about 1,200 barrels of cement in twenty-four hours.

The clinker is cooled, adulterated with gypsum to slow down the setting time of the cement, ground in ball mills, tube mills, Griffin or Fuller mills and conveyed to the storage bins, in which it is generally kept for a few weeks before being bagged for shipment. This seasoning seems to improve the quality of the cement and reduce the likelihood of unsoundness.

The process of manufacture is being continually improved, of course; recent developments being a finer grinding and therefore more intimate mixing of the raw materials, advances in the uniformity of burning, and a finer grinding of the finished product. A very important feature has been the development of the chemistry of the material in its various branches.

The volume of manufacture has grown at a wonderful rate and nowhere has this been faster than in the United States. A few figures serve to show how rapid this growth has been.

	Portland Cement barrels
1890	335,500
1900	8,482,000
1908	51,072,000
1914	84,418,000
1923	137,000,000

The daily production in 1923 was greater than the annual production of 1890, and was slightly more than one-half that of the whole world.

Introduction of Reinforcing rapidly extends Usefulness

The early uses of Portland cement were for mass concrete such as foundations, mortar, stucco, and that product which was for so long an architectural abomination, cement block.

The field of usefulness did not extend very rapidly until the invention and realization of the possibilities of reinforced concrete. The opening of a new era was marked by the discovery of the fact that steel rods embedded in concrete would become so firmly bonded in place that they would act integrally with the concrete, and impart to the combination a tenacity capable of withstanding heavy bending moments. For the first steps in this direction we are indebted to France. Lambot, Monier, Coignet and Hennebique were feeling their way from 1850 to 1880, and by the latter year the principles of reinforced concrete design were beginning to be understood. It is rather odd that the first object intelligently built with reinforced concrete was a boat by Lambot in 1850, and that this idea was not carried very much farther until the past decade. Since the 80's the development has been due to so many engineers that we can mention only a few of the most outstanding.

In the 90's, and the first years of this century, there was a regular flood of patented reinforcing bars for which claims of almost magical properties were made by their manufacturers. They aimed at two objects; to give the bar a mechanical bond with the surrounding concrete, and to combine or connect the main tensile reinforcement with the shear reinforcement. Most of them have disappeared from the market.

Early Principles of Design

But perhaps before dealing with methods we should touch on the principles of design. The early French designers made quite a mystery of their theories; in fact, even to-day in that country the actual computation of design is kept as a trade secret of the firm.

Where design was more openly discussed there were many long sustained and bitter arguments between conflicting theories. For instance, one school maintained that for beam members the only sound method was to design for ultimate strength, using the parabolic relation of stress to strain, and applying a factor of safety to obtain the safe load. Another school adopted what were considered safe working stresses and used the straight line relation of stress to strain. Many series of tests and micrometer studies of beams under various conditions demonstrated that the latter method was accurate, consistently with the material, and being much simpler in application it is now almost universally employed.

Hoop form of Reinforcing

A. Considere developed a method of reinforcing columns by means of hoops, which by preventing the lateral expansion of the column under load, greatly increased its ultimate strength. Controversy was hot and heavy for several years but has now simmered down to an acceptance of the fact that reinforcement in the form of hooping, properly disposed, is of greater value than the same quantity of metal in vertical rods; but the exact ratio of this greater value is still a point of difference between authorities.

Very recently the whole question of column design has been thrown into the ring again by some long time tests made in the United States, and the issue is still in doubt.

Arch Design

The practice of arch design was in a doubtful state twenty years ago, although Weyrauch in 1879, and others later, had developed and stated the theory of the elastic arch. A prominent bridge builder of that day says:—

> "As a matter of fact, the construction of a concrete bridge twenty years ago, even of moderate dimensions, was generally considered an achievement. The project was regarded as an innovation and grave fears and doubts had to be swept away before a favourable decision was reached. After the job was finished and the falsework removed, those responsible for the design and erection would heave a sigh of relief and appear to be pleased that the expected had happened, — the bridge was still there, — and that their own doubts had been groundless."

C. A. P. Turner, by applying an idea patented by another man, developed his famous "mushroom" design for building construction, and strove by some remarkable mathematics to develop a theory which would fit the observed phenomena as shown under test. His mathematics have hardly obtained general acceptance, but the application of his idea has, and Westergarde and Slater have produced a theory of design which is acceptable as to its mathematics and also explains the action of the structure.

There have been other uncertainties and disagreements and they are not all cleared up yet, but the general trend has been toward a simplification and clarifying of the whole issue, and structures designed under the accepted theories have withstood sufficiently severe tests both in service and by students of the question for us to feel to-day that we are not far wrong except that possibly we are too conservative.

Prejudices which had to be Overcome

This reminds one of the prejudices that had to be overcome before concrete could replace some of the longer established materials of construction. To hark back to 1780, Dr. Bryan Higgins, previously referred to, in stating the need of a better cement describes England as a place,—"Where the weather is so variable and trying, and the mortar commonly used is so bad, that the timbers of the houses last longer than the walls, unless the mouldering cement be frequently replaced by pointing."

In the early 90's, at a meeting of the Engineers Club in Philadelphia, it was predicted that the concrete made with rotary kiln cement would disintegrate within five years.

Only about twenty years ago I heard a man in this city, who was responsible for the design of many large structures, say in reference to the proposed use of concrete for basement walls, that, "He would stick to rubble. No mud walls for him".

Another strong, and still existent, spirit of opposition came from those interested in the sale of competing materials.

Government and municipal departments responsible for the regulation of building design were reluctant to admit concrete construction on what we would now consider reasonable terms.

There was serious opposition from laymen, who could not understand how a wet mixture of sand, stone and Portland cement with a few steel rods in it, could carry its own weight, much less heavy imposed loads.

These handicaps are now very largely removed and it is interesting to analyze their causes. Besides the general ignorance of the possibilities of the material, there was the conflict as to methods of design between the authorities from whom leadership was to be expected, and possibly of even greater importance were the variations in results produced on the job and the inability to account for all of these variations.

First Concrete Mixed by Hand

There was no general agreement as to method of mixing, proportions of mix, consistency, protection of the work from heat, wet and cold, and other questions dealing with the execution of the job after it left the designer's office. Consideration of these questions brings us to the subject of equipment.

When concrete was all mixed by hand it required an enormous amount of labour relative to the result produced. On a well run job the materials were spread on a platform, measured in bottomless boxes, mixed by turning with spades, three times dry and three times wet, the third turn often being direct into the work, or into a wooden wheel barrow for conveyance to the work. The equipment was portable and so the place of mixing was usually moved about to be adjacent to the final resting place of the finished concrete. In those days a fair day's work for a gang of eight men was to mix and place on the level 40 cubic yards per day or 5 yards per man. Present day labour at hand mixing will not average over 2 yards per man. The five yard man was paid about $1.50 per day; the two yard man gets about $4.00. In other words the labour cost of that operation was then about 30 cents per yard while to-day it would be about $2.00 per yard.

On big mass work a rate of 160 yards per hour has been maintained by six men and two mixers, or 1,280 yards per 8-hour day. Under hand mixing conditions that would cost about $2,500.00, and require an acre or two of ground. Not much chance there of getting a tender that would permit the job to proceed!

Modern development in Plant and Methods

Not only does the mechanical mixer make possible this enormous volume of work, but its adjuncts, the storage bins, measuring hoppers and automatic water regulation, give accurate control of the proportions of the mix and its consistency, or at any rate, its cement-water ratio, which is now accepted as the most important element in control of strength.

But all this means equipment of such size and weight that when once placed it will remain there until the end of the job. Thus there is required efficient means of distributing the mixed concrete over a wide area and perhaps up to a great elevation. The descendant of the old round topped wooden barrow is the modern steel flat topped barrow of greater and more definite capacity, better balance and much easier traction. Another development has been the two-wheel cart with much larger hopper, large wheels to ease traction and no tendency to tip sideways. Even these implements could not distribute the output of a large mixer, depending as they do on man power and requiring runways which must be frequently shifted. The solution of this difficulty was the inclined chute. Concrete in a plastic condition was found to be easily transported without separation in sheet metal trough-like chutes inclined at an angle of about 23 deg. with the horizontal. These have been immensely improved in their general efficiency since their inception, and in the ease with which the point of discharge may be moved about. In some plants, where great lateral range was desired, the concrete has been elevated, chuted to the distant base of another tower, and elevated again before entering the distributing chute which might have a range of several hundred feet.

This need of elevating the concrete brings up another item of job equipment which has undergone great change. The early method was to hoist the mixture in small buckets, or barrows, with a hand derrick, or to run the barrows on to a platform hoist such as is used for handling brick or tile. Then came a special hoist tower with guides in which ran a large concrete bucket of special shape to discharge its contents at one side. At the level of discharge the door of this bucket was automatically tripped and the concrete flowed into a fixed hopper from which it could be run as desired into the barrows, carts or chutes. This scheme is in general use to-day; recent improvements having been made in mechanical details, and in building the tower of steel instead of wood. A smaller brother of the hoisting tower is the mast hoist, a very adaptable tool for small jobs. It consists of a timber or steel mast, guyed or braced in position, upon one side of which slides the hoisting bucket, and to which is attached, so as to be adjustable in height, the distributing hopper. For the lining of tunnels and other underground work a system of pneumatic transportation through pipes has been successfully used.

The pneumatic method has been applied to small equipment in the Cement Gun. This machine, by throwing a fine concrete with a blast of air produces a stone of great density and hardness, and so impervious that it may be relied on to hold water under high pressure as long as the base upon which it is cast does not produce cracks. Plaster so made can be applied to old concrete or other structural materials, and will bond very strongly to them. There have been many other detail improvements in concreting plant but time does not permit of discussing them now.

Rapid advance in Knowledge of Structure of Concrete

In addition to improvements in manufacture of cement, theory of design, and methods of execution, a great advance has been made in recent years in our knowledge of the structure of concrete and methods of obtaining the best and most uniform results. Prof. Duff A. Abrams, M.E.I.C., of the Lewis Institute of Chicago, has been a leader in this work, and the publication of the reports of investigations made under his direction, have had a great influence in improving specifications and field practice.

The standardization of methods of design on this side of the water has been largely due to the work of committees appointed by the engineering societies. The first joint committee of representatives from a number of the American societies was appointed in the summer of 1904. Their work, extending over several years, laid the foundations for a standard specification. The second joint committee, appointed in 1916, have not yet published their final report, but their draft report, issued for discussion in 1921, (and it has certainly produced discussion), has been very generally accepted in the majority of its rulings. The discussion referred to may have had the effect of making the final report acceptable in all its rulings, but that is almost too much to hope for. Our own Canadian Engineering Standards Association has had a committee at work on this subject for about three years, and, while they have completed and published their specification on Portland cement, and on reinforcement, the specification for design will probably not be ready for publication this year.

What are the qualities of this material that make it of such vast importance to the engineering and construction industry to-day?

It is a plastic stone, which may be deposited in small units or a thin stream, to locations difficult of access and complicated in form, and there become a monolithic mass of accurate outline.

It is a material having the compressive strength and permanence of stone, and the tensile strength of steel. It is incombustible and resistive to fire, free from corrosion and capable of infinite variety in its surface finish, and with all these qualities it is low enough in cost to compete to advantage with other materials having only one or two of them.

Great Undertakings made possible by use of Concrete

It has made possible such great undertakings as, for example, the Chippawa hydro-electric development. From the outer tip of the intake tubes to the discharge of the tailrace, concrete is the chief material of the fixed construction, except for the penstocks, and even they are protected from the elements with a concrete shell. The perfection of outline of the water passages in the gate house, and in the draft tubes would have been practically impossible to obtain in any other permanent material.

Bridge Construction

In bridge construction there have been innumerable imposing and beautiful structures erected in the past thirty years. Development along this line began earlier in Europe than in this country, and by 1900 there were several arches there of from 150 to 180 feet in span.

In 1897 a bridge with five spans having a total length of 693 feet was erected on the Melan system at Topeka over the Kansas river. By 1904 about 300 reinforced concrete arches had been built on this continent, one of them having three spans of 140 feet. Since then dimensions and perfection of design have rapidly increased. The Long Key viaduct of the Florida East Coast Railway has a series of 50-foot semi-circular arches with an aggregate length of six miles. The Arroyo-Seco viaduct at Pasadena, 1,468 feet long, with spans from 113 to 223 feet and 150 feet high; the Monroe Street bridge at Spokane with a span of 281 feet; the Tunkhannock viaduct on the Lackawanna Railway, and the bridge at Peterborough with centre span of 240 feet and total length of 1,172 feet, designed by one of our members, are a few examples of what has been done.

The Cappelan Memorial bridge, with a central span of 400 feet and a total length of 1,100 feet, has recently been completed over the Mississippi at Minneapolis, and contracts have been recently awarded for a bridge over the Minnesota river having twelve spans of 304 feet and a total length of 4,120 feet.

The most daring arch span so far erected is that over the Seine near Rouen in France where a span of 432 feet is cleared by two ribs only 7 by 7 feet in exterior dimensions having no inter-connection for the middle 340 feet of their length.

The design for another French bridge has been approved providing for three spans of 613 feet, 640 feet and 672 feet, and a total length of 2,775 feet.

Designs have been prepared for an arch span of 700 feet, for a site near New York, and the project shown to be quite feasible from the structural point of view.

In connection with bridge design the bow-string truss, (so-called), with suspended floor, is a beautiful example of the adaptability of reinforced concrete to special conditions. Girder and slab bridges have been built of all sizes from a 10-foot flat topped culvert to the 142-foot girder bridge in Humboldt County, California.

Hydraulic, Harbour, and Tunnel Works

In hydraulic work, such as dams and canals, concrete has made economically possible projects which could not have been seriously considered with older methods of construction. The great irrigation and reclamation schemes of the West, the Panama canal and the new Welland canal are a few outstanding examples of this.

Harbour and dock work have had a similar development, and while there has been much criticism of the behaviour of cement in sea water, there is one important fact to consider. Of all the structural materials used in the sea, concrete has the best record, and a steadily increasing number of concrete structures are being built in sea water, as the causes of failure and methods of preventing it are being better understood. The so-called failures have generally resulted from improper use and bad workmanship and many structures have stood sucessfully for long periods. The new Ballantyne pier at Vancouver is a very fine example of dock work designed and executed with great precaution to ensure its permanence.

In fresh water the many harbours, docks and sea walls erected in the Great Lakes show some excellent engineering with concrete, and it is safe to say that the wonderful development of our Toronto water front would not have been economically feasible with any other material.

Concrete piling and caissons have opened new fields in foundation work, making the elevation of ground water a matter of small importance, and permitting very high concentrations of loading.

In tunnel work concrete has provided a much cheaper and more permanent lining than formerly available, and even when, as in the Hudson river tubes, sectional cast iron lining is employed it is packed in place on the exterior and lined on the interior with concrete.

Road Construction

In road construction, that mechanical marvel of our age, the automobile, and that structural marvel, concrete, have marched together. The motor car created the demand for good roads, and its increasing use for both pleasure and commerce made the tax payer willing to pay for them. Concrete made them possible. But by supplying the demand it also increased it. Cars need good roads; good roads make cars more desirable; the result is, more cars and the demand for more roads to accommodate them. This reciprocal action has brought about such great expenditure for both cars and roads that many economists are shaking their heads in doubt as to the wisdom of it all.

Concrete Pipes

Reinforced concrete pipe is coming increasingly into use as its advantages and economies are better understood. Standard types are now made up to 9 feet in diameter and good for heads of over 200 feet. The larger sizes are made in oiled steel moulds, with no obstructions, grooves or irregularities even at the joints, and thus have a pressure loss smaller than pipe of any other material except wood-stave. The water losses are small, not more than in pipes of steel or cast iron, and much less than in wood-stave pipe, and tend to decrease as the pores of the concrete are filled.

Smaller sizes, up to 36-inch diameter are being made by the centrifugal process, which produces a very dense, practically impervious wall. The joints in concrete pipe have to provide for the movement caused by temperature changes, and have been perfected so that they permit of this movement without leakage. Reinforced concrete pipe is hydraulically economical, moderate in first cost, very low in maintenance cost, and its long life means low sinking fund charges for the retirement of bonds issued to finance its construction.

Reinforced Concrete applied to Building Construction

The history of the application of reinforced concrete to building construction would fill a volume in itself. We can touch on only a few outstanding points here.

On this continent, following the precedent of steel framing, reinforced concrete was employed chiefly as the skeleton frame, with this important difference, the floor and roof slabs were an essential part of the frame, which made for a much more rigid building. This frame was, and very often is still, enclosed by an exterior facing of brick, terra-cotta or masonry. As one architect expressed it: "In short, we build two buildings; one a complete structural entity, the other an elaborate architectural and decorative falsehood".

In Europe the architects attempted to develop a style suitable to the material, but it happened that the "Nouveau Art" movement was sweeping Europe just as the possibilities of concrete were being appreciated, and this exerted a pernicious influence on the use of a plastic material which allowed free rein to the wierdest and most flamboyant fancies.

Here utilitarian purposes ruled. A material that afforded its own protection against fire and the elements, permitted large window areas and few columns, gave freedom from vibration, and all at a relatively low cost, was eagerly utilized for industrial buildings. For such purposes there has been a great advance architecturally in the past twenty years and a distinct and individual type has been developed. For more general purposes the development has been more recent, but the last five years have produced many architecturally successful buildings, such as hotels, clubs, hospitals, office buildings and places of amusement.

A few examples will illustrate. The oldest concrete building in America of which I can find record was a house built at Prairie du Lac, Wis., in 1838. The source of the cement is unknown, but the builder had confidence in it. He was made the butt of many jokes concerning his "pet", and becoming angry one day he handed a sledge hammer to one of his tormentors, and told him that if he thought the building was unsound he might try knocking a hole in it, but that each blow would cost him five cents. This was made a standing offer, but the old building shows no sign of damage incurred. Five other concrete houses were built in the same town during the next thirteen years. All are in service to-day and in an excellent state of preservation.

We are prone to consider the skyscraper, particularly the concrete skyscraper as the child of American ingenuity, but the first concrete skyscraper was built in England, perhaps "skyscratcher" would describe it better. It is a tower 220 feet high and 22 feet square at the base. It was built fifty years ago and stands to-day with no sign of disintegration. Even the fine mouldings of the cornices show perfect arrises. The cement was from the Isle of Wight Portland Cement works. The mixture used was one cement, one sand, and five gravel for the walls and 1–2–4 for the roof. The roof was originally covered with coal tar, but although this has disappeared it is watertight to-day. Precast concrete was used for moulded work surrounding the door and window openings, and for a central spiral stair leading to the top. Floors were supported on wrought iron joists which are still in perfect condition even where the bottom flanges are exposed. The concrete at the base of the walls is under a stress of about 300 pounds per square inch, if wind be estimated at 20 pounds per square foot of exposure. It is in a very exposed position, being one of the first landmarks to meet the eye from the sea. It has been struck by lightning but without any great damage. It stands perfectly plumb and shows no evidence of its fifty years of defiance to storm and stress.

In mentioning more recent buildings I would quote Mr. Albert Kahn of Detroit, who has produced many notable industrial buildings in concrete: — "Take Cass Gilbert's Brooklyn army supply base building. Nothing could be finer in mass, more straight-forward or more direct. It is almost bald in its simplicity, certainly ornamentation plays no part in the design and yet by a masterly vertical sub-division of pylons, piers and mullions, all in proper relation to each other, all splendidly proportioned not only in width and height, but also in relative projection, we have a work of the highest architectural merit. Nor has the architect tried to conceal the character of the material. Indeed he frankly accepts it and makes a virtue of what would seem a blemish. He makes no attempt at hiding even the board marks of the forms. Instead he procures a certain texture thereby. Throughout there is revealed a fine appreciation of the material employed and the problem in hand. It is truly the work of an artist and incidentally proof positive that even the plainest structure may be made attractive; furthermore, that the architect is a much needed individual in spite of the opposite opinion of many engineers.

"Another important group for the navy is its office building in Washington. It is inoffensive but it fails in that its design does not express concrete. It might as well be constructed of brick or stone. Mr. Gilbert's is a concrete structure and could be mistaken for nothing else

"The Marlborough-Blenheim in Atlantic City is one of the earliest of important reinforced structures in this country, and although its enclosing walls are of hollow tile stuccoed, the exterior design is typically concrete. It was indeed a courageous undertaking. Architecturally, this building ranks high. There is a playfulness and picturesqueness which are well suited for a resort of the kind. Then, too, there is much originality in the design without being outré. Price and McLannahan were its architects.

Just what are the practical limitations as to height of reinforced-concrete buildings is a matter of opinion. The sizes required for columns are usually the determining factor. Our own experience would indicate that for buildings of ten, even twelve, floors, to carry ordinary live loads, concrete columns need be no larger than of structural steel fire-proofed. Beyond that height we prefer to use the latter, although often enough we use structural steel for lower floors with concrete for the upper with results not only structurally practical, but economical as well.

"Reinforced-concrete is at its best when used for low buildings as in southern and western places. The Presbyterian hospital at San Juan indicates how beautifully the material lends itself to such structures. This is concrete design at its best. Simple pier and wall surfaces, square and semi-circular openings, no cornice and plain belt course. Of similar character, although a high building, is the new University club in Los Angeles by Allison and Allison. This, I believe, is one of the best buildings we have in concrete. Its design is excellent in every detail, and particularly noteworthy is the surface treatment which apparently exposes form marks without hesitancy. This building indicates the possibilities of reinforced-concrete for exterior use in civic architecture, an unlimited field in which it has been but little employed up to now.

"Our most recent structure of importance is the new body plant for the Studebaker Corporation in South Bend. Here we had a rare opportunity, the building being six stories high and over 1,000 feet long. We have in this increased the more usual brick pylons to brick pavilions with exposed concrete mullions.

"The matter of surface treatment is still a problem. How will it be solved ? Left in its natural state untouched from the forms, cement washed, or rubbed with carborundum, concrete at best is cold in color and uninteresting in texture. Stucco or other surface applications have proved on the whole a failure in most parts of the country, for they do not adhere because of difference in expansion and contraction and develop unsightly cracks. Attempts have been made to treat the surface by tooling or exposing the aggregate, but few have proved successful and none economical in cost. A ray of hope is afforded by the remarkable work of Mr. Earley. His first efforts in connection with Meridian park at Washington, D.C., gave promise, his latest, however, are a distinct achievement. By the use of aggregates carefully selected as to colour and size and these exposed through wire brushing and washing with acid, he produces a surface and texture of surpassing beauty. Withal, it is no imitation of anything but true concrete, remarkable in its effectiveness."

In regard to surface finish, some experiments carried out in Toronto last winter showed that with ordinary commercial aggregates, and precautions as to the proportions, mixing and placing, a concrete which would produce a very fine surface, both as to colour and texture, could be produced for monolithic work. Another type of surface, very attractive for some purposes is exemplified by some of the buildings at Sunnyside.

There are many other fields of concrete work which space does not permit even to mention. The future holds great promise of even more remarkable achievement. It is only within the last ten years that the qualities of this material have begun to be generally appreciated. In many lines we seem to be only now on the threshold of new worlds to conquer. Aluminate cement, for instance, appears to have remarkable virtues, in its early strength, final strength, and resistance to sea water and the injurious chemicals of some ground waters.

The greatest field is, however, probably in the results of continued research into the possibilities of Portland cement as now produced, or improved as it will be with the passing years. If Joseph Aspdin could return and make a world tour to-day and see what has been accomplished with his invention, I think he would be a very proud and happy man, and a greatly amazed man too.

Creosoting of Material as Relating to Constructive Engineering

The Development of Processes for the Preservative Treatment of Timber.

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President, Canada Creosoting Company, Limited, Toronto.

Paper read before the Montreal Branch, The Engineering Institute of Canada. November 1st. 1923.

It is not the purpose of this paper to enter into a highly technical treatise on wood preservation, for it would be quite unfair to invade the field of the erudite gentlemen who, during the past decade, have added to the literature of the creosoting profession, if it may be so-called, many tons of higher mathematics, (there probably being several hundred pounds yet unread).

Neither is it my purpose to take you back to the days of the Egyptians and describe in detail the treating plants operated by the Pharaoh Boys, nor will we more than touch on the preserving processes and methods described in the writings of our old school book friends:—Cato, Pliny, Vitruvius and others whose names I cannot spell and who are mostly deceased or have retired from business. I merely mention these early competitors in the business in order to add tone to this paper, for you who are well read, doubtless have observed that no really well informed speaker or writer on this subject would, under any circumstances, think of overlooking the Ancients: he would be classed as an inefficient writer who, given a fountain pen, a warm fire-place, a cozy chair and a travelling library, could not develop at least a page of manuscript per Ancient.

However, the present author wants to confess, here and now, that this class of literature has not been fruitful of much nourishment to him in the practical, every day and night operation of creosoting plants, where daily production and efficiency are required in the handling, treatment and shipment of many millions of ties per annum, nor in his negotiations with practical engineers, it might be mentioned, parenthetically, of whom quite a number are Scotch. We will, therefore, even at the risk of decreasing the length of this paper, take a fairly lengthy jump from somewhere around 586 B.C. where we will leave the Egyptians, to 1838 A.D. where we will start anew with the Englishman, the latter date being the practical starting point of the industry in England.

Early Processes for the Treatment of Timber

It was only after the birth and growth of railway systems in that country that the antiseptic treatment of timber may be said to have received its most important development. The stone blocks and other solid supports at first used for the permanent way of railways were found to be too rigid and had to be replaced by a more elastic material. The wooden sleepers which were substituted decayed so rapidly that some method of prolonging their life began to be considered as an engineering necessity. By the year 1838, four different processes of antiseptic treatment were before the public and competing for the favors of the engineers. These were:—

Corrosive sublimate, Introduced and promoted by Mr. J. H. Kyan.
Sulphate of copper, " " " " Mr. J. J. L. Margary.
Chloride of Zinc, " " " " Sir Wm. Burnett.
Heavy oil of tar, later called Creosote, Introduced and promoted by............ Mr. John Bethell.

Corrosive sublimate or bichloride of mercury, commonly known as "Kyanizing" after the name of the patentee, for a time met with more or less success when used in comparatively dry situations, but when exposed to rainfall and used in sea water it appears invariably to have failed, as has apparently been the case with most of the metal salts. Corrosive sublimate is somewhat volatile at ordinary temperatures; it also has the drawback of producing injurious effects upon the workmen employed in handling it.

Sulphate of Copper

In 1837 Mr. J. J. L. Margary took out a patent for the use of sulphate and ascetate of copper in the treatment of woods and this for a time enjoyed considerable popularity, but on account of its destructiveness to pumps and cylinders and other metal parts it was practically, if not quite, abandoned in England.

Chloride of Zinc

This process, commonly known as "Burnettizing", was patented by Sir Wm. Burnett in 1838 and for a time was patronized by the British Admiralty and the railway companies in the treatment of sleepers. It was also used extensively in France for the treatment of railway sleepers, but on account of its extreme solubility in water, it was gradually replaced by other, more insoluble preservatives.

Creosote

The first mention of the products of gas tar distillation, to be used separately for impregnating timbers, appears to be by Franz Moll, who took out a patent in 1836 for injecting wood in closed iron vessels with the oil of coal tar, first in a state of vapor, and next with the heated oils in the ordinary liquid state. He recommended the adoption both of the oils lighter than water, and of the oils heavier than water, calling the former "Eupion" and the latter "Kreosot". He relied on the "Kreosot" for its antiseptic qualities, but proposed to use the light oils separately, at the beginning of the operation for the purpose of facilitating the absorption of the heavy oil. This plan was never used in practical operations as it was obviously wasteful and not practical to inject initially and separately the lighter oils, which would immediately evaporate.

The Origin of the Creosoting Process

The practical introduction of this idea is due to Mr. John Bethell. His patent, dated July 1838, does not mention the words "creosote" or "creosoting". It contains no less than eighteen various substances, mixtures or solutions, said to be preservatives of wood. Amongst them is mentioned a mixture, consisting of coal tar, thinned with from one-third to one-half of its quantity of dead oil distilled from coal tar. This is the origin of the so-called creosoting process, and was really the actual beginning of the industry, as an industry, as up to that period such treatments as were applied to wooden materials were done by brushing, painting, dipping, boiling in open tanks and other make-shift methods.

Some time in the early thirties, a Mr. Breant, a director of the Paris Mint, took out a patent covering an apparatus for injecting chemicals into timber by means of vacuum and pressure in a closed, air-tight iron cylinder, he employing by preference linseed oil and resin. The cylinder was fixed vertically, an inconvenient arrangement not necessary to the efficiency of his process. This idea of an iron cylinder was adopted by Mr. Bethell and greatly improved by him and his associate, Mr. H. P. Burt. The cylinder was enlarged, placed horizontally, its fittings strengthened, and an interior heating apparatus installed. Later on tram tracks were placed in the cylinders, upon which were operated cars with low wheels, on top of which were circular containers slightly smaller in diameter than the diameter of the cylinders. While the modern treating cylinder has undergone some refinements in the way of more easily handled doors, better system of heating coils and other minor details, as well as enlargement in diameter and length, yet it has not been greatly changed from the ones used by the pioneers, Bethell, Burt and Boulton, during the early fifties. To these three gentlemen, beyond question of doubt, must be given credit for the intensive, intelligent studies and the building of the ground work, upon which the present industry is founded.

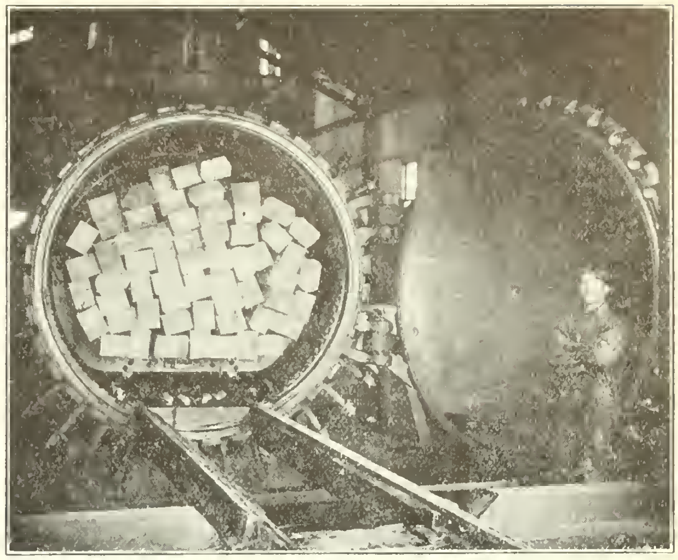


Figure No. 1.—View of the Front End of a Treating Cylinder.

Sir Samuel Boulton, an engineer of outstanding qualifications, endowed with a highly scientific, yet practical mind, in 1850 associated himself with Mr. H. P. Burt, the firm afterwards becoming that of Burt, Boulton and Haywood, and has so continued until the present day. Owing to the faith these men had in the future of the industry, during the following thirty-five years immense quantities of sleepers, fence posts, poles, building materials and piling for marine work, were creosoted and used, not only in England, France, Germany and Belgium, but in India, Australia, Mexico and many other countries of the world. These materials were honestly and efficiently treated, resulting in an added life of all the way from four to fifteen times the normal life of the same woods when untreated. In consequence of these demonstrations of the longevity of creosoted woods, constructive engineers who were at all progressive quickly adopted them, even after taking into consideration the then low wages paid carpenters and track men, as applied to the many renewals of untreated woods.

Extent of the Industry Fifty Years Ago

To bring to your notice impressively how tremendous was the volume of the treating business in Europe, even as far back as fifty years ago, I want to quote as briefly as possible, excerpts of some talks made in 1885 at a meeting of the Institution of Civil Engineers, of Great Britain, at which meeting an exhaustive paper on "The Preservation of Timber" was read by Sir Samuel Boulton. During the discussion of this paper, Mr. W. H. Preece, a member of the Institution and an engineer in the employ of Her Majesty's telegraph service, said: —

> "As the behaviour of certain of Her Majesty's telegraph poles had been called in question, he ought to say something in their behalf. For the past thirty years he had devoted all the attention and skill he could command to the enquiry as to the best modes of

preserving timber. In the telegraph service of the country many millions of poles had been preserved in various ways, and one of the methods, the Bethell, had proved to be the survival of the fittest. A great deal had been said as to the various causes of decay. Reference had been made to chemical and physiological causes, but there was a third cause, which might be called mechanical, — the decay existing at the "wind and water" line, or the ground line, where the timber was exposed to incessant changes of moisture and temperature. A careful microscopic examination showed that the process of decay was a purely mechanical one, that the wood disintegrated by a process of bursting; the fibres appearing to be minute boilers, and the change of temperature produced evaporation, minute explosion, and rapid deterioration. It was a simple thing to meet the chemical cause by the insertion of salts of various kinds, and it was possible to meet the physiological cause by antiseptic treatment, but the mechanical cause could only be obviated by coating the fibres of the wood with a thick viscous mass like creosote in its best form."

Mr. Preece further relates that in 1844 the first line of telegraph was constructed between London, Southampton and Gosport and the poles were made of the best timber, preserved by the Burnettizing process simply impregnating the wood with zinc chloride. In 1857 he made a personal observation of a great portion of the line in different grounds, and found that in sand about 40 per cent of the poles had gone, in clay about 33 per cent and in chalk about 28 per cent. In 1860 he found the proportion was much greater, and in 1871 they had all failed so they had to be removed. The Burnettizing process materially added to the life of the pole, without rendering it indestructible. Kyanizing was tried to a small extent, but the poisonous character of the salts deterred them from carrying it further. In 1848, a line of poles was erected from Fareham to Portsmouth, a distance of about twenty miles, and all the poles, 318 in number, were creosoted by Mr. Bethell. In 1861 he examined them all and only two showed the slightest trace of decay, and they had begun to decay at the top. In 1874 he had them again examined and every pole was sound. In 1884 owing to the requirements of the service and the necessity of increasing the number of wires, the line of poles had to be taken down and although they had been put up in 1848, they were, with the two exceptions, as sound as when first erected.

About the year 1861 the proper mode of preserving timber was one of great consequence. The authorities were not satisfied as to which was the best, creosoting or boucherizing (a process invented by Dr. Bouchere and used at that time to some extent in France, the preservative injected being copper sulphate); consequently in the Yeovil and Exeter line of the London and South-Western Railway Company the poles were put up alternately, first a plain pole, next a boucherized pole, and next a creosoted pole, the line extending about forty miles. In 1870 the lines were carefully examined and it was found that of the plain poles that had been up ten years not one existed, all having decayed; of the boucherized poles 30 per cent had decayed, and of the creosoted poles not one had decayed. The result was, the government has for years past decided to creosote all their poles. At that time, (1885), millions of poles existing in that country were all creosoted.

I have quoted at somewhat greater length from Mr. Preece than is perhaps necessary, but there are two points I want to bring to your notice, the first being that at that date, (1885), engineers were divided as to the real cause of wood decay, whereas laboratory investigations many years since proved conclusively that wherever spores could get access there would begin development of the mycelium or root of the fungus which penetrated the wood wherever nutritious materials were supplied. The second, and most illuminating point is that thirty-eight years since, *all* of the millions of poles planted throughout England were creosoted and the same condition exists today.

At the same meeting of the Institution of Civil Engineers, (mark you this was in 1885), a letter bearing on the discussion was read from Mr. A. Bouisson, of the Western Railways of France, who stated that in 1859, on the line from Rouen to Dieppe, sleepers creosoted by the Bethell process had been adopted for the first time. These sleepers were of beech. They had been creosoted in England, and when examination of them was made twenty years later, on the occasion of the Paris exhibition of 1878, it was shown that not a single one of them bore the slightest trace of decay. Since 1864 the railway company, of which he was engineer of permanent way, had adopted creosoting for their sleepers, and from that date they had applied it to about five million sleepers, of which at least three million and a-half were of beechwood. In these latter, as in the trial sleepers of 1859, no sign of decay has as yet been distinguished and the lasting power of the sleepers seemed only to be limited by the wear and tear to which the materials were exposed. Beechwood placed in the ground, without having been prepared, completely decayed at the end of two or three years, which rendered impossible the use in the form of sleepers of that wood unprepared.

I want you to analyze closely the statement of Mr. Bouisson, an engineer of standing and prominence and to remember particularly that three million, five hundred thousand of the five million sleepers treated were *beech*, and that *all* of them had given a service of twenty years or more. Notwithstanding this and many other similar authentic records of beech ties, it may be somewhat of a surprise to many of you to know that it has been only a comparatively few years since beech ties were first used in Canada, even in face of the fact that this is one of the most plentiful woods in the eastern portion of the Dominion. There are yet engineers in Canada who are not quite certain it is a desirable tie wood, even when treated.

While, as has been seen, during the period from 1850 to 1885 the treating business had in Europe grown to a very large volume, yet up to that time very little progress in the business had been made on this side of the water. The credit for the pioneering work in this industry in the United States is largely due to three men — Mr. Octavius Chanute, Mr. J. W. Byrnes and Mr. Christian. Up to the time of their death all three of these men were active in the industry for many years.

Development of Creosoting in this Country

Much of the first work in the way of creosoting done in this country in the period between 1875 and 1895 was under the supervision of these three men and because of the fact that their treatment was thorough, the materials gave excellent service and proved to be highly economical. The work of Mr. Byrnes and Mr. Christian was largely for marine structures, such as docks and bridges, in the Gulf of Mexico. Mr. Chanute was a strong advocate of the Burnettizing process for ties and was an authority on this method of treatment.

Many of the bridge and dock structures erected from 1875 to 1900 in Teredo and Limnoria infested waters were still standing and in service after a period of from twenty to twenty-five years. This in itself is a monument to the men who were responsible for the treatment, and aided greatly in the promotion and use of creosoted materials.

Up to the year 1885 there were some four plants in the United States. During the following ten years the business was of such slow growth that the records show there were only nine additional plants erected and in operation. In 1905 the number of plants in the United States had increased to thirty-four, and in 1912 there were eighty-four pressure treatment plants in operation in North America. Since that period to the present date the number of plants has more than doubled. I am giving you this data to show the slow growth of the industry in America during the first twenty years of the period mentioned, and the rapid growth during the past twenty years.

There have been in use from time to time in America many different processes, (I believe something over two hundred patents having been taken out on different methods of wood preservation), but the larger portion of them have fallen by the wayside and have been entirely forgotten by the treating fraternity.

The processes yet in use may be divided into two groups. These we may call the "superficial" and "impregnation" processes.

Superficial Processes

By the superficial process is meant those processes of treatment aiming to protect the wood by simply giving it a surface protection. In sound timber decay can occur only from outside agencies. If the surface of the wood is rendered resistant to wood destroying fungi, the entire timber will remain sound. This contention is doubtless correct and when the surface of a timber is so preserved and the surface protection is completely maintained, the timber may last for a considerable period of time. Unfortunately wooden materials so treated are almost certain to have the protective coating broken, either through abrasion or checking. When this happens, the untreated interior is at once attacked by the fungi of decay and the effect of the protecting shell is completely destroyed. In addition to these objections in the use of creosote oils in the superficial processes, a large portion of the lighter oils, if heated to the necessary temperature, are lost by evaporation. However, superficial treatments have been very helpful to the creosoting industry, for an engineer after he has started using the brushing, dipping, boiling and other superficial treatments, almost invariably studies the subject of wood preservation to such an extent as to cause him to become an advocate of the more permanent pressure treatments.

All so-called pressure treatments rely upon the use of pressure above atmospheric in order to force the preservatives into the wood. There are in use various processes at the present day, but in general the larger portion of pressure treating plants use one of three or four different treatments, a brief description of which is given below:—

Bethel Process

This process is named after John Bethell who took out patents in England in 1838. It is commonly referred to in our country as the "full-cell" process. Either green or seasoned timber can be treated by this process, creosote oil, (dead oil of coal-tar), being the preservative used. The timber to be treated is loaded upon steel cars or buggies which are run into horizontal cylinders usually seven feet in diameter by one hundred and thirty-two feet long. Their length, however, varies from about fifty feet to one hundred and eighty feet, and diameter from six to nine feet. If the timber is green it is subjected to a bath of live steam for several hours, after which a vacuum is drawn by means of pumps. This also is held for one or more hours according to the judgement of the operator. If the timber is air seasoned, the steam bath is generally omitted. Creosote oil is then run or pumped into the cylinder and a pressure of one hundred to one hundred and eighty pounds applied until the gauges show the desired amount of oil has been forced into the wood.

The excess oil is then drained from the treating cylinder and the timber is allowed to drip for a short period, after which the process is ended and the charge removed. Many treating engineers draw a vacuum in the cylinder after the excess oil has drained from it as this tends to hasten the drip and dry the timber. The Bethell or "full-cell" process is considered the standard process of treating timber with creosote, and the most effective results in prolonging the life of wood have been secured by it. On account of the relatively large amount of oil which the ties absorb the process is, however, the most expensive and for this reason several modifications have been made.

Lowry Process

In the Lowry process, air-seasoned timber is loaded on tram cars and placed within the treating cylinder. The cylinder is then filled from a charging tank with creosote oil at a temperature not to exceed 200°F. The main line is then closed and oil from the charging tank is forced by pressure pumps into the cylinder until the timber has

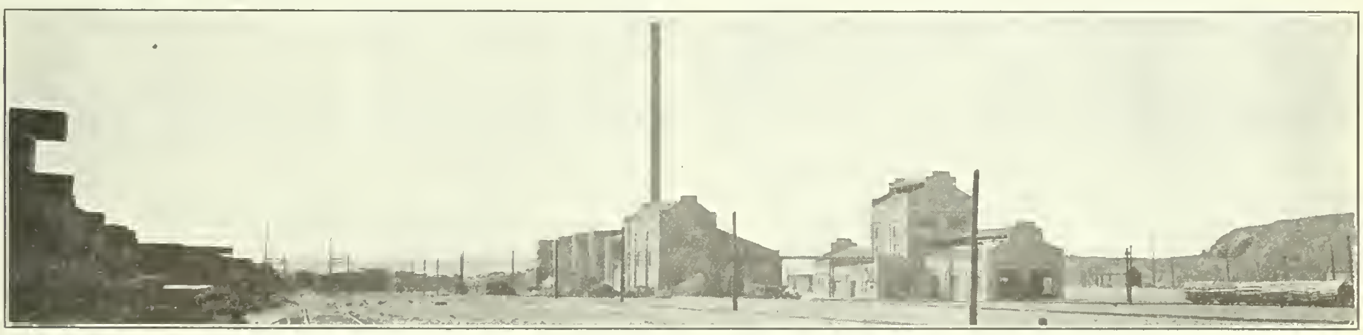


Figure No. 2.—General View of a Creosoting Plant located at Sudbury, Ontario, operated by the Canada Creosoting Company, Limited.

taken oil to the point of refusal, or a predetermined amount. The pressure and temperature within the cylinder are controlled so as to give a maximum penetration of the oil. The pressure is then released and the free oil in the cylinder is drained off. A vacuum of a sufficient degree and duration is then drawn in the cylinder to recover that portion of the free oil in the timber above the specified amount. The recovered oil is then drained off from the cylinder and the charge is withdrawn. The Lowry process may be termed an "empty-cell" process in that it aims to secure a deep penetration of creosote without consuming as much of it as the Bethell, or "full-cell" process.

Reuping Process

This is also termed an "empty-cell" process in that the object sought is a deep penetration of creosote with a comparatively small consumption of the oil. The timber to be treated should be air-seasoned. Green or partially seasoned wood is subjected to a steam and vacuum bath similar to that given in the Bethell process before the treatment is begun. After the timber has been placed in the treating cylinder, it is subjected to air pressure of a predetermined intensity. Creosote is then admitted into the cylinder, while this pressure is maintained.

When the cylinder is filled with creosote the pressure on the oil is raised to about one hundred and fifty or more pounds and held until no more oil can be forced into the wood. The cylinder is then drained of oil and a final vacuum drawn to increase the expansive force of the air in the timber and to dry the wood as quickly as possible. The length of time the compressed air is held, the pressure of the compressed air, the length and pressure of the oil period and the length of the vacuum all vary with the kind of timber under treatment. Reuping-treated timber has a tendency to drip much longer than timber treated without the use of compressed air, and the rate of evaporation of the creosote from it is also likely to be greater.

Burnett Process

William Burnett patented this method of treatment in England in 1838, and it has been in constant use since. It is commonly referred to as the "standard" process, using a water-soluble salt, chloride of zinc. The method of treatment is exactly analogous to the Bethell process, the only essential difference being in the character of the preservative. As a general rule, water solutions can be forced into wood deeper than oils, so that under any given set of conditions slightly better penetrations are secured from the use of zinc chloride than from creosote. The Burnett treatment is in extensive use in the United States and Europe, where it has given excellent results in prolonging the life of timber not set in very wet conditions. On account of the soluble nature of the salt, several methods have been employed to retard its leaching action, some of which are now extensively practised.

There is also in use the "Card" process which is a treatment similar to the Bethel except a mixture of creosote oil and zinc chloride for the preservative.

In the past a considerable number of ties were treated with the "Wellhouse" process which used as a preservative a mixture of glue, zinc and tannin. This treatment has now become obsolete. There have been also many ties pressure treated in the past with various solutions and mixtures, but these have practically all been discontinued.

During recent years at many of the larger tie treating plants machines have been installed for the purpose of adzing and boring ties before treatment. The adzing machine planes that portion of the face of the tie upon which the rail or rail plate bears, thereby accomplishing two important things. One is that sawn ties which have warped in seasoning and hewn ties which are seldom faced true are given a uniform surface across the full width, which reduces mechanical wear to a minimum. The second thing accomplished is that on account of not having to adze the tie before placing it in the track, the treatment is saved at the most important point.

The boring machine bores the spike holes to any gauge wanted and marks the line side of the tie during the same operation. In addition to being correctly gauged for laying in the track, the tie has a penetration of preservative where it is most needed. The spike holes in a tie come at a point under the rail plate just at the edge of the rail, where by reason of abrasion the tie is most apt to be subject to initial decay. The boring machine bores the holes entirely through the wood which allows a greater penetration at this point than at the less vulnerable portion of the wood. This also overcomes the additiona abrasion and breaking down of the wood cells or fibre by reason of driving spikes where the hole is not already prepared. Spikes driven into a tie that has been bored have greater holding power than those driven into the solid wood. There is no question but that this practice materially lengthens the life of a tie.

There has also been in operation for a year or more at the largest creosoting plant in Canada, a perforating machine for perforating, (or incising), refractory woods, such as Douglas fir, tamarac, hemlock and some of the pines. This machine may be set up in conjunction with the adzing and boring machines and the ties perforated during the same handling, if desired. The machine in use for this work is adjustable for any desired spacing of perforations on the four sides of ties or timbers, this being determined by the kind of wood. The perforations, (or incisions), enable the operator to secure a much deeper penetration into the heartwood and a more uniform distribution with a smaller quantity of preservative. This results in a greater life for the tie on account of the better penetration and distribution and a very substantial saving in the cost of the treatment.

The perforations are, for most woods, made in staggered rows of approximately one inch crosswise and two inches lengthwise of the tie, but on account of the careful staggering no longitudinal fibre is separated oftener than every six inches. The incising of ties and timbers, especially those made from refractory woods, is proving so successful that it will doubtless soon become a common practice.

As has been shown, the pioneers of the treating business in the United States confined their work largely to cross ties, switch ties, marine piling and railroad bridge materials. Later on the treatment of telephone and transmission poles was started and on account of the fact that the results of the first poles planted were highly satisfactory and proved a very pronounced economy, this end of the business has, during the past fifteen years, grown by leaps and bounds until today the more progressive engineers responsible for the continuous operation and efficiency of the lines under their supervision cannot afford to continue the high cost of maintenance of quickly-decayed, burnt and broken poles.

Many of you gentlemen are probably not aware of the fact that a properly and thoroughly creosoted pole, after it is planted, is absolutely fire resistant. This statement is borne out by many cases where creosoted poles have passed through disastrous fires and they were the only things left standing and are still in use; in fact, it is a favorite demonstration of some of the creosoting people to give actual tests of the fire resistance of poles at their plants.

Owing to past economies, creosoted materials are being used in almost every conceivable form. Millions of creosoted fence posts have been treated throughout the middle west and in Canada they are supplanting the untreated post.

The following is a brief list of some of the purposes for which creosoted materials are used: Track ties; switch ties; piling for marine work; piling for bridge and fresh water structures; fence posts; trunking for block and signal systems; timber and planking for storm sewers; telegraph poles; telephone poles; transmission line poles; electric light poles; general building material; bridge timbers; wharf timbers; mining and shaft timbers; crossing plank; roof decking for round house roofs; roofing for industrial plants; blocks for round house floors; blocks for industrial floors; blocks for street paving; wooden conduit; cross arms.

Everyone of these treated materials have and are showing economies in maintenance all the way from 30 per cent to 75 per cent per annum.

Notwithstanding the many millions of dollars spent on re-forestation, the creosoting industry has and is accomplishing more in the way of timber conservation than has been accomplished in any other direction. When one million ties are properly treated and properly plated, thus enabling us to increase their life from three to four times the normal life of the untreated tie, we have conserved for the nation two to three million ties per annum. This applies even to a greater extent to poles and other wooden materials where mechanical wear is not involved.

Eastern Canada has standing today one of the largest bodies of hardwood timber on this continent consisting principally of birch, beech and maple, all of which woods are subject to quick decay if used in an untreated state. All of these species of woods, when properly seasoned and creosoted, are very long lived, and, when so treated, would reduce at least 75 per cent per annum the annual maintenance of docks, platforms, crossing planks, cattle guards, and many other structures, involving millions of dollars of capital investment, and these woods will, in my opinion, be utilized freely by Canadian engineers in the very near future.

Proprietary Asphalt Pavements Covered by Trade Names and Patents.

The principal Features of Proprietary and Patented Asphalt Pavements.

Charles A. Mullen, M.E.I.C.
Consulting Paving Engineer, Director of Paving Department, Milton Hersey Company, Limited.

Paper read before the Montreal Branch, The Engineering Institute of Canada, October 16th, 1924.

The proprietary and patented asphalt pavements at present most used and discussed in Canada, covered by trade names and more or less by patents, are: Bitulithic, Warrenite-Bitulithic, and Standardite; National, and Willite; Westrumite and Amiesite; Kyrock and Trafficway.

In the first three pavements, Bitulithic, Warrenite-Bitulithic, and Standardite, the differentiating features are in the structure of the pavement surfaces themselves; and the nearest prior art equivalent is discussed under the name Jensenite. In the next five pavements, National, Willite, Westrumite, Amiesite and Kyrock, the differentiating features are in the materials and the methods of preparing and laying the pavement surfaces, and not in the structures thereof. In the last two pavements, Kyrock, and Trafficway, the words used to designate them seem to be trade names only, referring to special products of particular firms.

The Bitulithic Pavement

The Bitulithic pavement consists of a surface layer of asphaltic concrete, the mineral aggregate of which is graded from particles about one and one quarter inch in diameter down to impalpable powder, for the purpose of reducing the "percentage of voids" and securing a high degree of "inherent stability" in the pavement surface.

The Bitulithic surface is usually laid so that it is about two inches thick after the mixture is thoroughly compressed by rolling. As the surface still remains "honeycombed" or porous on top, a prior art "Abbott Grit Surface" seal-coat is applied, which consists of flushing the main Bitulithic under course with asphalt cement and covering it with a thin layer of stone chips or coarse sand.

The prior art covering is left to be beaten into a thin seal-coating upper course by the traffic; but the excess of stone chips is finally worn away, leaving the large Bitulithic under course stones exposed on the surface and the interstices between these stones sealed by the top dressing.

The Warrenite-Bitulithic

The Warrenite-Bitulithic pavement consists of a surface layer of asphaltic concrete much like that of the Bitulithic pavement. The nature of the thin upper seal-coating course and the method of applying it constitute the principal change from Bitulithic to Warrenite-Bitulithic.

The differentiating feature is that, after the main prior art Bitulithic type under course is spread and before it is rolled, a fine mixture of the prior art sheet asphalt type is spread over it in a thin layer, and the two courses then receive their "initial compression" by being rolled together, so that there is no clear line of demarkation between the main under course and the thin upper or seal-coating course in the completed Warrenite-Bitulithic pavement, and the total resulting thickness is "densest at its top."

This method of compressing the lower and upper courses at one time, and not separately, is the feature which is claimed to be new; no claim to novelty is made by the Warrenite-Bitulithic pavement for either the lower or the upper course mixture, considered separately.

The Standardite Pavement

The Standardite pavement is similar to the Warrenite-Bitulithic pavement in every important particular except one. The change from Warrenite-Bitulithic to Standardite is even simpler than the change from Bitulithic to Warrenite-Bitulithic.

The differentiating feature is that, where, in Warrenite-Bitulithic, the main prior art Bitulithic type under course is spread and not rolled at all before the thin layer of fine mixture of the prior art sheet asphalt type is spread over it for the seal-coating course, in Standardite, the main Bitulithic type under course is rolled just slightly before the thin upper layer of fine sheet asphalt type seal-coating mixture is spread thereupon.

The purpose of this rolling is to turn down the points of the larger stones in the under course, but the compression must not be sufficient to so compact the main under course to the extent that, when rolled together, there will be a clear line of demarkation between the two courses in the completed Standardite pavement; and this pavement is also "densest at its top".

This method of compressing the lower course only sufficient to turn down the points of the large stones at the surface, before applying the upper course, and then compressing both courses to final density under the roller at one time, is the feature which is claimed to be new; no claim to novelty is made by the Standardite pavement for either the lower or the upper course mixture, considered separately, or to the compression of the two courses together, as in Warrenite-Bitulithic.

The Jensenite Pavement

The Jensenite pavement is similar to the Standardite pavement in every important particular except one. The change from Standardite to Jensenite is quite as simple as the change from Warrenite-Bitulithic to Standardite, if not more so.

The differentiating feature is that, where, in Standardite, the main prior art Bitulithic type under course is spread and rolled lightly to turn down the points of the larger stones in the under layer before the thin upper layer of fine prior art sheet asphalt type seal-coating mixture is spread, in Jensenite, the main Bitulithic type under course is rolled a plenty, and then, after it is spread, the thin upper layer of fine sheet asphalt type seal-coating mixture is rolled a plenty also.

There is no clear line of demarkation between the two courses in Jensenite either, for there is a "honeycomb" on the surface of the compressed main under course into which some of the fine upper course seal-coating mixture is forced during its compression by rolling; and this pavement too is "densest at its top".

The method of compressing the lower and upper course mixtures in an asphalt pavement while both are still warm is not novel with either Warrenite-Bitulithic or Standardite, as this has always been recognized as desirable in the prior art; it is the leaving of the under course uncompressed in the one case and compressed only sufficiently to turn down the points of the larger stones on the surface in the other case that are claimed as new.

Bitulithic vs Jensenite

Bitulithic and Jensenite differ not so much as Warrenite-Bitulithic differs from Bitulithic. The variation is in the thin upper or seal-coating layer; and the only differences in the method of applying this course are those incident to the types of seal-coatings themselves.

The differentiating feature is that, as we have already seen, where the Jensenite has a thin upper seal-coating course of prior art sheet asphalt mixture spread evenly upon the thoroughly rolled main Bitulithic type under course, the Bitulithic, after thorough rolling, is flush-coated with asphalt cement and covered with a thin layer of stone chips or coarse sand, in accordance with the Abbott prior art, which covering is usually left to be beaten into a thin seal-coating by the traffic, though sometimes given a perfunctory rolling.

The Compass has been Boxed

The compass has been boxed by these patented pavements. The prior art pavement immediately preceding Bitulithic consisted of an asphaltic concrete or Bitulithic type "close-binder" with a sheet asphalt top.

Frederick John Warren left off the sheet asphalt top and substituted the thin prior art Abbott flush-coating and stone-chip sealing course, and called the result Bitulithic Edwin C. Wallace next changed to a thin prior art sheet asphalt top sealing course which was spread before rolling the "close-binder", and called it Warrenite-Bitulithic. James Francis Driscoll next rolled the "close-binder" a little to turn down the points of the stones, and called it Standardite. Chris P. Jensen next rolled the "close-binder" a plenty, as in the old "prior art," and called it Jensenite.

If someone will increase the thin prior art sheet asphalt top sealing course of Jensenite to its original thickness of from one and one-half to two inches, he will be back where Frederick John Warren left the beaten track that most of us have preferred to follow. What will next be done with our poor old "prior art" friend I do not even venture to guess; but this old type still maintains its standing at the top of the list in our large cities.

The quality of the mixtures used for the under and upper courses in the foregoing pavements, it seems to me, is of more importance than the special differentiating structural features having to do with the manner in which the mixtures are laid. In other words, a careful observance of the prior art principles for making the mixtures themselves is the prime essential.

The National Pavement

The uational pavement consists of a surface layer of asphaltic mixture the mineral aggregate of which is, to use the inventor's own words, "ordinary soil, clay, or loam, as distinguished from crushed stone, gravel or sand."

The differentiating feature is just that, and nothing more; ordinary soil, clay or loam is substituted for crushed stone, gravel, or sand, or combinations thereof; otherwise the process is purely the prior art one by which sheet asphalt is produced. If the roadside aggregate happens to be a good grade of clay or clay and sand, and the practice in combining it with the asphalt cement is correct, there is no reason why the result should not be a very good pavement; but this method seems to be surrounded with exceptional difficulties.

No national pavements have been laid in Canada to-date, as far as I am aware; but a number have been constructed in parts of the United States, and I understand some of these are considered successful. My own experience with this pavement is nil.

The Willite Pavement.

The Willite pavement consists of a mineral aggregate like that of the National pavement, mixed with an asphalt cement into which a small proportion of copper sulphate or other salt having like action has been introduced.

The differentiating feature is in the addition of the copper sulphate to the asphalt cement, for the claimed purpose of "hardening and toughening" it, just prior to its entrance into the mixer containing the mineral aggregate. Hardening and toughening of asphalt cement to any desired consistency at the refinery is the prior art to Willite, and the prior art method is under better control and productive of more uniform and satisfactory results.

The use of soil aggregate was abandoned for the Canadian practice in those Willite pavements laid at Niagara Falls and at Thorold, Ontario; and, I understand, it is also being abandoned in many parts of the United States.

The Usual Hot Mix Method

The usual hot mix method is employed in preparing and laying all of the pavements heretofore treated; that is, the mixtures depend for their plasticity and workability upon the liquification of the bituminous cement through the application of heat, and then harden by its cooling to atmospheric temperature.

The next two pavements do not depend upon heat for the plasticity required while they are being laid, but upon solvents which serve their purpose as "liquifiers" and then evaporate, the pavements hardening through such evaporation instead of through cooling from a high heat to atmospheric temperature.

The Westrumite Pavement

The Westrumite pavement consists of a surface layer of asphaltic concrete, like Bitulithic, but it might consist of any other type of mineral aggregate treated in the Westrumite way.

The differentiating feature is that the mixture is made on the job, without heating or drying the mineral aggregate or heating the bituminous cement, the latter being kept plastic through the use of "an emulsifying agent whose basis is water."

Westrumite was laid cold. I say "was" because its production has apparently been abandoned. The emulsified bituminous cement was shipped from a central manufacturing plant, and combined with the mineral aggregate, on the job, in an ordinary concrete mixer. The evaporation of the water left the pavement surface hard. No Westrumite is laid in Canada or the United States to-day, as far as I am aware; though there are a few successful "Westrumite" pavements still in service in some of our Western Ontario cities, principally Stratford.

The Amiesite Pavement

The Amiesite pavement consists of a surface layer of mixed method bituminous macadam, but it also may consist of any other type of mineral aggregate treated in the Amiesite way.

The differentiating feature is that the mixture is made at a central manufacturing plant and shipped to the job, where it is laid cold, the bituminous cement being kept plastic through the use of a light oil such as kerosene, called the "liquifier".

Amiesite is laid cold, days and weeks or even months and years after its manufacture. As long as the mixture remains piled in bulk, the "liquifier" mostly remains in it; yet, when spread upon a foundation and rolled, exposed in a thin layer to the atmosphere, the "liquifier" evaporates and the bituminous cement is thereby gradually hardened to the desired consistency. Amiesite was first laid in Canada last year, principally at Quebec city; but it has been laid quite extensively and for a number of years past around Philadelphia, the home of Dr. Amies, its inventor.

The Amiesite mixture is made by first introducing cold mineral aggregate into the mixer, then dampening it thoroughly with a light oil like kerosene, called the "liquifier", as a sort of priming coat and temporary flux, then coating the dampened mineral aggregate with liquid asphalt cement of the desired consistency, after which a proportion of hydrated lime is added.

The mixed asphalt macadam type of pavement construction is that to which the Amiesite method has been successfully applied. An under layer of coarse Amiesite mixture in which the mineral aggregate is principally one and one-half to three-eighths inch stone is first spread and compressed upon the prepared foundation, then an upper layer of fine "Amiesite" mixture in which the mineral aggregate is principally three-eighths to one-eighth inch stone chips is spread and compressed thereupon.

The bitumen-coated particles of the fine Amiesite upper course mixture are of a size to key into the surface voids of the bitumen-coated particles of the compressed coarse Amiesite under course mixture on the macadam principle; which is facilitated by the fact that the bitumen coating of the under course remains plastic while this is being done. When the rolling is completed, sand is spread evenly over the surface of the pavement to fill the small surface voids which still remain in the upper course and seal it further as it receives its final compression under traffic.

The cold laying feature of Amiesite, combined with the macadam construction, seems to gain for it whatever advantage there is in the special non-rolling and lightly rolling features of the Warrenite-Bitulithic and the Standardite pavements; and the rolling of the two Amiesite courses together while they are both still plastic is done at leisure instead of against the rapid cooling of the mixtures depending upon heat for the plasticity during laying and compressing. Amiesite is also "densest at its top".

The Kyrock Pavement

The Kyrock pavement is any pavement in which Kentucky rock asphalt as produced by the Kentucky Rock Asphalt Company is used; and Kentucky rock asphalt is to some extent analagous to our own Alberta asphaltic sand.

The differentiating feature is that the product of the Kentucky Rock Asphalt Company is used; nothing more. Exactly the same material from some other source laid in exactly the same way would not produce a Kyrock pavement.

Kyrock is also laid cold, which is made possible by its lack of dust filler and the inferior grading of its mineral aggregate, combined with the softness of the bitumen with which the sand grains were coated by the accidence of geological formation. Kyrock was first laid in Canada this season, the Ontario highway department having ordered a small quantity for experimental purposes. It is used quite extensively however, within a reasonable shipping distance of its Kentucky origin.

Kyrock is sand and asphalt, about 93.5 per cent sand and 6.5 per cent soft asphaltic bitumen, by weight, as tested by our Montreal laboratory. Kyrock may be said to be a sheet asphalt paving mixture, the sand aggregate of which is not specially well graded, pulverized dust filler absent, and the bitumen considerably softer than is usually employed in sheet asphalt paving work.

If such a material as Kyrock is needed in Canada, it can be manufactured from Canadian sand and asphalt, over ninety per cent sand and under ten per cent asphalt. There is no economic reason for freighting Kentucky sand to Canada, since it is not superior thereto; nor is there any reason why such a Canadian asphalt mixture should not be made superior to Kyrock in several respects.

The Nearest Prior Art

The nearest prior art to the cold-laid pavements is, of course, the same pavement laid by the hot mix method; or, in the case of Kyrock, the same mixture from some other source, laid cold.

The plasticity for laying depends, in the one case, on liquifying the bituminous cement by the use of heat for long enough to make and lay the mixture; in the other case, it depends either, as with Kyrock, upon the bituminous cement being sufficiently plastic to lay cold, or, as with Westrumite and Amiesite, upon its being rendered so, for long enough to make and lay the mixture, through the use of a "liquifier" that, having performed its function, evaporates and leaves the bituminous cement in the pavement of the desired consistency.

There are differences incident to these methods of laying, no doubt, but I have not yet considered them sufficiently. One would be that due to the slower hardening of the mixtures rendered soft by "liquifier" than of those rendered soft by heat.

The Trafficway Pavement

The Trafficway pavement is one that was but recently brought to my attention. The trade name Trafficway is the property of the Godson Contracting Company, of Toronto; but whether or not the name is to cover some special feature differentiating their pavements from others, or is simply to be used as a trade name on pavements constructed by them under specifications which they are willing to stand back of with their reputation, I do not yet know.

The Monopolies Claimed

That a monopoly is claimed under a patent for one or the other of the foregoing pavements, is as far as I care to go; for I do not want to be understood as venturing an opinion as to the validity or invalidity of patents. The basic patents only will be mentioned in the following paragraphs. Frequently, there are several patents, each claiming a monopoly of some one special feature of a pavement. I have not examined all of these critically, for a glance assured me that they were not germane to this discussion of the main differentiating features in the pavements named.

A monopoly of Bitulithic was claimed under the Frederick John Warren United States patent number 727,505, dated May 5th, 1903, which expired on May 5th, 1920, and under the Frederick John Warren Canadian patent number 88,116 dated July 5th, 1904, which expired July 5th, 1922.

Bitulithic is public property now, of course, and a part of the prior art when later pavement patents are considered. This patent was successfully sustained in the courts through its life, although many engineers felt very strongly that it should never have been granted.

A monopoly of Warrenite-Bitulithic is claimed under the Edwin C. Wallace United States patent number 959,976, dated May 31st, 1910, and under the Edwin C. Wallace Canadian patent number 132,025, dated March 28th, 1911, both presumably in force.

A monopoly of Standardite is claimed under the James Francis Driscoll Canadian patent number 223,705, dated September 19th, 1922, and presumably in force. As far as I have information, there is no counterpart United States patent issued, though doubtless one has been applied for.

Standardite is an improvement on Warrenite-Bitulithic, I think, and superior in type to Bitulithic; although I hold it inferior to Jensenite or the "prior art" asphalt pavement.

No monopoly of Jensenite is successfully claimed by anyone; it is not patented, and the word is merely an adaptation of the name of the county engineer of Fresno county, California, Chris P. Jensen, who laid it in preference to Warrenite-Bitulithic.

The Warren Brothers Company of Boston sued the county of Fresno contractors for infringement of the Wallace patent, and Warren Brothers lost in the trial court. They have appealed the case, but it is hard to see how any court could possibly uphold their contention. I have in my office a printed copy of defendant's trial brief, and the decision.

A monopoly of National is claimed under the Michael A. Popkess United States patent number 1,008,433, dated November 14th, 1911, and under the Michael A. Popkess Canadian patent number 131,266, dated February 21st, 1911, both presumably in force.

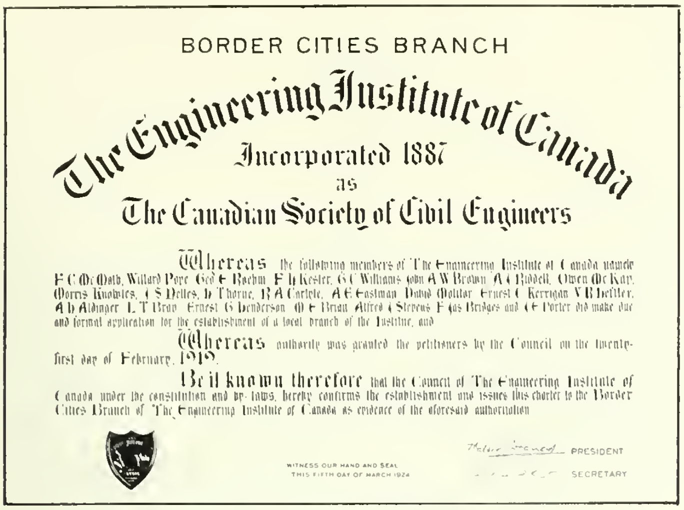
A monopoly of Willite is claimed under the Harry P. Willis United States patent number 1,190,615, dated July 11th, 1916, and under the Harry P. Willis Canadian patent number 162,145, dated April 20th, 1915, both presumably in force.

A monopoly of Westrumite is claimed under the Leonard Schade Van Westrum United States patent number 956,009, dated April 26th, 1910, reissued July 4th, 1922 under reissue number 15,401, and under the Leonard Schade Van Westrum Canadian patent number 125,365, dated April 26th, 1910, both presumably in force.

A monopoly of Amiesite is claimed under the John Hay Amies United States patent number 934,494, dated September 21st, 1909, and under the John Hay Amies Canadian patent number 134,803, dated August 8th, 1911, both presumably in force.

The monopoly of Kyrock is commercial rather than legal; though I presume the trade name, which indicates the product of the Kentucky Rock Asphalt Company, may not be used by anyone else.

Branch Charters


BORDER CITIES BRANCH

The Engineering Institute of Canada
Incorporated 1887
as
The Canadian Society of Civil Engineers

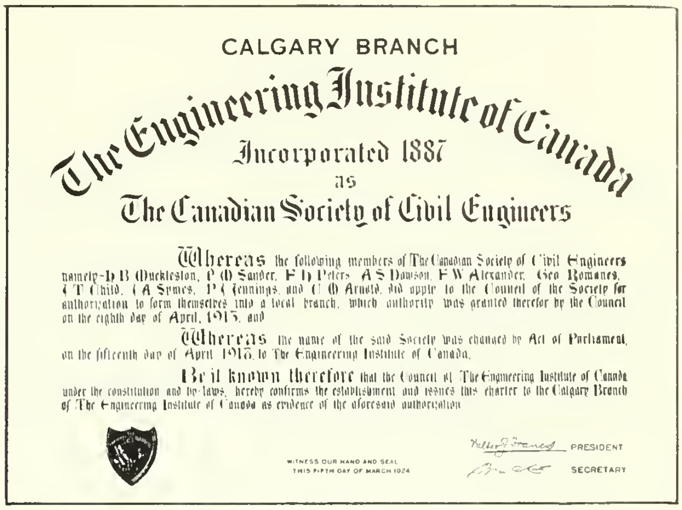
Whereas the following members of The Engineering Institute of Canada namely F C McMath, Willard Pope, Geo E Roehm, F H Kester, G C Williams, John A W Brown, A J Riddell, Owen McKay, Morris Knowles, J S Dallas, H Thorne, R A Carlyle, A E Eastman, David Molitor, Ernest C Kerrigan, V B Hettler, A H Aldinger, L T Bray, Ernest G Henderson, M E Brian, Alfred J Stevens, F Jas Bridges and C E Porter did make due and formal application for the establishment of a local branch of the Institute, and

Whereas authority was granted the petitioners by the Council on the twenty-first day of February, 1919.

Be it known therefore that the Council of The Engineering Institute of Canada under the constitution and by-laws, hereby confirms the establishment and issues this charter to the Border Cities Branch of The Engineering Institute of Canada as evidence of the aforesaid authorization

WITNESS OUR HAND AND SEAL
THIS FIFTH DAY OF MARCH 1924

PRESIDENT
SECRETARY


CALGARY BRANCH

The Engineering Institute of Canada
Incorporated 1887
as
The Canadian Society of Civil Engineers

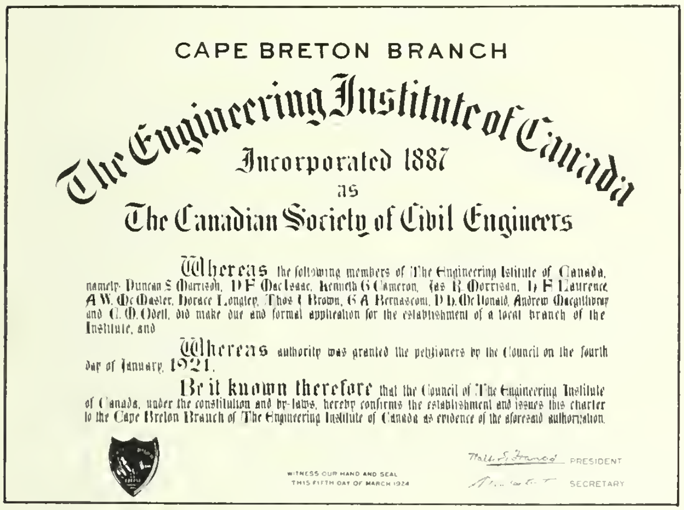
Whereas the following members of The Canadian Society of Civil Engineers namely—H B Muckleston, P M Sauder, F H Peters, A S Dawson, F W Alexander, Geo Romanes, J T Child, J A Symes, P J Jennings, and C M Arnold, did apply to the Council of the Society for authorization to form themselves into a local branch, which authority was granted therefor by the Council on the eighth day of April, 1915, and

Whereas the name of the said Society was changed by Act of Parliament, on the fifteenth day of April 1918, to The Engineering Institute of Canada.

Be it known therefore that the Council of The Engineering Institute of Canada under the constitution and by-laws, hereby confirms the establishment and issues this charter to the Calgary Branch of The Engineering Institute of Canada as evidence of the aforesaid authorization

WITNESS OUR HAND AND SEAL
THIS FIFTH DAY OF MARCH 1924

PRESIDENT
SECRETARY


CAPE BRETON BRANCH

The Engineering Institute of Canada
Incorporated 1887
as
The Canadian Society of Civil Engineers

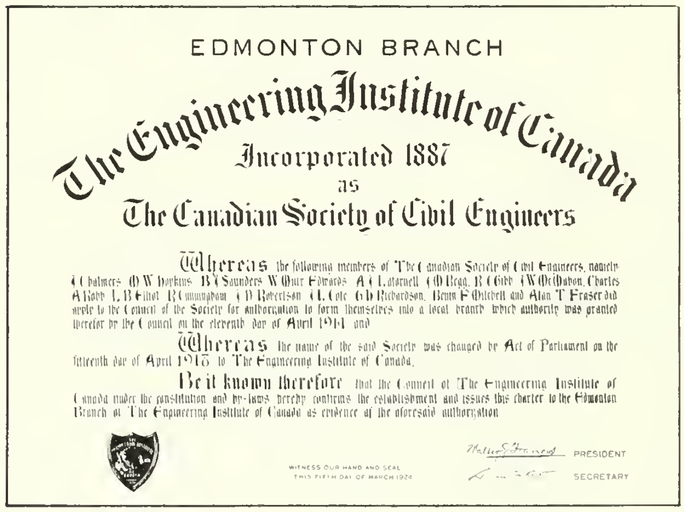
Whereas the following members of The Engineering Istitute of Canada, namely- Duncan S Marrison, D F MacIsaac, Kenneth G Cameron, Jas R Morrison, H F Laurence, A W McMaster, Horace Longley, Thos J Brown, G A Bernasconi, D H McDonald, Andrew Macgillivray and C M Odell, did make due and formal application for the establishment of a local branch of the Institute, and

Whereas authority was granted the petitioners by the Council on the fourth day of January, 1921.

Be it known therefore that the Council of The Engineering Institute of Canada, under the constitution and by-laws, hereby confirms the establishment and issues this charter to the Cape Breton Branch of The Engineering Institute of Canada as evidence of the aforesaid authorization.

WITNESS OUR HAND AND SEAL
THIS FIFTH DAY OF MARCH 1924

PRESIDENT
SECRETARY


EDMONTON BRANCH

The Engineering Institute of Canada
Incorporated 1887
as
The Canadian Society of Civil Engineers

Whereas the following members of The Canadian Society of Civil Engineers, namely J Chalmers, M W Hopkins, R J Saunders, W Muir Edwards, A J Latornell, J M Begg, R C Gibb, J W McMahon, Charles A Robb, L B Elliot, R Cunningham, J D Robertson, J L Cote, G H Richardson, Benm F Mitchell and Alan T Fraser did apply to the Council of the Society for authorization to form themselves into a local branch which authority was granted therefor by the Council on the eleventh day of April 1914 and

Whereas the name of the said Society was changed by Act of Parliament on the fifteenth day of April 1918 to The Engineering Institute of Canada.

Be it known therefore that the Council of The Engineering Institute of Canada under the constitution and by-laws hereby confirms the establishment and issues this charter to the Edmonton Branch of The Engineering Institute of Canada as evidence of the aforesaid authorization

WITNESS OUR HAND AND SEAL
THIS FIFTH DAY OF MARCH 1924

PRESIDENT
SECRETARY


HALIFAX BRANCH

The Engineering Institute of Canada
Incorporated 1887
as
The Canadian Society of Civil Engineers

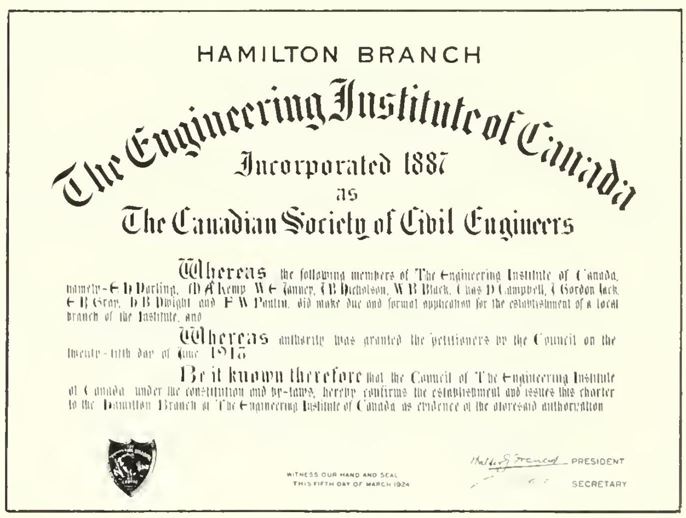
Whereas the following members of The Canadian Society of Civil Engineers, namely C E W Dodwell, Hiram Donkin, Philip A Freeman, J R Freeman, H D Putnam, Roderick McColl, Kenneth H Smith, O S Cox, T M Schenk, Chas A Hodge, J G W Campbell, W P Morrison, F H McKechnie, A C Brown, J F Pringle, L G Van Tuyl, J D Finlayson, F A Bowman, C L Allan and D McD Campbell did apply to the Council of the Society for authorization to form themselves into a local branch, which authority was granted therefor by the Council on the nineteenth day of March 1915 and

Whereas the name of the said Society was changed by Act of Parliament on the fifteenth day of April 1918 to The Engineering Institute of Canada.

Be it known therefore that the Council of The Engineering Institute of Canada under the constitution and by-laws hereby confirms the establishment and issues this charter to the Halifax Branch of The Engineering Institute of Canada as evidence of the aforsaid authorization

WITNESS OUR HAND AND SEAL
THIS FIFTH DAY OF MARCH 1924

PRESIDENT
SECRETARY


HAMILTON BRANCH

The Engineering Institute of Canada
Incorporated 1887
as
The Canadian Society of Civil Engineers

Whereas the following members of The Engineering Institute of Canada, namely—E H Darling, M A Kemp, W E Janney, J R Nicholson, W B Black, Chas D Campbell, J Gordon Jack, E R Gray, H B Dwight and F W Paulin, did make due and formal application for the establishment of a local branch of the Institute, and

Whereas authority was granted the petitioners by the Council on the twenty-fifth day of June 1918

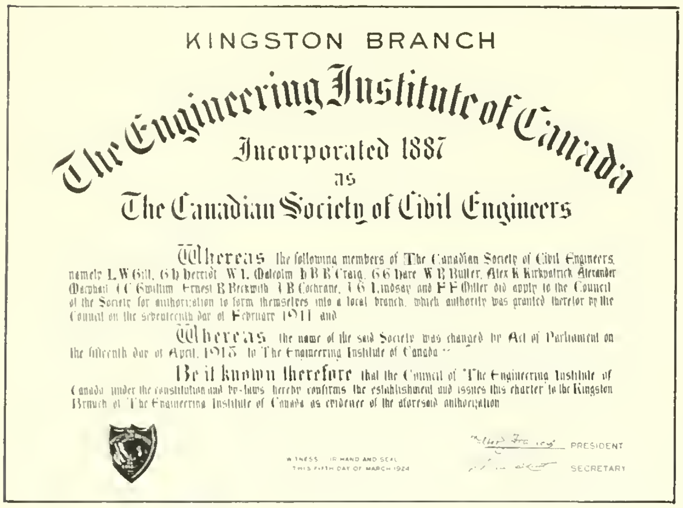
Be it known therefore that the Council of The Engineering Institute of Canada under the constitution and by-laws, hereby confirms the establishment and issues this charter to the Hamilton Branch of The Engineering Institute of Canada as evidence of the aforesaid authorization

WITNESS OUR HAND AND SEAL
THIS FIFTH DAY OF MARCH 1924

PRESIDENT
SECRETARY

Border Cities Branch: Presented by President Dr. Arthur Surveyer on November 8th, 1924.
Calgary Branch: Presented by Vice-President Major Geo. A. Walkem on October 22nd, 1924.
Cape Breton Branch: Presented by Secretary Fraser S. Keith on November 19th, 1924.
Edmonton Branch: Presented by Vice-President Major Geo. A. Walkem on September 29th, 1924.
Halifax Branch: Presented by Vice-President F. A. Bowman on November 17th, 1924.
Hamilton Branch: To be presented by Vice-President J. B. Challies.

Branch Charters


KINGSTON BRANCH

The Engineering Institute of Canada

Incorporated 1887 as The Canadian Society of Civil Engineers

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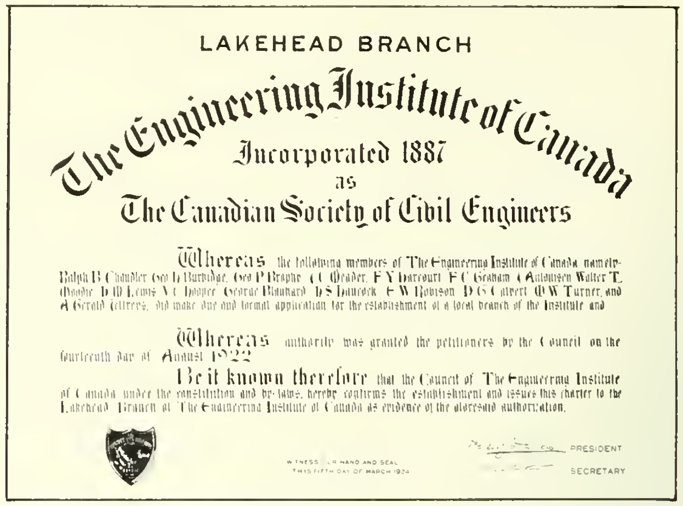
LAKEHEAD BRANCH

The Engineering Institute of Canada

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PRESIDENT

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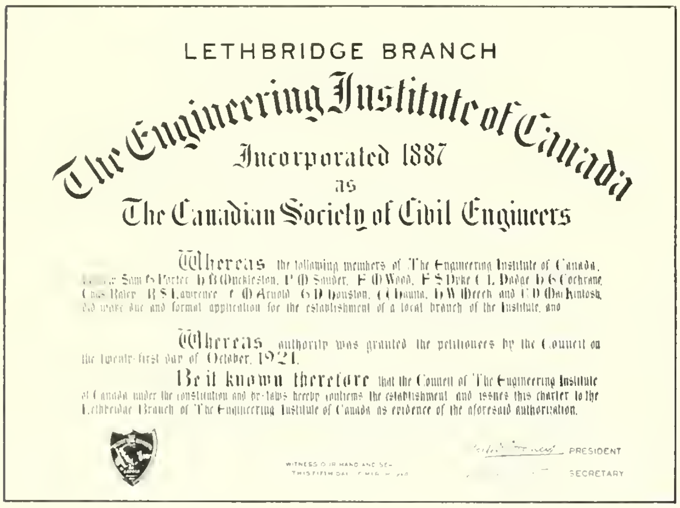
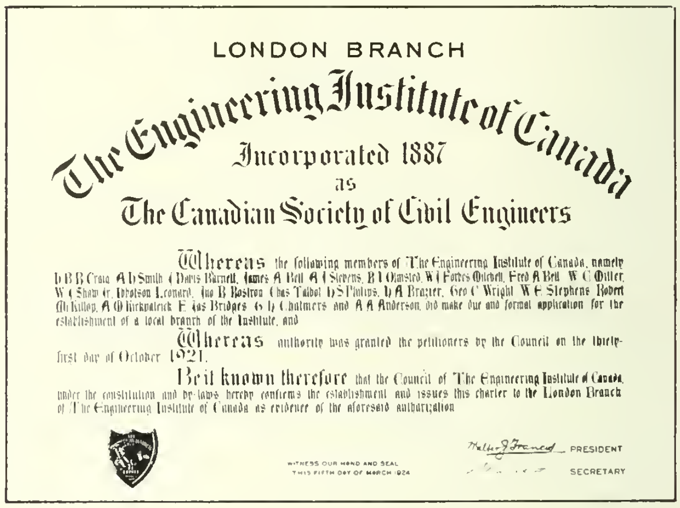

LETHBRIDGE BRANCH

The Engineering Institute of Canada

Incorporated 1887 as The Canadian Society of Civil Engineers

PRESIDENT

SECRETARY

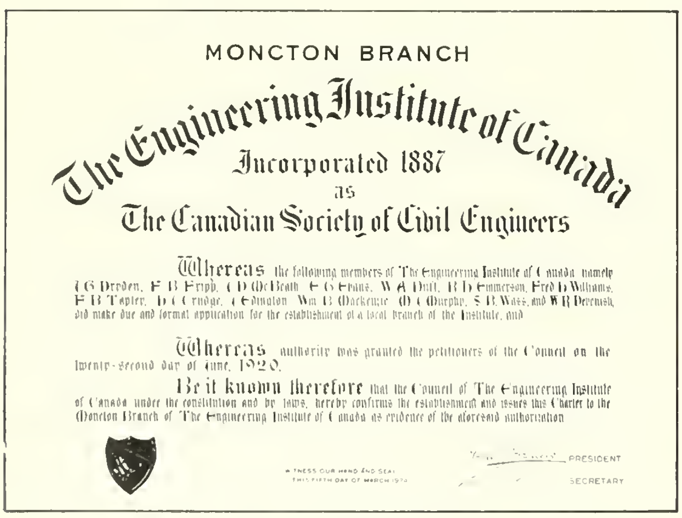

LONDON BRANCH

The Engineering Institute of Canada

Incorporated 1887 as The Canadian Society of Civil Engineers

PRESIDENT

SECRETARY

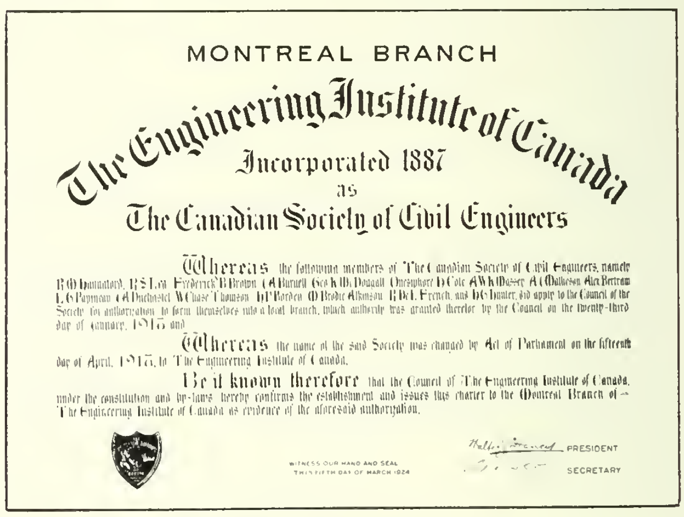

MONCTON BRANCH

The Engineering Institute of Canada

Incorporated 1887 as The Canadian Society of Civil Engineers

PRESIDENT

SECRETARY


MONTREAL BRANCH

The Engineering Institute of Canada

Incorporated 1887 as The Canadian Society of Civil Engineers

PRESIDENT

SECRETARY

Kingston Branch: To be presented by Vice-President J. B. Challies.

Lakehead Branch: Presented by Vice-President Major Geo. A. Walkem on October 18th, 1924.

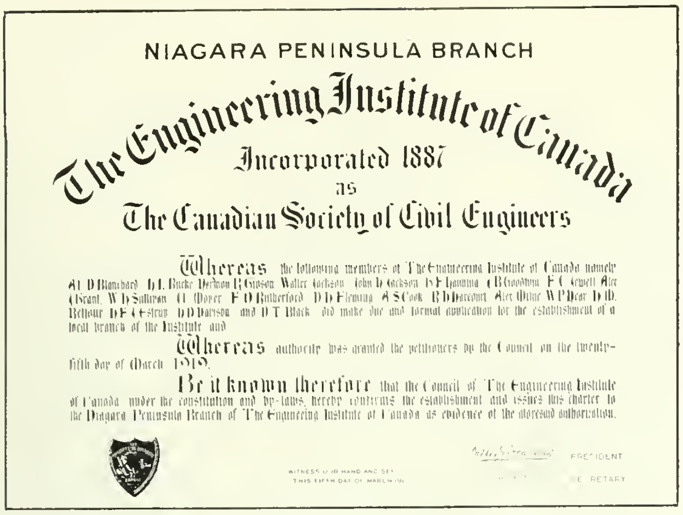
Lethbridge Branch: Presented by Vice-President Major Geo. A. Walkem on September 30th, 1924.

London Branch: To be presented by Vice-President J. B. Challies.

Moncton Branch: Presented by Vice-President F. A. Bowman on November 13th, 1924.

Montreal Branch: To be presented at annual meeting by the President.

Branch Charters


NIAGARA PENINSULA BRANCH

The Engineering Institute of Canada

Incorporated 1887

as

The Canadian Society of Civil Engineers


OTTAWA BRANCH

The Engineering Institute of Canada

Incorporated 1887

as

The Canadian Society of Civil Engineers

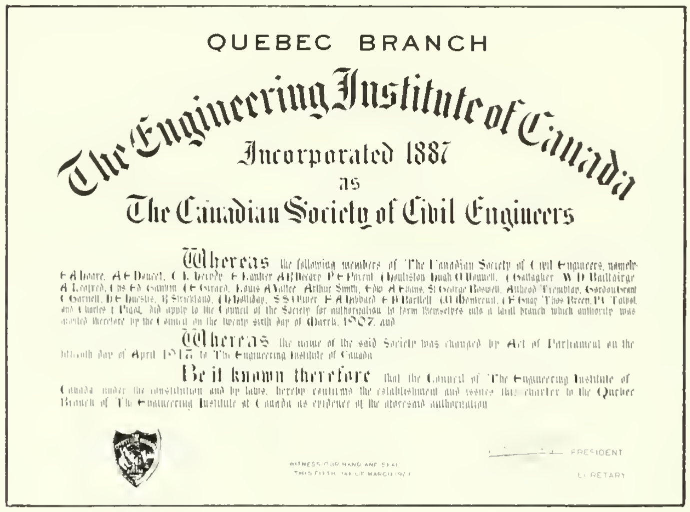

PETERBOROUGH BRANCH

The Engineering Institute of Canada

Incorporated 1887

as

The Canadian Society of Civil Engineers

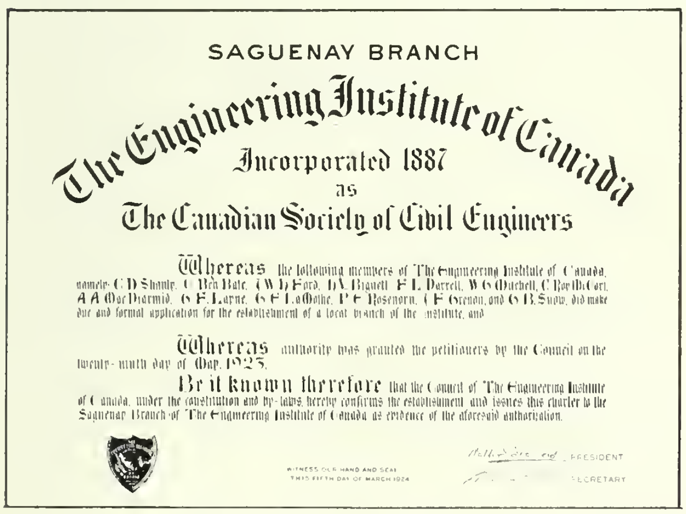

QUEBEC BRANCH

The Engineering Institute of Canada

Incorporated 1887

as

The Canadian Society of Civil Engineers

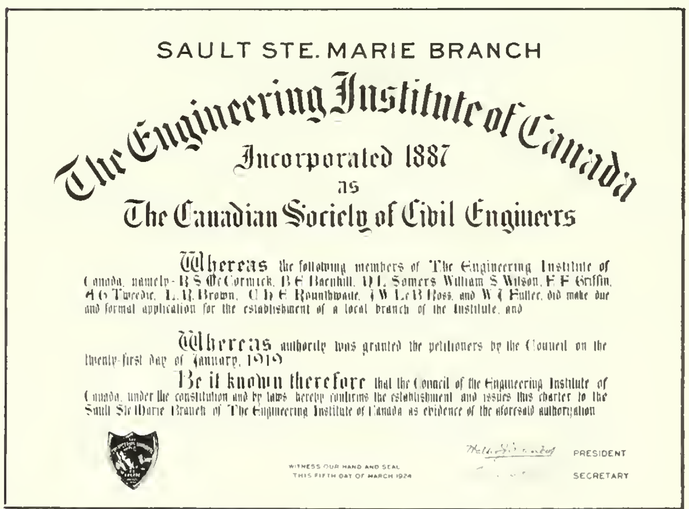

SAGUENAY BRANCH

The Engineering Institute of Canada

Incorporated 1887

as

The Canadian Society of Civil Engineers


SAULT STE. MARIE BRANCH

The Engineering Institute of Canada

Incorporated 1887

as

The Canadian Society of Civil Engineers

Niagara Peninsula Branch: Presented by President Dr. Arthur Surveyer on November 7th, 1924.

Ottawa Branch: To be presented by President Dr. Arthur Surveyer on January 8th, 1925.

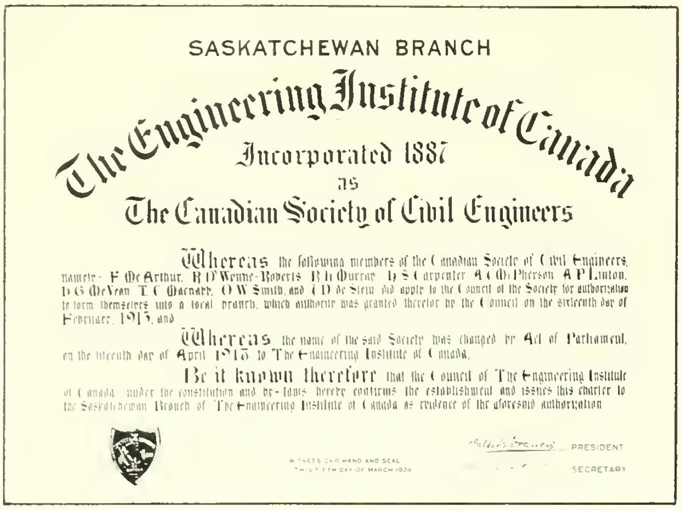
Peterborough Branch: Presented by Vice-President J. B. Challies on November 18th, 1924.

Quebec Branch: To be presented by the President and the Secretary.

Saguenay Branch: To be presented by Vice-President A. R. Decary.

Sault Ste. Marie Branch: Presented by Vice-President Major Geo. A. Walkem on October 16th, 1924.

Branch Charters


SASKATCHEWAN BRANCH

The Engineering Institute of Canada

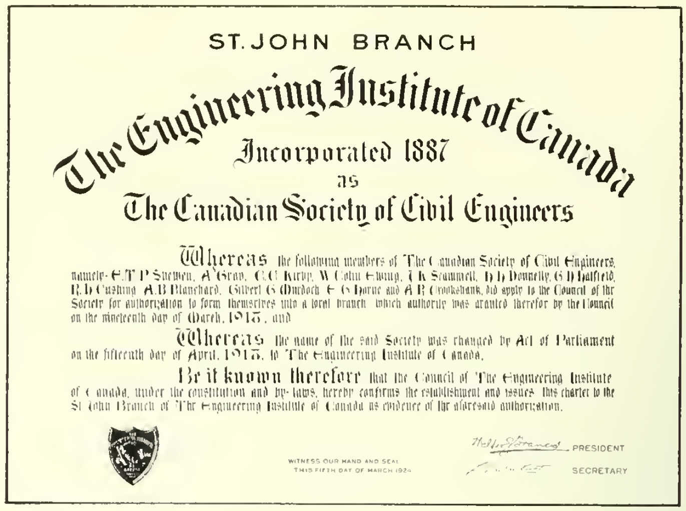
Incorporated 1887 as The Canadian Society of Civil Engineers

Whereas the following members of the Canadian Society of Civil Engineers, namely- F. McArthur, R. D'Wenne-Roberts, R. H. Murray, H. S. Carpenter, A. C. McPherson, A. P. Linton, H. G. McVean, T. C. Macnabb, O. W. Smith, and J. D. de Stein did apply to the Council of the Society for authorization to form themselves into a local branch, which authority was granted therefor by the Council on the sixteenth day of February, 1915, and

Whereas the name of the said Society was changed by Act of Parliament, on the fifteenth day of April 1918 to The Engineering Institute of Canada,

Be it known therefore that the Council of The Engineering Institute of Canada, under the constitution and by-laws, hereby confirms the establishment and issues this charter to the Saskatchewan Branch of The Engineering Institute of Canada as evidence of the aforesaid authorization

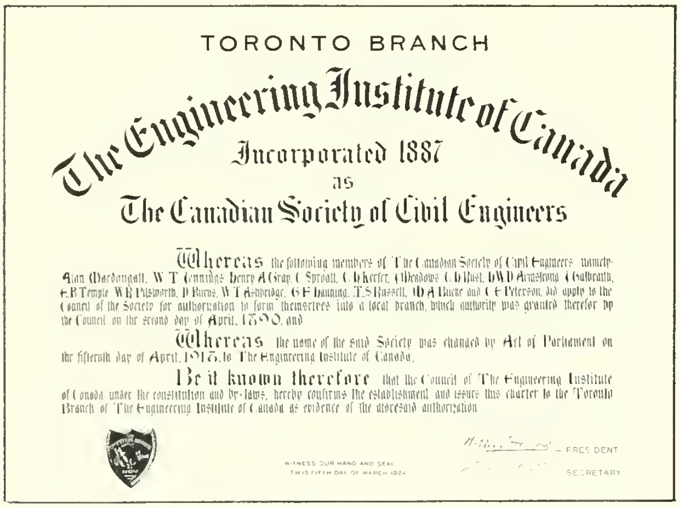
WITNESS OUR HAND AND SEAL THIS FIFTH DAY OF MARCH 1924 PRESIDENT SECRETARY


ST. JOHN BRANCH

The Engineering Institute of Canada

Incorporated 1887 as The Canadian Society of Civil Engineers

WITNESS OUR HAND AND SEAL THIS FIFTH DAY OF MARCH 1924 PRESIDENT SECRETARY


TORONTO BRANCH

The Engineering Institute of Canada

Incorporated 1887 as The Canadian Society of Civil Engineers

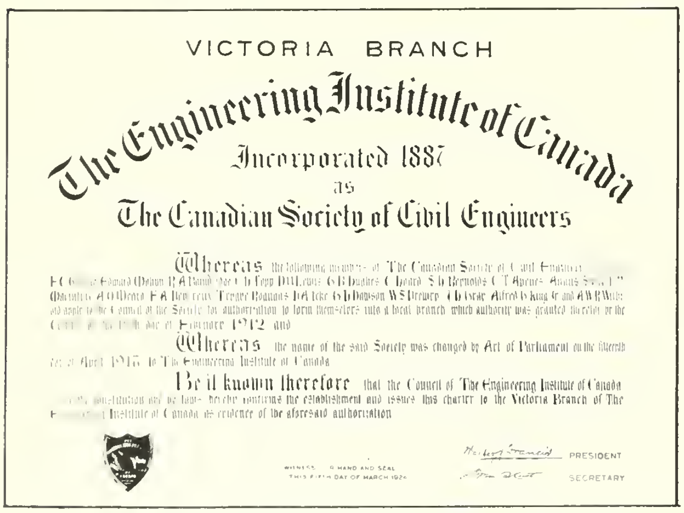
WITNESS OUR HAND AND SEAL THIS FIFTH DAY OF MARCH 1924 PRESIDENT SECRETARY


VANCOUVER BRANCH

The Engineering Institute of Canada

Incorporated 1887 as The Canadian Society of Civil Engineers

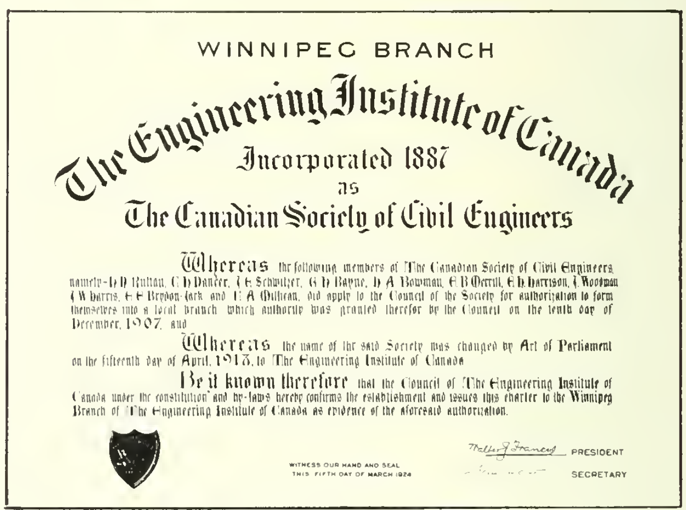
WITNESS OUR HAND AND SEAL THIS FIFTH DAY OF MARCH 1924 PRESIDENT SECRETARY


VICTORIA BRANCH

The Engineering Institute of Canada

Incorporated 1887 as The Canadian Society of Civil Engineers

WITNESS OUR HAND AND SEAL THIS FIFTH DAY OF MARCH 1924 PRESIDENT SECRETARY


WINNIPEG BRANCH

The Engineering Institute of Canada

Incorporated 1887 as The Canadian Society of Civil Engineers

WITNESS OUR HAND AND SEAL THIS FIFTH DAY OF MARCH 1924 PRESIDENT SECRETARY

Saskatchewan Branch: Presented by Vice-President Major Geo. A. Walkem on October 20th, 1924.

St. John Branch: Presented by Vice-President F. A. Bowman on November 12th, 1924.

Toronto Branch: To be presented by President Dr. Arthur Surveyer.

Vancouver Branch: To be presented by Vice-President Major Geo. A. Walkem.

Victoria Branch: Presented by Vice-President Major Geo. A. Walkem on November 5th, 1924.

Winnipeg Branch: Presented by Vice-President Major Geo. A. Walkem on October 2nd, 1924.

The Welcome of Montreal

awaits you at the

Annual General Meeting

combined with the

General Professional Meeting

Tuesday, Wednesday and Thursday

January, 27th, 28th, and 29th, 1925

The Headquarters of the General Professional Meeting will be at the Windsor Hotel. It is advisable that you make your hotel reservation as early as possible.

When registering at the Hotel it will be to your advantage to advise the Hotel Clerk that you are a member of The Engineering Institute of Canada, attending the Annual Meeting.

A member of the Reception Committee will be at your service.

The Programme is an Attractive One

The Professional Sessions are being devoted to Engineering Education, and a Joint Session on Winter Construction, with the Association of Canadian Building and Construction Industries.

The Social Events include two Luncheons, a Reception and Dance, and a Smoker.

The arrangements are in the hands of men known to be artists in providing entertainments.

You are assured of a pleasant and profitable time.

In order that the Committee may have an idea of the number attending will you kindly either fill in and mail the corner coupon attached to this page, or mail a card to the Secretary advising that you will be attending the meeting.

To The Secretary,
The Engineering Institute of Canada.
I will / hope to attend the Annual Meeting
in Montreal Jan. 27, 28, 29, 1925.

Print name here. ....

Address. ....

THE
ENGINEERING JOURNAL

THE JOURNAL OF
THE ENGINEERING INSTITUTE
OF CANADA

VOL. VIII January 1925 No. 1

Message to the Members

In recording another year of Institute activity the President and Council desire to thank the members of all grades for their sustained and loyal interest in Institute affairs.

During the past year we suffered the loss of our President, Walter J. Francis, in whose passing The Institute was bereft of one of its brightest minds. It is fitting that the services he rendered The Institute should be recorded at this time and his memory recalled.

With the adoption of a Code of Ethics and rules covering its administration The Institute is pledged in an earnest endeavour to maintain the highest principles of ethical conduct amongst its members. A service to the Dominion as a whole has been rendered by the Fuel Committee whose report has been published and whose recommendations are receiving consideration. The completion of a charter for every branch, most of which have been presented, was a notable historic event. Pending final financial arrangements, plans are practically completed for a bronze war memorial and a bronze war record to be erected at headquarters, the designs submitted in competition being of high artistic merit.

Indications are in evidence that a year of greater industrial progress is coming to the Dominion which should affect the engineering profession advantageously, and it is the hope of your President and Council that the coming year will see every member sharing in a greater prosperity and continuing to add to the strength and prestige of the engineering profession.

On to Montreal

In the December *Journal* appeared a tentative programme of the annual general and professional meeting to be held in Montreal, January 27th, 28th and 29th. The local committees in charge of arrangements have matters well in hand and are planning for a record attendance.

It is anticipated that the papers presented at this gathering will have an important bearing on the future of the profession, and will be of such outstanding interest that no one who can possibly attend should miss the opportunity. A novel feature being introduced at this meeting of a joint session with the Association of Canadian Building and Construction Industries will not only bring the engineer and contractor closer together but will also emphasize the dominant position the engineer to-day holds in the contracting field.

It has been decided not to adopt the certificate plan of convention tickets on account of the fact that it has always been difficult to have sufficient certificates presented to secure the maximum rebate. As an alternative, however, the railways are offering a reduced fare in every case where ten or more are coming from the same centre, provided they travel together and make the fact known at the time tickets are purchased.

The Montreal group welcome the opportunity of providing an interesting programme for their fellow engineers and anticipate renewing many friendships of former gatherings.

Becoming Better Acquainted

Prior to the inauguration of professional meetings engineers had little opportunity of becoming acquainted with one another except at the annual meeting, and to those living at great distances from headquarters it was almost nil. The general establishment of branches and the adoption of professional meetings have promoted acquaintanceship and stimulated friendship so that to-day a camaraderie exists that was unknown a generation ago.

Even yet, however, the individual engineer, when visiting another centre, usually on business or professional duties, is diffident and extremely reluctant to take the initiative of getting in touch with his fellow engineers, although he may have personal acquaintanceship with some at the centre visited. Very often a member of *The Institute* is away from home and in a branch centre on the night of a branch meeting but is unaware of that fact until he sees the paper the next morning. In order that visitors may be informed regarding branch meetings some of the branches have adopted a very excellent system of posting attractive notices at the desks of the local hotels where they may be easily seen. The employment of *The Institute* crest in this connection makes it more sure to attract the attention of a visiting member of *The Institute*, and on being informed that he will be welcome at the meeting he is apt to take advantage of the opportunity.

Since it is well known that branch secretaries do a great deal of work gratuitously and are a tower of strength to *The Institute*, it is not considered reasonable to ask them to undertake greater duties than at present, yet in this connection branch secretaries can be of great assistance to other branches by advising the secretary of a sister branch at any time where he knows of a contemplated visit on the part of one of his own members to that branch centre.

The average meeting of a branch of *The Institute* is one of the most interesting functions one could possibly attend, and members are assured of the most friendly welcome when they have the good fortune to attend a session of another branch. It is hoped that this custom will become universal as such visits do much to strengthen the bonds of fellowship between the branches and amongst the members of the profession.

Engineering Education and Training

While it is generally conceded that within another generation or so the economic life of the nations of the world will be largely dominated by men who have had technical training, it is obvious that the advances we are to make in developing this country will depend to some extent upon the nature of the technical training our young men are receiving or will receive in the years to come.

Believing this subject to be of paramount importance to the engineering profession and one deserving of the greatest attention and consideration by the members of *The Institute*, no matter the branch in which they are engaged, it has been decided to set aside an entire day at the coming annual meeting for the discussion of this subject. Two men holding leading positions in engineering education in the Dominion, Dean H. M. MacKay, M.E.I.C., of McGill, and Dean C. J. Mackenzie, M.E.I.C., of Saskatoon, will present papers, looking at the subject from the university viewpoint. In addition, most of the engineering colleges will be represented by professors who will take part in the discussion. The industrial aspect will be given by an engineer from one of the largest engineering companies and it is expected that the ideas advanced and the suggestions made will have an important bearing upon engineering education in this country. In addition to the above, arrangements have been made with the director of investigations of the Society for the Promotion of Engineering Education to present a paper bearing upon the general phases of the entire situation. H. P. Hammond, associate director of investigations of the Society will present the opening paper of the series.

Realizing the importance of this problem the Society for the Promotion of Engineering Education in the United States has set aside the sum of one hundred and eight thousand dollars to be spent during a period of three years by a Board of Investigation and Co-ordination, to be directed to a study of the subjects of engineering education and the fitness of the present day curriculum for preparing the student for his profession.

It is intended to study the process by which the curriculum of fifty years ago has come to its present form.

It is intended to organize committees in the faculties in as large a number of the engineering colleges as may be practicable, who shall co-operate with the committee and with the Society for the Promotion of Engineering Education in the prosecution of this work.

A director of investigations has been appointed who is devoting all his time to the problem.

In view of the fact that our engineering educational problem in Canada bears considerable similarity to that confronting the United States, it would be well to glance for a moment at what our neighbours to the south are proposing to do in this connection.

The Committee on Investigation and Co-ordination believes it can only function by the closest harmony between the various engineering Societies, the universities and the United States Bureau of Education.

In addition to having the various engineering colleges appoint local committees of investigation to co-operate with the board by undertaking studies relating to the student body before entering college, during college, and after graduation, it intends appointing a number of committees.

(a) Committees on Professional Subjects.
(b) Committees on related sciences and English, to make a study of the means by which the needs of exceptional students may be met in these subjects.
(c) Committee on admission and freshman, correlation studies based on data supplied by local committees on the ground.

It is also intended that the advisory council of the national engineering societies consider what are the standards and objectives in engineering education which are of concern to the profession at large and undertake to formulate its recommendations for the guidance of educational effort.

This advisory committee has the important duty of considering:

(a) The minimum standards which the profession at large may properly set for the recognition of any institution as a college of engineering, or any course of study as an engineering course.
(b) The common ground work of general studies which should underlie the professional training of all engineers.
(c) The common ground work of technological studies which should be included in the training of all engineers.
(d) The extent to which specialization is desirable and the stage at which it should begin.
(e) What the profession at large should contribute to the field of vocational information and guidance.
(f) The desirable or necessary qualifications of engineering teachers.
(g) The economic and professional status of engineering teachers.
(h) Means which should be taken to impress on engineering students the nature and ethics of professional obligations.
(i) The extent to which the contacts of professional societies with student groups should be unified or co-ordinated.

It is further intended that the joint advisory committee of the National Industrial Conference Board and the Society for the Promotion of Engineering Education should continue its study of the nature and magnitude of the industrial demand for engineering graduates and of the methods by which they may best be introduced into industrial life, and that this committee foster the development and dissemination of the basic information concerning various fields of industrial effort, which would assist engineering students in an intelligent choice of initial employment.

It is further proposed to extend the statistical survey of the United States Bureau of Education of engineering curricula in the United States and to collect information regarding the graduates from the several engineering courses of all the engineering colleges of the United States.

What does all this expenditure of money and effort mean?

It means simply this — our engineering brethren to the south of us have become firmly convinced that there should be closer co-operation between the engineering universities and the engineering societies to the end that after a thorough study of the situation there may be evolved more ideal curricula, and that there may be a closer bond of union and community of interest between university and engineering bodies.

This subject is of vital interest to every member of the profession and should attract a record attendance on January 28th.

OBITUARY

Lieut.-Col. Sir Maurice Fitzmaurice,

M.A., M.Eng., F.R.S., M.E.I.C.

A distinguished member of the profession in the person of Sir Maurice Fitzmaurice, M.E.I.C., passed away in London on Monday, November 17th, 1924, after a brief illness.

Maurice Fitzmaurice was born on May 11th, 1861, and following his scholastic training he took the course in engineering at Dublin University, obtaining the degrees of Bachelor of Arts and Bachelor of Engineering. From Dublin he went to London to be articled to the late Sir (at that time Mr.) Benjamin Baker. He was engaged from 1885 to 1888 in the construction of the Forth bridge under Mr. Baker and Sir John Fowler. He had the responsible charge of the building of the approach railways on both sides of the Forth. His next work was on Chignecto Ship Railway, and later engaged in making designs and estimates for replacing cast iron bridges on the London, Brighton and South Coast Railway by steel structures. From May 1892 he acted under Sir A. R. Binnie as resident engineer during the construction of Blackwall Tunnel. On the completion of that work he went to Egypt where he was appointed resident engineer in charge of Assuan dam, in the building of which 75,000 tons of cement and 28,000 tons of coal were used, all being brought from England. The dam was completed in 1902. On returning from Egypt he was appointed chief engineer to the London County Council which position he occupied for eleven years during which time he carried out a large number of notable engineering works, his standing in the profession being recognized by knighthood during this period. On resigning this position, he entered consulting practice as a member of the firm, Messrs. Coode, Fitzmaurice, Wilson and Mitchell, which carried on harbour works and construction in many parts of the world.

Sir Maurice occupied many positions of responsibility including giving advice to the government of Australia on naval harbours and works. During the war he was chairman of the War Office Committee on Civilian Labour on the London Defences, and a member of the War Office Committee on Hutted Camps. He twice visited the British front on the continent on questions of drainage. During 1918-19 he was chairman of the Nile Projects Committee of the Foreign Office; from 1917 to 1919 chairman of the Canal Control Committee of the Board of Trade; and in 1919 chairman of the Treasury Committee on Aerodrome Accounts. He was a member of the Royal Commission on Fire Prevention, of the Advisory Council of the Science Museum from 1915 to 1921, of the Advisory Council on Scientific and Industrial Research, and of the International Technical Commission, Suez canal. He was also Lieut.-Colonel in Command of the Engineer and Railway Staff Corps.

For his work on the Assuan dam, Sir Maurice received the Order of the Mejidieh, 2nd Class, in 1901, and was created C.M.G. the following year. He held the honorary degree of LL.D. of Birmingham University, and had been a Fellow of the Royal Society since 1919. He entered the Institution of Civil Engineers as a student, became an associate member in 1887, was transferred to the class of member in 1893, and was President in 1916. His presidential address, which dealt in the main with the difficulties which had to be overcome by engineers in their work, was one of the best of recent years. He received for contributions to the Institution's "Proceedings" the Telford and Watt Medals, a Telford Premium and a Miller Prize. He was also a member of the Institution of Mechanical Engineers, an honorary fellow of the Society of Engineers, an honorary member of the Royal Engineers' Institution, and Vice-chairman of the Institute of Transport.

Sir Maurice was well known in Canada having been appointed as a member of the commission set up to inquire into the collapse of the Quebec Bridge, a phase of engineering on which he was a world authority. He became a member of *The Institute* on January 14th, 1909, and during the years of his membership took a deep interest in the affairs of the profession in this country.

PERSONALS

Major G. R. Turner, R.C.E., A.M.E.I.C., has been detailed to attend the Staff College, at Quetta, India, during the next two years.

H. M. Lake, Jr.E.I.C., who for the past two years has been with the Lake Superior Paper Company Limited, has been appointed to the staff of the International Nickel Company, at Copper Cliff, Ontario.

J. A. Hehn, Jr.E.I.C.. is at present in Sault Ste. Marie, Ontario. The work on which he has been engaged at mile 103, Algoma Central and Hudson Bay Railway, is practically complete except track laying and ballasting.

R. H. B. Cook, S.E.I.C., has been appointed draughting instructor at the Technical School in London, Ontario. Mr. Cook graduated from the University of Toronto with the degree of B.A.Sc., in 1922.

V. R. Currie, S.E.I.C., until recently with the Spanish River Pulp and Paper Mills, Limited, at Sault Ste. Marie, Ont., is engaged in the survey of coal lands for the Dixie Construction Company at America, Ala. Mr. Currie graduated from Queen's University in civil engineering in 1923.

F. R. Winter, S.E.I.C., has been transferred by the Bell Telephone Company of Canada, from London, Ontario, to their Toronto office, where he is division equipment superintendent in the plant department. Mr. Winter is a graduate of McGill University, having received his degree in 1922.

N. B. Seely, Jr.E.I.C., of St. John, N.B., has joined the staff of the Condit Electrical Manufacturing Company, at South Boston, Mass. Following his graduation from the University of New Brunswick in 1920, Mr. Seely took the students' engineering course with the Canadian General Electric Company at Peterborough, Ont.

Alf. A. Oldfield, A.M.E.I.C., engineer of maintenance of way, of the Wisconsin Power and Light Company, is located at Fond du Lac, Wisconsin. The company with which Mr. Oldfield was associated has recently consolidated several of their power interests in Wisconsin under the one name, Wisconsin Power and Light Company.

On the re-organization of the staff of the Niagara Falls Park Commission, John H. Jackson, A.M.E.I.C., formerly superintendent of the commission, has been appointed to the new position of general manager of the same, while J. R. Bond, A.M.E.I.C., formerly occupying the position of assistant superintendent, has been appointed to that of superintending engineer.

G. M. Ponton, A.M.E.I.C., who for the past four years has been in charge of the operations of the Harris Oil Corporation Limited, in Oklahoma, Texas and Louisiana, has opened an office as consulting mining engineer, at Haileybury, Ontario. Mr. Ponton, is a graduate of the University of Toronto, in mining engineering, of the class of 1909, and spent three years previous to 1908 in the Northern Ontario district.

J. B. Hayes, A.M.E.I.C., formerly assistant manager of the Jamaica Public Service Company, Kingston, Jamaica, B.W.I., has been appointed manager of the Fort Madison Electric Company at Fort Madison, Iowa, which company is under the management of Stone and Webster, Inc. Mr. Hayes received the degree of B.A. from Mount Allison University, Sackville, N.B., in 1912; B.Sc., from Dalhousie University, Halifax, N.S., in 1913, and S.B., in civil engineering from Nova Scotia Technical College in 1916. For three years from 1916 he was on active service overseas.

T. S. Scott, M.E.I.C., has tendered his resignation as city manager and engineer of Niagara Falls, Ontario, the same to take effect before the end of the year. Mr. Scott will leave immediately for Florida to take charge of the development of a tract of land some twenty-five square miles in area. This land, at present swamp and jungle, lying south of St. Petersburg, Florida, is to be transformed into a number of large estates. The improvement will necessitate the building of a sea-wall, roads, houses and golf links, and the installation of electric lighting, drainage and water systems. Strong representations have been made by the Niagara Falls Council to induce Mr. Scott to remain in the position where he was so well regarded and where he did such good work. At a special meeting of the council it was decided to give leave of absence till February 1st to Mr. Scott, instead of accepting his resignation at once, in the hope that he might reconsider his action. Banquets have been given by the municipality and other organizations in honour of the retiring manager and he has also been the recipient of several presentations.

Becomes Director General of Surveys

Official announcement has been made by the Civil Service Commission of the appointment of John Davidson Craig, B.A., B.Sc., M.E.I.C., D.L.S., to the position of Director General of Surveys for Canada, to succeed the late Doctor Deville, Hon.M.E.I.C. Following twenty-four years of employment with the Federal Government this appointment comes to Mr. Craig as a recognition of valued service rendered and a tribute to his high ability.

In 1897 Mr. Craig graduated from Queen's University with the degree of B.A., and in 1900 with the degree of B.Sc. in mining engineering. That year he joined the staff of the Surveyor-General at Ottawa, and the following year became articled as a Dominion land surveyor receiving his commission as D.L.S. in 1902. In 1904 and part of 1905 he was inspecting township subdivision contract surveys for the Surveyor-General in Manitoba and Saskatchewan, being transferred to the International

J. D. CRAIG, M.E.I.C.,
Director General of Surveys for Canada

Boundary Surveys staff in April 1905. During that season he was Canadian Attache to the American party working on the boundary between British Columbia and Alaska in the vicinity of the Unuk river, the work comprising triangulation, photo-topography and demarcation of the line, and during the season of 1906 was in charge of the Canadian party engaged in similar work on the line in the vicinity of the Whiting river, Alaska. During the following season Mr. Craig was in charge of the Canadian party on the Bradfield canal and river, Alaska, and during the season of 1908 was in charge of the Canadian party on the Iskoot river, Alaska, during the winter seasons being engaged on the reduction of field notes and their computation, and on the mapping, phototopographically, of various sections of the line between British Columbia and Alaska. From 1909 to 1913 he was in charge for Canada, of the survey of the 141st Meridian, the boundary between Alaska and the Yukon. From 1914 to 1917 he was assistant superintendent, Geodetic Survey of Canada, making various inspection trips for the Boundary Commissioner, and doing triangulation along the Quebec-Vermont and the Quebec-New York boundaries. In 1918 he was appointed engineer to the International Boundary Commission, to which duties were later added that of being advisory engineer to the Northwest Territories Branch of the Department of the Interior. In 1922 Mr. Craig was given an important position as officer in charge of the Arctic Expedition which he handled in a highly credible manner.

As engineer to the Boundary Commission, which position he occupied at the time of his present appointment, Mr. Craig has had a varied technical and diplomatic experience, his work at all times calling forth expressions of high appreciation from his Deputy and the chairman of the Commission.

Mr. Craig was elected an Associate Member of *The Institute* in 1910, and became a Member in 1919. Besides his proven ability and technical knowledge Mr. Craig possesses a pleasing personality and these qualifications combined with his well known tact and sound judgment ensure for him a high measure of success in the new position with which he has been honoured.

J. B. STRAUSS, M.E.I.C.

J. B. Strauss, M.E.I.C., whose appointment to the Joint Association of Designing and Consulting Engineers for the proposed South Shore Bridge, Montreal, was announced in last month's Journal.

Professional Engineers of B. C. Hold Annual Meeting

On December sixth, nineteen twenty-four, the Association of Professional Engineers of the Province of British Columbia, held its fifth annual conference at the Hotel Vancouver, Vancouver, B.C. The meeting was presided over by President E. E. Brydone-Jack, M.E.I.C., and the opening address was one of welcome to visiting members by Mayor W. R. Owen of Vancouver, who in the course of his remarks stressed the value of the engineering profession to the community and spoke in high praise of the excellent results which have followed the policy adopted by the Vancouver city council regarding the relations with its engineering department through which an effort has been made to give the city engineer a free hand and full responsibility.

In his presidential address, Mr. Brydone-Jack reviewed the activities of the association during the past year, and referred briefly to the important part played by the engineer in the life of the community, expressing his gratification at the number of engineers who were now appearing in the federal and provincial parliaments and municipal councils as well as public commissions and other bodies having to do with the affairs of communities. In continuing he dealt with the opportunities for men with engineering training, emphasizing that such training fitted men for positions of responsibility in industrial and commercial life as well as in pure engineering.

At the conclusion of President Brydone-Jack's address the secretary gave a most interesting outline of the activities of the association as affecting the welfare of the profession. Mr. Wheatley's address was followed by an interesting discussion.

Luncheon Session

At the conclusion of the morning session of the conference, a luncheon was attended by 193 local and visiting members in the banquet room of the hotel Vancouver, at which a number of guests of the association were entertained, including President Klinck of the University of British Columbia, Dean Brock, M.E.I.C., Mayor Owen of Vancouver, Col. G. H. Kirkpatrick, chairman of the Harbour Commission, F. P. Shearwood, M.E.I.C., chief engineer of the Dominion Bridge Company, J. K. Macrae, president of the Board of Trade, and Capt. Ian Mackenzie, M.L.A.

Engineering Education

Following the luncheon, President Klinck addressed the gathering, taking for his subject "Engineering Education". President Klinck's address was a most interesting account of the efforts being made by the Faculty of the University of British Columbia to develop a system of engineering education that will meet the changing requirements of this country.

Afternoon Session

At the opening of the afternoon session of the conference, Capt. Ian Mackenzie, M.L.A., gave a most inspiring address which he entitled "The Engineer and the Dreamer".

In the course of his address, Capt. Mackenzie dealt particularly with the moral characteristics that must go with the engineer's professional knowledge if he is to be successful to the community, as well as successful in his own practice; and after an eloquent description of the trials and difficulties through which many of the earlier engineers passed and the great strength of character and knowledge of human nature that grew out of these early trials, he gave as the keynote of his address, the statement that the engineer is "The dreamer whose dreams come true".

President Brydone-Jack voiced the thanks of the meeting for Capt. Mackenzie's address and then proceeded to the business of the afternoon session, which consisted of discussions arising out of the minutes of the last annual meeting, and the appointment of a Nominating Committee for the ensuing year.

Election of Officers

At the close of this meeting the report of the scrutineers was received and the announcement made that the elected members of the incoming Council will be:

President: Patrick Philip, M.E.I.C., deputy minister and chief engineer, Department of Public Works, Government of B.C., Victoria, B.C.

Vice-President: Frank Sawford, A.S.M.E., A.I.E.E., consulting engineer, Vancouver, B.C.

Councillors:

- A. S. Wootton, A.M.Inst.C.E., M.E.I.C., chief engineer Park Board, Vancouver, B.C.
- G. S. Eldridge, B.Sc.,A.M.E.I.C., president of Eldridge & Co., Vancouver, B.C.
- J. F. Frew, M.E.I.C., A.M.Inst.C.E., consulting engineer, Vancouver, B.C.
- G. M. Tripp, A.M.E.I.C., general superintendent, British Columbia Electric Railway Company, Victoria, B.C.

ELECTIONS AND TRANSFERS

At the meeting of Council held on December 23rd, 1924, the following students were admitted:—

ANTERBRING, Clarence V., 27 Atlantic Avenue, Winnipeg, Man.
BURROWS, John Arthur, 33 Lenore Street, Winnipeg, Man.
CARRY, Charles William, 79 Hart Avenue, Winnipeg, Man.
COLLCUTT, Sydney Ray, 1549 Barclay Avenue, Vancouver, B.C.
CREASE, Charles Edward, P.O. Box 435, Amherst, N.S.
EGGERTSON, Eggert Grettir, 766 Victor Street, Winnipeg, Man.
GAUER, Edward, 275 Evanson Street, Winnipeg, Man.
GILMOUR, William A. T., 811 University Street, Montreal, Que.
HAGBORG, Helmer V., 783 Bannatyne Avenue, Winnipeg, Man.
HERSCOVITCH, Charles, 1088 St. Urbain Street, Montreal, Que.
KELLETT, James Edward, 407 Lipton Street, Winnipeg, Man.
KENNEDY, James Mitchell, 421 Graham Avenue, Winnipeg, Man.
KENNEDY, Leslie John, Sifton, Man.
LEWIS, Wilfrid Jamieson, 379 Wardlaw Avenue, Winnipeg, Man.
MACKAY, Leslie, 296 Yale Avenue, Winnipeg, Man.
MacKINNON, William Duncan, 211 University Avenue, Kingston, Ont.
McMILLAN, Hugh, 128 Walnut Street, Winnipeg, Man.
McNEIL, John, 109 Luxton Avenue, Winnipeg, Man.
O'DAY, Martin F., 971 McMillan Avenue, Winnipeg, Man.
PAUL, Banbihari B., Moulmein, Burma.
PAYNE, Harold, 499 Walker Avenue, Winnipeg, Man.
STEEVES, Samuel Merritt, 402 Lipton Street, Winnipeg, Man.
SUMNER, Joshua, 311 Chalmers Avenue, Winnipeg, Man.
VAN VLIET, Wilbur D., 77 Kingston Row, St. Vital, Man.
TREBLE, Harold Edison, Crystal City, Man.
WARKENTIN, Cornelius P., 287 Young Street, Winnipeg, Man.
WHITEHEAD, J. Gordon, 794 Shuter Street, Montreal, Que.
YOUNG, William Richard, 348 Manderville Street, St. James, Man.

Metallurgy of Aluminium and Aluminium Alloys

By Robert J. Anderson, B.Sc., Met.E.

A modern and practical treatise on the metallurgy of aluminium and its light alloys, covering the subject from the mining of the ores to the fabrication of the metal, and applications thereto has been prepared by Robert J. Anderson, B.Sc., Met.E., consulting metallurgical engineer, and formerly metallurgical engineer of the United States Bureau of Mines. This volume is being published by Henry Carey Baird and Company, Inc., 2 West 45th Street, New York, and will be shortly ready for distribution. As there has not been published any up-to-date work dealing with aluminium metallurgy this book has been specially prepared to fill the need for such a treatise.

Message from Rensselaer's President

Rensselaer Polytechnic Institute,
Troy, N.Y., December 2nd, 1924

Fraser S. Keith, M.E.I.C., Esq.,
Sec'y, *The Engineering Institute of Canada*,
176 Mansfield Street,
Montreal, Canada.

Dear Mr. Keith:

I have your very courteous letter of November 24th.

Will you kindly convey to the Council of *The Engineering Institute of Canada* my sincere appreciation of their courtesy. We were only too glad to confer the degree of Doctor of Engineering upon Mr. Surveyer. We did intend it as a recognition of the services to the profession of the many great engineers who are members of your *Institute*, as well as a compliment to your President, whose remarkable ability and professional attainments were well known to us. We feel it to be a great honour to have such a man connected in this manner with this institution.

Very sincerely yours,

PALMER C. RICKETTS.

THE TRUSTEES AND FACULTY
OF
RENSSELAER POLYTECHNIC INSTITUTE
GRATEFULLY ACKNOWLEDGE
THE COURTEOUS MESSAGE OF CONGRATULATION
OF
THE ENGINEERING INSTITUTE OF CANADA
UPON THE OCCASION OF THE
HUNDREDTH ANNIVERSARY
OF THE
FOUNDATION OF THE INSTITUTE

PRESIDENT

TROY, NEW YORK, U. S. A.,
OCTOBER 10, 1924

Economy in Central and District Heating Lies in Burning Low-Grade Fuels

That central and district heating has shown economies and that such systems may and will be adopted to an increasing extent in Canada is the conclusion reached by the Dominion Fuel Board in its report of an investigation just issued. The inquiry, which was conducted by F. A. Combe, M.E.I.C., is in furtherance of the board's policy to encourage the displacement of foreign fuels by those produced in Canada.

One of the essentials to success in district heating, the report points out, is density of load and for this reason it cannot be successfully adopted in towns of less than 4,000 population, and if other conditions are not favourable, the minimum population for economic operation is placed at 10,000.

Advantages to be gained in addition to the saving effected by the substitution of low-grade fuels and refuse are elimination of the smoke nuisance, absence of dust and dirt, reduced fire risk, ease of regulation, uniformity of temperature, relief of street traffic from coal and ash traffic, and appreciation in value of property.

The fact is emphasized that very often the cost of service can be lessened by combining the heating plant with a steam electric generating or an industrial plant. Even in the most efficient steam engines and steam turbine generations only 15 per cent of heat in the steam is utilized for power production and by combining the two plants the other 75 per cent can be utilized for heating. Illustrative of such a combination is the district heating plant at North Battleford, Saskatchewan, where use is made of the exhaust steam from the municipally-owned steam electric generating system.

The report states that the benefits to be derived by consumers are not so much in cost as in greatly increased value of service as respects convenience, cleanliness and relief from handling ashes. A great deal depends, it is pointed out, on the costs of fuel available but under ordinary conditions it has been generally established that to give the heating company a reasonable return, a rate must be charged for dwellings in excess of the cost of fuel for individual heating.

In the course of the investigation examinations were made of 15 district heating plants in the northern United States and the two operating in Canada, of which full descriptions are given in the report. Central Heating plants such as those used in Toronto and Queen's University are also described. Some very interesting facts have been brought out by the enquiry. For example, it is stated that despite its hydro-electric power development the province of Ontario consumes 60 per cent of the coal requirements of the whole Dominion. Another curious fact is that in spite of the difference in temperature, the coal consumption for heating buildings in Canada is slightly less than in the northern United States. In fact in the heating of dwellings it is very appreciably less. This, it is pointed out, is due to better building construction and the use of double windows in Canada, to the greater use of hot water radiation and to the fact that Canadians are used to lower indoor temperatures than are the people of the northern States.

EMPLOYMENT BUREAU

Situations Vacant

Electrical Engineer

Electrical engineer with good technical training and about eight years' experience in electrical light power and railway public utility work. Location large city in Brazil. In applying please give full particulars regarding self and experience, stating also salary desired and when available. Apply box No. 124-V.

Electrical Engineer

Electrical engineer, college graduate about ten years' experience in general public utility work desired by company operating foreign electric light power and railway utilities. Apply by letter stating full particulars of experience, when available and salary desired. Location Toronto, Canada. Apply box No. 125-V.

Agents

Engineering firm with headquarters in Montreal desires to appoint sub-agents to cover Canada and Newfoundland from capitals of each province, in machinery and steam specialty lines. Commission basis only. Apply box No. 126-V.

Situations Wanted

Graduate of 1923, B.A. University of Montreal; B.Sc. McGill University; 27 years of age; married. Underground construction experience, also in organic chemistry and draughting, speaks English and French fluently. Locality preferred Montreal. Apply box No. 163-W.

Draughtsman

Draughtsman with twelve years' experience on mechanical and structural work, also shop and field experience, desires position. Location immaterial. Apply box No. 164-W.

Electrical Engineer

Graduate of the University of Toronto. Three summers on location, supervision of construction and inspection of highways. One summer on railway and transmission line construction. Overseas with R.A.F. Will go anywhere and commence immediately. Apply box No. 165-W.

Members' Exchange

One Brunton pocket transit with leather case and one seven-inch Abney hand level with leather case. Both new models and in perfect condition. Price $50.00 for the two. Inspection invited. Apply box No. 10-E.

Abstracts of Papers read before the Branches

The Hudson Bay Route

Lieut.-Col. A. C. Garner, M.E.I.C.
Saskatchewan Branch, December 11th, 1924.

Col. Garner said that in the preparation of his paper he had confined himself strictly to the following sources: official reports of the federal government, conversations with men that had been over the ground and papers written by outstanding engineers. The findings of the Senate Committee in 1920 relating to this subject are:

(1) "That the Hudson Bay route is feasible and will probably in time be profitable.

(2) "That the season of navigation under present conditions is at least four months in length and may by reason of improvements in aids to navigation be considerably increased.

(3) "That in the opinion of this Committee sufficient care was not taken in the selection of Nelson as the terminus of the railway, and that the government should not make further important expenditures upon this port without first making a new and thorough examination into the relative merits of Churchill and Nelson as a terminus for the railroad.

(4) "That the waters of the strait and rivers tributary to the bay teem with fish and valuable marine animals, and we believe that the bay is equally well stocked but there has not yet been sufficient data collected as to the extent of the fisheries of the bay to enable an authoritative statement to be made as to their value.

(5) "That the mines already discovered in the Hudson Bay district are of sufficient number and richness to indicate the existence of great potential mineral wealth."

Railway and Terminals

In 1907 the Department of Railways had its engineers consider this question and also sent boats into the Bay to investigate conditions. In 1908 John Armstrong, C.E., made location surveys from The Pas to the Bay, one going direct to Port Nelson, the other branched off at Split Lake and went to Port Churchill. The line to Churchill is the longer by 75 miles and was estimated to cost $3,000,000.00 more than the Nelson line. The route to Nelson was decided upon in 1912 and construction carried on intermittently until 1918. Steel is laid to within 92 miles of Nelson and all the large bridges are built. Expenses to March 31st, 1919, are: railway 14½ million dollars; terminal 6⅛ million dollars. It is estimated that 6 million dollars for the railway and 19 million for the terminals are required for completion. The total cost of the scheme is not unreasonable considering its vastness and the benefits to be derived. Facing the facts, why the delay? Col. Garner then related facts connected with the scheme in the '80's for a railway from Winnipeg to Hudson's bay.

Harbours

The only harbour is Churchill which is land locked with good anchorage, deep water, but limited capacity. Nelson is an open roadstead and exposed, requiring artificial development and continuous maintenance. The chief engineer, department of railways gave his opinion that in four years Nelson could be made ready to handle 15 million bushels but that the steel should be completed first. Men known to the speaker who have examined both harbours, are strongly in favour of Churchill and state that the route to Churchill passes through a better country than the route to Nelson. It therefore appears to be a great pity that Churchill was not chosen at the outset and although with limited harbour capacity, the route might already be in operation and demonstrating its usefulness.

Bay and Straits

Col. Garner gave a brief historical sketch of navigation in the bay, commencing with the discovery in 1610 by Henry Hudson. The safe period for navigation by ordinary ships, according to the average of 27 expert opinions, appears to be from the middle of July to the middle of November — a period of four months. In 250 years some 750 ships have entered the Straits and only two been lost. In 1914, 38 were sent in and suffered no serious loss. It is therefore a reasonable conclusion that the route is safe and practical. Recent improvements in wireless, ice detectors, etc., would likely increase the safety and lengthen the period of navigation. A great deal more investigation and study needs to be given to this portion of the scheme, in connection with wireless and meteorological stations, light houses, charts, etc.

Transportation

For the present the route is considered chiefly as an outlet for wheat and cattle. Incidental thereto will be the development of a territory rich in minerals, fish, furs, and water powers, and the entry at cheaper rates of goods from the Atlantic seaboard and Europe.

The speaker made an accurate comparison of the distance Regina-Liverpool via Nelson, and via Montreal, showing a saving via Nelson of 759 miles. Roughly, the distance Regina and Nelson is the same as Regina-Fort William, and Nelson-Liverpool the same as Montreal-Liverpool. The saving is therefore approximately equivalent to the distance Fort William-Montreal. The cost of transportation only on a bushel of wheat from Regina to Liverpool via lake and rail is 32½ cents. If the same rates per mile hold for the Nelson route, the cost will be 21 cents, or a saving of 11½ cents per bushel. Owing to limited capacity of the route, the effect of Pacific shipments and other factors, Col. Garner thought it not reasonable to expect a cheaper rate than the present 32½ cents rate for the first few years at least. The speaker wished to dispel any public delusion that if the money were voted at the present sitting of parliament, grain could be shipped next fall at a saving of at least 10 cents per bushel. To avoid disappointment the following facts have to be faced: An allowance of five years to complete the scheme and a rate at first of not lower than 32½ cents or 30 cents per bushel.

Deductions

Deductions or review of the foregoing are:

(1) The Special Committee of the Senate after a careful and exhaustive enquiry state "The Hudson Bay Route is not only feasible but will ultimately prove profitable".

(2) The railway to Nelson is mainly completed, in all 322 miles of steel has been laid, all the large bridges are built, there is only 92 miles of steel to lay on a grade already built. The outside cost to complete is only 6 million dollars.

(3) Nelson harbour has been partly developed, some 6 million dollars having been spent. There appears to be no reason why remainder of this part of the scheme cannot be completed at the estimated cost of 25 million dollars, leaving 19 million to effect cost of completion.

(4) Navigation of bay and straits has been proven as both safe and practical for at least a period of four months, which period with the help of aids and experience may be appreciably lengthened.

(5) That the maximum cost of transportation of grain per bushel should not exceed 35 cents Regina-Liverpool for the first few years.

(6) That opening up of new territory and development of natural resources, the greater use of commodities by this route, the added zeal to trade and commerce, are all very material factors to be considered and undoubtedly the Dominion as a whole would benefit by this route.

Col. Garner concluded his paper with the following recommendations:

(1) That the necessary money be voted to complete the scheme and that the work be pushed forward till completed.

(2) That meanwhile intensive or close examination be made of those features of the scheme not yet fully covered.

In connection with his paper Col. Garner exhibited a very complete set of maps.

Sodium Silicate and its Industrial Applications

E. T. Sterne, B.Sc.,
Ottawa Branch, November 26th, 1924.

Mr. Sterne was particularly well fitted to speak on this subject. He is a graduate of Queen's University in chemistry and mineralogy and lectured in chemistry at Queen's, also assisting in extensive research work for two years after graduation. He is now chemical director and a member of the firm of G. F. Sterne and Sons, Brantford, Ont., who are sole Canadian agents for sodium silicate in Canada.

Mr. Sterne's lecture, which was illustrated by a series of excellent slides, covered the subject in a very comprehensive manner, and left all those, who were fortunate enough to attend, with a clear conception of the present and future status of sodium silicate in Canadian industry.

According to Mr. Sterne sodium silicate as used in commerce is a syrupy semi-transparent liquid manufactured in 18 grades, varying in consistency from 42 to 60 degrees Beaumé. Two methods of manufacture are known, namely the fusion and the solution process, the former being in general use. This method involves the use of silica sand and soda ash which are mixed and melted together in a furnace, the molten product being cast into small slabs. These slabs are then treated with water and other chemicals in large dissolvers, and silicate of the required consistency produced. The proportion of alkali to silica content, known as the silicate degree is confined to certain limits which were clearly defined. Beyond the one limit, which is one of alkali to four of silica the resultant silicates formed are soluble with extreme difficulty, while crystalline products are formed when the other limit of two parts alkali to three of silica is exceeded. Mr. Sterne pointed out the very interesting fact that sodium silicate is readily soluble in small quantities of water but dissolves with difficulty in larger amounts.

The most important ingredient of sodium silicate which is silica sand, must be entirely free from alkaline earths and impurities. The largest and best known deposit on this continent is found in the State of Illinois, which, together with some Belgium ballast sand, supplies the requirements of the silicate manufacturers. This sand must receive a very elaborate treatment prior to use, involving washing, grinding and screening. The soda ash used is of the ordinary type supplied by chemical plants.

Mr. Sterne stated that 85 per cent of the sodium silicate produced is used in the manufacture of soap and corrugated paper boxes. It is an important ingredient of most laundry soaps, some of which contain up to 20 per cent of this substance. In the production of corrugated paper boxes and fibre board, it is used to glue the various layers together and also finds considerable employment as a mineral glue in sealing packages and making paper barrels. Mixed with casein it forms a binder for the manufacture of ply-woods and veneers. Recently it has come into considerable prominence in paper manufacture, for newsprint, kraft and grease-proof papers. A thin solution of sodium silicate applied to concrete surfaces after setting gives a much denser, better wearing concrete, which is very nearly impervious to moisture. Sodium silicate is also used to a considerable extent in the manufacture of silica gel, acid proof cements, carborundum wheels, boiler feed water softeners, and is also employed in the sizing of barrels and for egg preservation. The interesting fact was pointed out that vermin and insects will not attack substances impregnated with sodium silicate.

Mr. Sterne stated that the present consumption of sodium silicate in Canada is about 18,000,000 pounds. As the economic production of a plant, manufacturing this commodity, requires an output of at least 50,000,000 pounds per year, it may be seen that it will not be feasible to manufacture sodium silicate in Canada for a considerable period.

Northern Ontario

Hon. Chas. McCrae,
Niagara Peninsula Branch, December 9th, 1924.

Mr. McCrae, speaking of Northern Ontario, said that a broader and bigger vision was needed; a better appreciation of what lies in store for Northern Ontario, when mining shall have reached the position of importance to which it belongs. Canada is now emerging from a period of depression of world-wide extent. Among other factors behind this condition may be mentioned lack of buying power through greatly reduced agricultural production. The value of field crops in Ontario in 1919 of 397 million dollars had dropped to 219 million in 1923. This year a crop of 249 million has been produced. The other provinces throughout the country have had similar fortune. This year shows increased receipts. The worst is over. This factor is not controllable and affects all lines of industry.

Another factor is government policy. Tariff should be designed to assist Canadians primarily. Moreover, the impetus that the provincial government can give to industry by developing such a policy as will afford opportunity to exploit the mineral resources, is of great importance, affecting the volume of trade and business in allied and independent lines. The present government of Ontario, realizing the importance of an influx of capital to develop the mines, sent him to London. He came back elated at the good prospects of securing this capital.

Referring to a map of Ontario, which hung beside him, the speaker showed how the northern section was developing along the lines of railways, of which there are in the north 3,500 miles. The land lying along the north shores of the upper lakes, along the line of the C.P.R., was at one time said to be desert. The differences between the East and the West were largely caused by this extensive unproductive area. Now that its mineral possibilities are beginning to be realized, it is becoming rather a connecting link between the two regions.

The Pre-Cambrian rock area of Canada, of which the above forms a part, may be judged for its mineral possibilities, by results obtained in this formation in other parts of the world. Mining is being successfully carried on in similar rock to a depth of 6,000 feet in South Africa, of 6,700 feet in South America, of 6,000 feet in India, and also to great depths in the Black Hills of Dacotah and in British Columbia. The speaker prophesied that, in the period just opening, the immense extent of the Pre-Cambrian in Canada will make this country the most important mineral producer in the world. The Duke of Devonshire, speaking of these possibilities, before a London gathering, declared that the importance of this, not only to Canada but to the British Empire, must be measured not in years but in centuries.

The object of the London trip was to tell the English investor what Northern Ontario has to offer, and what is the government's policy towards capital. In making this appeal to capital, it was necessary to show what was the performance of the mines, and to undertake to treat fairly capital which responded to the welcome. Capital is entitled to know conditions and to get a fair run for its money.

The present mining laws in Ontario are the fairest in the world. (The speaker here disclaimed credit for them.) Taxes are levied on mining companies only when they win, never when they lose. The tax is so graded that the greater the profit the higher is the percentage tax. In 1923, of all the money invested in the mining industry in Ontario, English capital was only represented by a scant 3 per cent. The prospects of this condition soon being changed were very bright.

Mining in this province is assuming large proportions. In 1911, $50,000. in gold was produced in Ontario. The year 1924 will see produced some $25,000,000. in gold. Since Cobalt was tapped in 1902, the silver mines of the province have averaged a daily production of two tons of the white metal. The early owners of the Hollinger were told that they had no chance of finding gold. English textbooks claimed that there was no gold in their formations. Since then the Porcupine region has become one of tremendous wealth. The Hollinger is said to have ore proved up to a value of $15,000,000. for every hundred feet of depth. This will probably extend to a depth of 6,000 feet or more. Kirkland Lake boasts some of the richest ore in the world, mill-heads at the Lake Shore mine running as high as $20. to $30. to the ton.

It is likely that in the course of time there will extend all across Northern Ontario, from Quebec to Manitoba, innumerable mines, supporting towns, villages and hamlets; a large population forming a market for all varieties of manufactures. "We are entering a big era of prosperity. Can we not, like the U.S.A., attract population to our "Gold Coast"? We must tell the world what we have to offer. The prospector yearns for capital. This capital must be secured."

Mountaineering

Capt. H. Westmorland,
Kingston Branch, November 19th, 1924.

Mountaineering as a sport is of comparatively recent date, perhaps the first recorded ascent from this angle being that of Mont Aiguille in 1492, when Charles VIII, of France, commanded his chamberlain to make the ascent, which he did with much paraphernalia, staying on the summit for a week. In 1739, Titlis was climbed by a monk — the first true snow peak. The summit of Mont Blanc was attained for the first time in 1786, by Dr. Michel Paccard and the guide Jacques Balmat. Systematic mountaineering is usually dated from Sir Alfred Wills' ascent of the Wetterhorn in 1854. The Alpine Club (England) was formed in the winter of 1857-58, and the Alpine Club of Canada in 1883.

In Canada first ascents were made in the latter part of the last century and still continue. Mount Sir Donald was climbed in 1890, Mount Robson in 1913, Mount Assiniboine in 1920 and Mount Geike in 1924. An expedition is to be sent by the Alpine Club of Canada to attempt the first ascent of Mount Logan (19,850 feet), the highest mountain in Canada and the second highest on the North American continent, in the spring of 1925. This expedition will be under the joint leadership of Messrs. Lambart and MacCarthy, and is estimated to cost some $11,000, over three-quarters of which is already raised.

The sport of mountaineering is much misunderstood by the lay mind and generally held to be foolhardy. Grave risks may be incurred by the neglect of necessary precautions but these risks may be reduced to a reasonable point by the combination of skill, knowledge and good physical condition.

There are two unavoidable dangers, — falling stones, and sudden storms. The places where ice may fall or an avalanche of snow occur can be determined beforehand by a careful study of conditions. The avoidable dangers are, — lack of condition, bad guiding, and slips on rock, ice or snow.

There are two sides to the art, rockclimbing and snowcraft, and a thorough skill and knowledge of both of these are required by the successful mountaineer. In rock work cracks, chimneys, gullies, couloirs, arrêtes, buttresses, etc., are met with and either used or surmounted, and in snow or ice there are glaciers (dry and wet), bergschrunds, crevasses, seracs, steep slopes up to 60 degrees, avalanchey snow, etc., to be encountered.

The equipment is comparatively simple, the main items being the Alpine rope, the ice-axe and properly hob nailed boots. Various kinds of rope are used of a breaking strength of approximately 2,240 pounds. It should hold a 170 pound man falling a distance of 12 feet. Four rules must be invariably be observed in using the rope: It must be always kept taut with the slack carefully taken up and yet must not be pulled to upset the man following behind. It must never be jerked. It must not be allowed to catch on projections. Care must be taken to see that the rope does not dislodge loose stones to fall on those following behind.

The ice-axe is used for cutting steps in ice or snow, in glissading, in maintaining the balance on steep slopes, and should be held on the high side of the climber not on the low as the amateur is prone to use it.

Excellent rock climbing is to be had in the English Lake district which is a very beautiful hill and dale country with many steep rock faces up to 600 feet in height. One lady who had just had her first climb in a roped party could not find words to express her idea of the steepness and when a bystander suggested 90 degrees, she replied: "Oh no, it was much steeper than that, it must have been 180 degrees at least". Many of the climbs in this district hold rock work as difficult as to be found anywhere.

In the Alps there are many hundreds of very fine mountains, where, in contrast to the English mountains, much snow and ice is met with.

The Rocky mountains have the charm of freshness and seclusion and, far different from those of Europe, even the valleys are to a great extent untouched by the marring hand of man. The district of the Robson amphitheatre is undoubtedly one of the most superb in Canada, if not in the world, with the beautiful Emperor falls, Berg lake covered with numerous icebergs which fall from the Tumbling glacier, the supporting mountains Resplendent and Whitehorn, snow and glacier covered all the year round, and crowning all, the great monarch Robson, 13,000 feet high, with its mighty peak concealed by the clouds most of the time, but when clear, presenting a view indeed wonderful and never to be forgotten.

It is difficult to describe the actual charm of mountaineering. Someone has said, "Mountaineering has an indescribable charm which appeals to certain natures". This limit no doubt applies to the actual climbing but the wonderful works of nature encountered and the magnificent scenery to be viewed would almost warrant the substitution of "all" for "certain".

Steam Standby Plant of the City of Winnipeg Hydro-Electric System

Abstract of paper for which D. S. Young was awarded the first prize as the best students' paper in the electrical section.—Winnipeg Branch.

The purpose of the steam standby plant was to provide assurance of continuous service to city power users; to electrify, at a saving in operating costs of over $50,000. per year, the city high pressure plant; and to take care of peak loads, which are expected to increase the load beyond the present installed capacity of the Point du Bois plant of the city of Winnipeg.

The thought that the standby plant might be combined with the central steam heating plant was developed and the construction of a combination plant was the result. The incorporation of the central steam heating idea meaning the saving of fixed charges of some hundreds of thousands dollars yearly, and the utilizing of off-peak power for the generation of steam were economies that recommended the steam heating plant.

The use of pulverized coal, — eventually pulverized western Canadian lignite, — also recommended the central steam heating plant.

The whole plant has been laid out with future extensions in mind Additional turbines will soon be necessary for the emergency and relay service to which this standby plant is to be put. It is intended that future installation will be of larger units than those originally installed. Additional boilers will be necessary to carry the increased turbine load and also the increased steam heating load.

It may be noted that the steam standby plant is the third of its kind in Canada using pulverized coal as a fuel and also that it has the second largest boiler unit installation of its kind in Canada.

Mechanical Grain Car Unloaders

Abstract of paper for which Wm. G. Reekie was awarded the second prize as the second best students' paper in the electrical section.—Winnipeg Branch.

Although grain has been transported and unloaded in car lots on this continent for the past fifty years, it is only during the last ten years that a mechanical device for tipping and emptying grain cars has come into use. Of all the large terminal elevators in Canada only that of the Canadian National Railways in Port Arthur and that of the Dominion Government at Edmonton are equipped with this latest type of unloader.

The first cost of the unloader is high, but it is warranted when the mechanical unloader is in operation constantly for long periods. Since a car can be unloaded in from three to four minutes, as compared with from fifteen to twenty-four minutes by the usual scraper method, the saving of time becomes a large factor in their favour during the very busy fall months. All parts of the unloader are electrically controlled and operated by one man from the operator's tower.

Essentially the grain car unloader consists of five main parts: foundation and tread; cradle; door opener assembly; baffle assembly; tipping machinery.

The unloading operation is as follows: The cradle is locked in its horizontal position, the loaded car pushed onto it and held in place by end bumpers. By means of the door opener the grain door of the car is then forced inward and upward and held close to the roof of the car. The tipping machinery is then put in motion and the cradle rolls on its tread until the car is tipped longitudinally at an angle of 45 degrees. In this position the car becomes practically half emptied. A baffle is then pushed forward through the open doorway to the far side of the car and acts as a bulkhead while the car is tipped other end up. Very generally a certain amount of grain runs over the first baffle so that it is necessary to repeat the operation to completely empty the car.

When emptying is completed the baffle is withdrawn and the cradle is brought to its horizontal position and locked in place by the end locking pins.

Radio for Emergency Communication

F. K. Dalton,
London Branch, November 26th, 1924.

Whenever two or more persons desire to co-operate in any undertaking, some method of communication between these persons is required. The greater the importance of close co-operation, the more reliable must be the method of communication. The method used will also depend upon the distance to be covered.

In the operation of a power system, where all transformer stations are required to keep in touch with each other and also with the generating station, dependance is usually placed upon a telephone system, or possibly upon a telegraph system. Either of these systems, however, requiring a complete circuit, is subject to certain interruptions from broken or short circuited lines and also from interference at power or audio frequencies.

On a number of power systems, radio equipment is being installed for emergency communication. This equipment has an advantage over the telephone or telegraph, in that it is not dependent upon the continuance of a circuit as a medium of transmission. The radio telephone, however, is more complicated than the physical telephone and the equipment, therefore, requires more attention in operation and maintenance.

About four years ago, the Toronto Power Company installed complete radio transmitting and receiving equipment at five points on their Niagara-Toronto power lines, namely at Burlington, Port Credit, Silverdale (near Beamsville) and also at the transformer stations at each end of the line. These sets were for communication by straight radio and operate at present on a wave length of 510 meters.

The aerials used with these sets have now been supplemented by more simple aerials placed in the proximity of the power lines which, so long as the power conductors remain intact, use them to carry the radio frequency energy from the source to the destination, giving a more reliable method of communication and greater intensity than the straight radio system.

Three of these transmitters are rated at 250 watts, the remaining two transmitters are of much lower power, rated at 10 watts. All stations, however, are operating on the same wave length and can intercommunicate.

About the same time that the Toronto Power Company installed these sets, the Hydro-Electric Power Commission commenced the development of a guided wave radio system of communication, using low power sets entirely. Transmitters were built to operate either on the telephone lines or, through capacitive couplings, on the power lines. The receivers were designed with one stage of audio frequency amplification. Aerials were erected on the towers of the lines, and fifteen complete sets were installed in the transformer stations of the Niagara system.

These installations provide one-way communication between transformer stations and are operated throughout the system on storage batteries to ensure their functioning even in the event of a power interruption. Both transmitters and receivers have a minimum number of parts, thus rendering them simple in operation, reliable, and low in maintenance expense.

A further emergency communication system is provided in the installation of five higher power sets located at the principal points of the Niagara System. These are rated at 500 watts and give straight radio communication, not dependent on continuance of either power or telephone lines. The wave length used for these sets is 960 meters. They also are operated entirely on storage batteries which form part of the equipment of the transformer stations.

BRANCH NEWS

Niagara Peninsula Branch

R. W. Downie, A.M.E.I.C., Secretary-Treasurer.
R. Hogg, Jr.E.I.C., Branch News Editor.

St. Andrews Nicht Dinner

Members of the local branch and friends of Mr. Davy Dick, Jr., of Welland, were royally entertained and banquetted on December 1st, in honour of St. Andrew. Mr. Dick, whose annual dinner has come to be almost an institution and an affair to be looked forward to for a twelve-month, excelled even his hospitable self on this occasion. Oratorical, musical and artistic talent was secured from far and near. Pipers, attired in their tartans, led the guests from Mr. Dicks residence to the Hotel Reeta, to the great glory of the Celt and the discomfiture of the Sassenach. Here Jock Tamson's Bairns, in a riot of mirth, attacked the 'meagre fare' of bubblyjocks, haggis, and sic' like.

When Davy entertains he spares no effort, and his efforts are so well directed that his name has become synonymous with jollity and good-fellowship over a wide area. 'More power to your elbow, Davy' as the Irish say.

Northern Ontario Night*

On December 9th, the branch held a dinner meeting at Niagara Falls, where the Hon. Chas. McCrae, minister of mines in the Ferguson government, delivered a most interesting address on "Northern Ontario", to a rather small but appreciative audience. Among those present were 'Billy' Wilson, M.P.P., Mark Vaughan, M.P.P., representing Niagara Falls and Welland ridings respectively, and Alec. Frazer of Niagara Falls.

Mr. Wilson, M.P.P., in moving a vote of thanks to the speaker, paid high tribute to Mr. McCrae as a minister. "He not only may be approached at all times by the rank and file in the legislature," he said, "but is ever ready to lend an ear to anyone who has any suggestions to offer or remarks to make concerning Northern Ontario." Magistrate Alec. Frazer of Niagara Falls seconded the vote of thanks.

HON. WM. HAMILTON MERRITT
Originator of the Welland Canal, who made the first survey of the land, September 28th, 1818, with George Keefer, Esq., and others.

Kingston Branch

G. J. Smith, A.M.E.I.C., Secretary-Treasurer.

On Wednesday evening November 19th, a regular meeting of the Kingston Branch was held in Carruthers hall, Queen's University, the chairman, L. F. Grant, A.M.E.I.C., officiating.

Mountaineering*

The speaker of the evening was Capt. H. Westmorland of the headquarters staff, M. D. No. 3. Capt. Westmorland is a member of The Alpine Club (England), of The Fell and Rock Climbing Club, of the English Lake District and of The Alpine Club of Canada, and stated, in starting, that his talk would "consist of a few generalities on mountaineering followed by some descriptions of climbs in the English Lake district, the Dolomite mountains of the Austrian Tyrol and the Canadian Rockies".

For an hour the speaker delighted his audience by his account in a most unassuming manner, of many climbs of exceedingly difficult mountains. Some sixty very fine slides were shown of climbers attaining the most inaccessible spots together with the ice-axe, rope, climbing boots, etc., used during the climbs. The final description was that of the meeting of the Canadian Alpine Club at the base of Mount Robson in 1913, at which meet this mountain, the second highest in Canada (13,000 feet), was first climbed.

Capt. Westmorland stated that the great National Parks of Canada, in which many of the most beautiful mountains are located are being menaced by commercial interests desirous of obtaining water powers or other natural resources. A. O. Wheeler, F.R.G.S., D.L.S., director of the Alpine Club of Canada, has formed The National Parks Society to fight for their preservation and the speaker asked that every engineer do all that he is able to help Mr. Wheeler save this great Canadian heritage.

A hearty vote of thanks was tendered Capt. Westmorland by Col. A. Macphail, M.E.I.C., who stated the address was one of the most interesting he had ever had the pleasure of hearing and that he intended to take steps to have the lecture repeated, if possible, to the public under the sponsorship of the Arts and Lecture Committee of Queen's University.

The Queen's University Arena

The regular meeting of the Kingston Branch was held in Carruthers Hall, Queen's University, on Thursday evening, December 4th. The chair was occupied by R. J. McClelland, A.M.E.I.C., vice-chairman of the branch, and the attendance was unusually large due to the great local interest in the subject arranged for the evening's discussion.

The city of Kingston had never had a skating rink with an artificial ice plant installed so that when the Jock Harty arena at Queen's University was burned late last winter, the Athletic Board of Control of the University at once went into the matter of building a new fireproof, concrete structure with a thoroughly up to date plant for the production of a skating surface of artificial ice. The construction of this building has been watched with great interest by the students of Queen's as well as the citizens of Kingston in general during the past summer and the Kingston Branch of *The Institute* undertook to have the details of the undertaking explained at the open meeting of the branch on December 4th.

The subject was handled under five different heads, the following gentlemen looking after the respective parts:—

Prof. M. B. Baker — The history of the undertaking.
G. Maclachlan — The designing, contracting and building.
L. F. Grant, A.M.E.I.C., — The inspection.
Prof. L. M. Arkley, M.E.I.C., — The refrigeration plant.
Prof. W. P. Wilgar, M.E.I.C., — Summing up.

Professor Baker, in his explanation of the history of the project, told the rather interesting fact that the first game of hockey in Canada, and probably in the world, had been played in Kingston in 1888 between the Royal Military College and Queen's University, and that to commemorate this game the new arena was to be officially opened by another game between the teams from these two colleges. He also mentioned the fact that the rink had been built by the rather unusual procedure of calling for competitive designs directly from different firms of contractors, with accompanying prices, the design of Messrs. Maclachlan and Wright being finally chosen, and the contract awarded to this firm.

Mr. Maclachlan went thoroughly into the details of the design and the actual building of the structure itself, and L. F. Grant, A.M.E.I.C., explained the inspecting end of the work, and emphasized the complete harmony that had existed all through between the owners and contractors. The intricacies of the artificial ice plant were carefully dealt with by Prof. L. M. Arkley, M.E.I.C., this being the part of the subject that held possibly the greatest interest for the audience. Prof. W. P.

*Abstracts of these papers appear on another page of this issue.

Wilgar, M.E.I.C., closed the subject by a very capable summing up of the whole project.

The speakers were accorded the hearty thanks of all present for their interesting and instructive addresses.

London Branch

E. A. Gray, A.M.E.I.C., Secretary-Treasurer.
R. I. Olmsted, A.M.E.I.C., Branch News Editor.

The regular monthly meeting of the London Branch was held on November 26th, in the board room of the Board of Education, Public Utilities Building, with E. V. Buchanan, M.E.I.C., chairman, presiding.

The chairman introduced the speaker, F. Keith Dalton, B.A.Sc., radio engineer, Hydro-Electric Power Commission of Ontario, Toronto, whose subject was "Radio for Emergency Communication".*

Radio

The London Branch held its regular monthly meeting in the auditorium on December eighteenth. The event was of special interest to local radio fans as Lieut.-Commander C. P. Edwards, O.B.E., A.M.E.I.C., director of radio telegraphy, Department of Marine and Fisheries, Ottawa, gave a popular address on "Radio", illustrated by moving pictures and lantern slides.

The speaker was introduced in a short address by E. V. Buchanan M.E.I.C., chairman of the London Branch, and in the course of his remarks Commander Edwards predicted that within a few years Canada will have a string of broadcasting stations from coast to coast which will rival in power the programmes of radio centres at present on this continent.

The meeting was of a joint nature under the auspices of the London Chamber of Commerce, Canadian Club and *The Engineering Institute of Canada.*

Lethbridge Branch

Geo. S. Brown, A.M.E.I.C., Secretary-Treasurer.

With Peary in a dash for the Pole!

That was the treat which the Programme Committee served to the Lethbridge Branch on Friday night November 7th.

It has been the practice to invite the general public to meetings of the branch after dinner and usually there is a fair response, but when Mr. Jim Davidson of Calgary commenced his illustrated lecture on Peary's second expedition, the auditorium of the Y.M.C.A. was packed to the doors. John Dow, M.E.I.C., chairman of the branch, taking the opportunity of the big crowd, sketched the history of engineering and its place in the community, mentioning that while Commander Peary is universally known as an explorer, he was first of all an engineer.

Mr. Davidson, in his opening remarks, also referred to this aspect of the great explorer. It is a point that cannot be too greatly emphasized, for it proves, once again, the extent to which engineering plays its part in pioneering as well as other great accomplishments of the world, — a fact that is all too generally overlooked by the public at large. Another point which applies to engineers and other men of science, Mr. Davidson made in his talk when he answered the popular questions: "What is the purpose of these foolhardy trips to the North Pole?" "Are they not merely but a quest after adventure and excitement and of no benefit to the matter-of-fact world?"

"Men live not for themselves alone," said Mr. Davidson in effect. "Each must do what he can in his limit of life to advance knowledge of the earth. Man, from time immemorial, has sought to pierce the unknown, to venture into the wild places and tame them. The advancement of science directly affects the life of the world. Some particular bit of exploratory work may not be of direct benefit to the generation in which it is accomplished, but generations to come will benefit from the data collected."

Continuing, he said, "The life of the explorer is a hard one, but it is peculiarly the trait of the true engineer that he finds this hard life appealing, and to a very considerable extent the world is continuously in debt to the engineer, for the explorer is fundamentally, if not always technically, an engineer."

Mr. Davidson is not a lecturer in the professional sense and his talk before the branch was happily, in view of the large audience, entirely devoid of technical explanations. He told his story with a wealth of local colour and human interest. It was rather by inference than by direct reference that he left in the minds of his audience a picture of the hardships endured. As an instance of his methods: He told of the occasion when he, himself, was incapacitated by frozen feet and had to be returned later to the base, and told the story by describing the sufferings of his dogs throughout the eight days when his party were confined to their sleeping bags in storm during which the wind registered 58 miles an hour and the temperature remained under 68 degrees below. Of the 12 dogs, 7 were dead and two were frozen into the ice and had to be killed.

His picture of Peary was an inspiring one. "Peary," he said, "was a genius in exploration work with an uncanny instinct for direction. Undaunted of purpose, nothing was an obstacle. A little instance of this, Mr. Davidson gave in his humourous story of the burro which had been taken along for certain important preliminary transport work. Upon this animal rested the burden of getting supplies to a certain point four miles from the base. It refused to work and proved stubborn. Several days were lost while man after man in the party tried to get the burro to move. Forced finally to give up, they told the commander. Peary looked surprised and said quietly: "Why, the burro *must* go; he must haul the load. The expedition cannot be held up because the burro refuses to go. I'll see what I can do." Mr. Davidson said the whole party followed the commander when he visited the burro. Gently, but firmly, Peary talked to the animal with an axe handle and then proceeded, personally, to pilot him the four miles hauling the load. There was no further trouble with the burro.

Sault Ste. Marie Branch

W. S. Wilson, A.M.E.I.C., Secretary-Treasurer.

A regular meeting of the Sault Ste. Marie Branch was held on Friday evening November 28th, 1924, following a dinner partaken of by fifteen members and guests at the Y.W.C.A.

The chairman extended to the visiting teachers a welcome on behalf of the branch and called on A. G. Burns, superintendent of the U. S. Weather Bureau at Sault Ste. Marie, Michigan, to give an address on the work of the bureau.

The Work of the U. S. Weather Bureau

Mr. Burns favoured the branch with a very comprehensive and illuminating address on his work, which is very important to all classes of people. Some of the more outstanding points may be noted:

The work of the bureau in preparing weather maps started in 1871. Information for these is gathered from Alaska to Florida and the Hawaiian Islands and observations are taken twice daily at all regular stations and forecasts are issued from central stations at Chicago, Denver, San Francisco, Portland (Oregon), Washington, and Boston.

Sault Ste. Marie is in the area tributary to Chicago. On the 28th, Mr. Burns heard from 46 stations by telegraph in code, including Edmonton, Seattle and New Orleans and this between the time of taking the observation, 8 a.m. eastern standard time, and 9 a.m.

Hurricanes are anticipated by watching closely the Cirrus clouds of the upper air from northwest to southeast, and are sometimes forecasted a week ahead. The celebrated storm at Galveston was forecasted. Forecasts of storms are published by storm signals and by

GEORGE KEEFER, Esq.
First President of the Welland Canal Company.
The Keefer family have, for four generations, been identified with engineering progress in Canada, and most of the country's undertakings have profited by their wide experience.

*An abstract of this paper appears on another page of this issue.

weather maps given to mariners. The forecast of heavy snowfall is given to the railroads and the snowplow crews are held in readiness. Cold snaps expected are published and the railroads and other parties interested are warned to protect perishable goods and fruit growers light fires and take other means to protect their orchards and groves. The forest service is warned of approaching high winds. Mr. Burns told how he assisted the local industrial and produce men and others by calling on the phone with the co-operation of the local exchange a list of 35 parties, requiring possibly a minute each giving a condensed summary of important changes impending. At Sault Ste. Marie the mean annual temperature is 39.2 F. and the mean annual precipitation, including snowfall reduced to the equivalent rainfall, is 29.98 inches over a period of 33 years. The ten year periods show considerable variation, 1889 to 1899, 33.93 inches, 1900 to 1909, 26.33 inches, and 1910 to 1919, 29.69 inches.

At the conclusion of the address a specially interesting discussion ensued and the cause of the extreme low temperatures at White River, Ont., and at Franz, Ont., were debated. The extreme variation in wind velocities between those noted at the local station and Whitefish Bay and the effects of the local topography were given. The velocities are nearly double the local observed velocities.

The superintending engineer of the ship canal, inquired as to the explanation of the phenomena of tidal waves occasionally observed in lake Superior, but Mr. Burns said that the occurrence had not been completely explained but was probably an accumulation of the effects of wind and pressure and other conditions. The disastrous storm of November 1913 was referred to and the unique combination of a storm from the West Indies moving up to lake Erie and then deflecting from the usual course and following northwesterly up the Great Lakes to meet a storm from the northwest, was described. The storms combined their force with tragic results.

The vote of thanks was moved by J. Hayes Jenkinson, A.M.E.I.C., and was seconded by R. S. McCormick, M.E.I.C., and carried with applause. Messrs C. Stenbol, M.E.I.C., and G. W. Holder, Jr.E.I.C., were appointed scrutineers to count the ballots for election of 1925 executive committee and requested to make their report at the annual meeting to be held December 19th. An important paper in two sections was announced for the December and January meetings to be given by F. Smallwood, M.E.I.C., by C. H. Speer, M.E.I.C., the chairman of the Papers Committee to whose efforts the addresses given by Messrs. Sherman and Burns of our sister city are due.

Winnipeg Branch

P. Burke-Gaffney, A.M.E.I.C., Secretary-Treasurer.
James Quail, A.M.E.I.C., Branch News Editor.

Winners of Students' Prizes

The regular meeting of the Winnipeg Branch was held in the Engineering Building of the University of Manitoba, on Thursday, December 4th, 1924. In the absence of the chairman, E. V. Caton, M.E.I.C., occupied the chair.

City of Winnipeg Steam Standby Plant*

Prof. Fetherstonhaugh introduced D. S. Young, a student of the University of Manitoba. Mr. Young had won the first prize for the best paper in the electrical section of the engineering division. The paper had been written as his yearly thesis. His subject was "Steam Standby Plant, City of Winnipeg Hydro-Electric System". Mr. Young developed his subject, which was illustrated by lantern slides as he proceeded, by considering:

(1) The economic advisability of the standby plant for its primary use as protection against failure of the plant or the transmission line at and from Point du Bois.
(2) The practicability of the standby plant as a unit in a system of plants for developing steam heat centrally and distributing over various areas of the city.
(3) The mechanical and electrical and steam developing equipment of the plant.

The chairman congratulated Mr. Young on behalf of the branch and wished him success. Discussion of Mr. Young's paper was taken part in by J. W. Sanger, A.M.E.I.C., W. M. Scott, M.E.I.C., J. Rocchetti M.E.I.C., and others. The direction of the discussion was dictated by the points raised and information given by J. W. Sanger, A.M.E.I.C., chief engineer of the City of Winnipeg Hydro-Electric System. Mr. Sanger complimented Mr. Young on the broad grasp of his subject that he evidently had and, too, on his familiarity with the details of the plant equipment and construction.

Mr. Sanger went on to say that the operation of the plant to burn pulverized coal containing more than 5 per cent moisture was being experimented with and that the expectation was that success would be achieved. The difficulty that was being met with at the present was in passing through, without drying, the pulverized lignite containing in excess of 25 per cent moisture. He expressed the belief, as was wished, that coal from the lowest grade lignite to the highest grade would soon be used. He drew attention to the fact that danger from firing in the drying process had to be guarded against when lignite of a low moisture content was subject to temperature of about 300 degrees F. Mr. Sanger also drew attention to the fact that a step in pre-heating water had been obviated and that engineering foresight had eliminated a danger point in operation that had not been provided against in part of the equipment by the manufacturers.

*Abstracts of these papers appear on another page of this issue.

Mechanical Grain Car Unloaders*

Prof. Fetherstonhaugh, following the discussion of Mr. Young's paper, introduced W. J. Reekie, winner of the prize for the second best thesis. Mr. Reekie's subject was "Mechanical Grain Car Unloaders". Mr. Reekie had gathered the information on which his paper was based while at work on the construction of a government grain elevator at Edmonton. His paper, too, was illustrated by slides. The discussion that followed Mr. Reekie's paper provided him with an opportunity that he demonstrated himself as being very capable of handling. The members of the branch were not familiar with the mechanical details of a grain car unloader and asked questions freely. Mr. Reekie answered them all illustrating his answers by blackboard sketches. Mr. Reekie was heartily congratulated by the chairman. The discussion of Mr. Reekie's paper was taken part in by W. M. Scott, M.E.I.C., Mr. Barnes, Prof. Fetherstonhaugh, M.E.I.C., J. Rocchetti, M.E.I.C., and others.

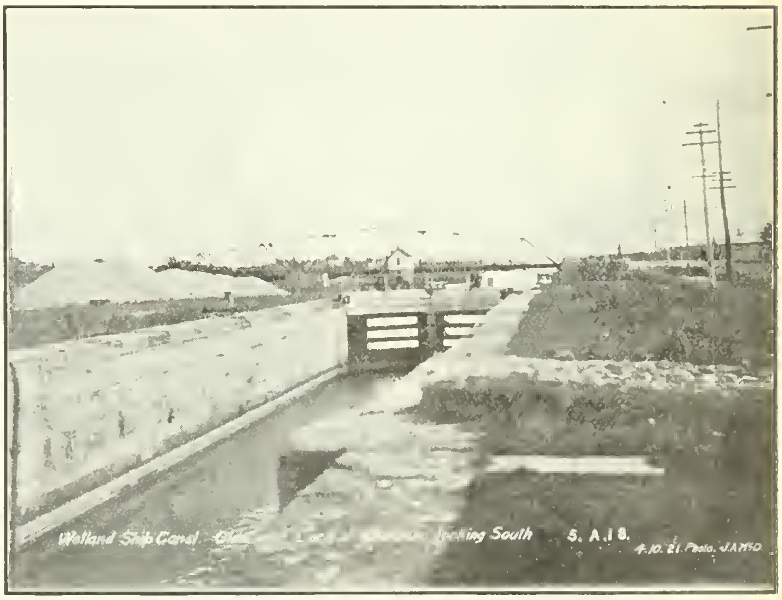
Mr. Bull, superintendent of utilities of the city of Regina was present as a visitor. Mr. Bull expressed his pleasure at being present. The chairman drew the attention of the meeting to the fact that Mr. Bull had been one of the earliest of the engineers in western Canada to demonstrate the value of western Canadian coal for steam purposes. The hope was expressed that Mr. Bull would contribute to the success of the experimental work that was now being carried out to demonstrate unqualified success of the burning of pulverized lignite.

Cape Breton Branch

D. W. J. Brown, Jr.E.I.C., Secretary-Treasurer.

On October 19th, we had the pleasure of a visit from Mr. Keith, who came officially to present the Cape Breton Branch with its charter on behalf of the President and Council.

The regular monthly meeting for October was held in the form of a dinner meeting, in the Vidal hotel. Twenty-eight members and five guests were present. After dinner Mr. Keith presented the charter with fitting ceremony, and it was accepted on behalf of the branch by the chairman, Mr. Mifflen. A. S. McNeil, president of the Nova Scotia Mining Society, and E. C. Hanrahan, secretary of the same society, each made a short address, in which they congratulated the members of *The Engineering Institute* in Cape Breton on the success of their local branch. Mr. McNeil stated that the Nova Scotia Mining Society was about to increase the number of meetings held annually, and he extended to our members an invitation to be present at these gatherings. In addition to presenting the charter, Mr. Keith delivered his very interesting illustrated address on the Wembley Exhibition. After a vote of thanks was tendered to the speaker the meeting adjourned.



Old Welland Canal Lock at Allanburg looking South, about the spot where the first sod was turned on November 30th, 1824.

During his visit arrangements were made whereby Mr. Keith was given an opportunity to inspect the operations of the Dominion Coal Company. He was conducted underground at No. 1-B colliery by A. L. Hay, A.M.E.I.C., assistant mining engineer of the company. This colliery is one of the best equipped on the continent. Coal is extracted from submarine areas, dropped or hoisted as the case may be from workings to main landings, from which it is taken to the shaft in trains of 50 to 60 cars (100 to 120 tons coal), by electric trolley locomotives.

Annual Meeting

The annual meeting for 1924 was held on the regular meeting night for December, Tuesday, the 9th. The first business to be attended to was counting the ballots for election of officers, the result being the election of S. C. Mifflen, A.M.E.I.C., for chairman, and W. C. Risley, M.E.I.C., and W. E. Clarke, M.E.I.C., for committee men. After the results of the ballot had been announced by the chairman, the annual report of the Branch Executive to the President and Council was read by the secretary, and adopted.

The speaker of the evening was E. L. Ganter, A.M.E.I.C., manager of the Sydney office of the Canadian General Electric Company, Ltd., the subject chosen by Mr. Ganter being "Radio Reception", with particular reference to the super-heterodyne receiver. The speaker outlined the principles upon which radio reception depends, and described the functions of the different instruments as used in various circuits. The principal circuits used in radio reception were described and illustrated by lantern slide diagrams. After reading his paper and answering the questions of the members, Mr. Ganter demonstrated the use of the super-heterodyne using a six tube Radiola with loud speaker and an indoor loop aerial.

The next meeting of the Cape Breton Branch will be held on Tuesday, January 6th, at which C. H. Wright, M.E.I.C., chairman of the Halifax Branch, will deliver an illustrated paper on the use of electricity in the mining industry.

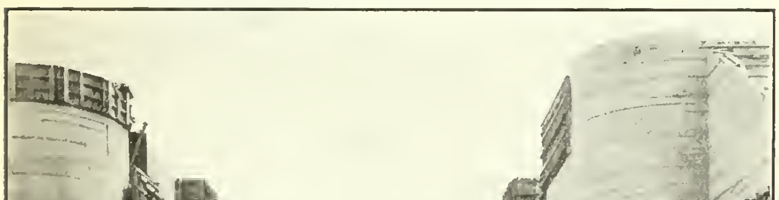
St. John Branch

W. J. Johnston, A.M.E.I.C., Secretary-Treasurer.

Tests for Vocational Selection and Guidance

"Tests for Vocational Selection and Guidance" was the title of an address delivered by Dr. G. J. Trueman, president of Mount Allison University, before the members of the St. John Branch, on the evening of December 11th, 1924. On invitation from the branch the members of the Character Analysis Club of St. John attended in a body and found the subject very interesting, as the subject was a study in psychology similar to the studies of the club. This Character Analysis Club, with membership of forty-odd members, was organized here in September last following a course on character analysis and business psychology by Prof. Edward Lee Hawk of Chicago.

At different times tests have been devised in the attempt to find a person's fitness for a particular kind of work or branch of study. The matter is not easy at the outset and is complicated by the personal equation of the examiner, as pointed out by the speaker in the case of twenty-eight different examiners in marking a Latin examination paper awarded marks ranging from 45 to 100.



Welland Ship Canal, Lock No. 2, looking South.
First work on this Canal commenced October 3rd, 1913.

A series of tests have been devised to test the efficiency of school children, and in an enlarged scale is also used in colleges. A set of tests have been devised for each age. If a seven-year old child just succeeds in passing the seven-year old test correctly he is said to be of average ability, his mental corresponds with his actual age, and his intelligence quotient is 7 divided by 7; or should he test 7 when his actual age is 10, his intelligence quotient is his mental age divided by his actual age, 7 divided by 10, or 0.7. If he tests 14.4 when his actual age is 12 he is well above the average, 14.4 divided by 12, with intelligence quotient of 1.2. Multiply by 100 to clear of decimals, and in the first case he was normal with intelligence quotient of 100, in the second case with 70 he was below normal, and when it was 120 he was above normal.

The Barr scale, drawn up by 20 scientists, provides for placing a person in five grades with intelligence quotient ranging from 140, in the case of an inventive genius of the Edison type, to zero in the case of the "hobo". The speaker humourously qualified the latter rating by stating he believed it took considerable brains on the part of a hobo to live without working.

During the Great War about 1,800,000 men in the United States army were given tests to determine their fitness for particular jobs. These tests were given in groups and became known as the Alpha and Beta tests, the Alpha for men who could read and write, and the Beta for illiterates. Good results have been claimed for these tests. They were particularly useful in picking competent shell inspectors.

Three kinds of tests are necessary to properly measure a person's capacity. Abstract intelligence as found by some form of tests previously described; mechanical intelligence, or the ability to handle tools and use one's hands; social intelligence, as tact, perseverance, ambition. Such qualities as tact, perseverance, ambition cannot be properly guaged, and a person with low rating by other tests may overcome many obstacles by the exercise of these qualities. In addition to a person's intelligence tests it was necessary to know the school record, medical examination record, tastes and dislikes, and other un-related data in predicting a person's fitness for a particular kind of work.

Studies along these lines were carried on in France between 1900 and 1912 by a psychologist and a medical doctor resulting in a series of tests known as the Binet-Simon tests. In the United States the Thurston engineering tests are now given to engineering students in a number of the colleges. Other tests under different names are now in use in different countries with a view of placing the right man in the job for which he is fitted, thereby cutting down the "labour turnover". The speaker urged the necessity for some system in the hiring of help, citing in contrast the method as described by a foreman in hiring men, "On Monday I turns down all men with white collars; on Tuesdays, all with blue eyes; Wednesdays, all with dark eyes; red-headed men I never hires, and there do be days when I has a grouch and hires every tenth man".

At the close of the address Dr. Trueman answered a number of questions from persons in the audience. G. G. Hare, M.E.I.C., chairman of the branch, presided at the meeting, and extended a vote of thanks on motion of W. R. Pearce, M.E.I.C., and J. N. Flood, A.M.E.I.C.

Saskatchewan Branch

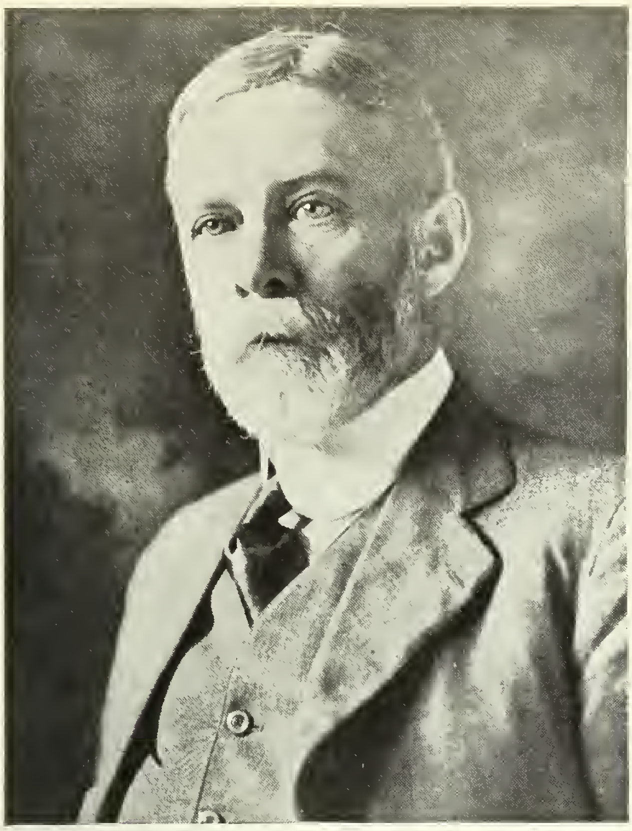
J. W. D. Farrell, A.M.E.I.C., Secretary-Treasurer.

The regular meeting of the Saskatchewan Branch was held on November 27th, at the dining room of the Parliament Buildings and was preceded by a dinner. Vice-Chairman Blackburn presided. After disposing of a few business items, the chairman called on P. C. Perry, A.M.E.I.C., for his paper on "Railway Maintenance Problems".

Railway Maintenance Problems

Mr. Perry introduced his paper by reading a letter from a section foreman which showed that the survival of the fittest was a basic principle in certain very active circumstances. As instancing the size of the maintenance work the speaker reported that the Canadian railways spend over $80,000,000.00 per year on maintenance of way and structures. In the Regina division of the Canadian National Railways, the yearly expenditure under this head is approximately $900,000.00. Owing to conditions prevailing where new lines are opened, much maintenance work is really of a capital nature. The problem of keeping expenditures within their allowed appropriation and at the same time keeping the properties in a safe condition is perhaps the critical problem for the engineer engaged on maintenance. Mr. Perry developed his paper under the following headings: — Road bed and track, bridges and culverts, buildings, miscellaneous. In each case the practices followed were clearly described and discussed. The question of materials and treatment of cross ties, weight of track steel and track fastenings received particular elaboration. The organization or human side of the question was also given in suitable detail.

A discussion of the paper was very ably led by Messrs. deStein and Lewis and centred on such topics as comparison of practices of different railways as to state of road bed when put into operation, rail chairs, steel ties, treated ties, tie plates, placing of ballast and culverts.



A. J. GRANT, M.E.I.C.,
Chief Engineer of New Welland Ship Canal.

The Hudson Bay Route*

At the December meeting of the branch which was held on December 11th, Vice-Chairman Blackburn presided. Following the dinner, some matters of routine business were disposed of, including a report on the standing required for admission to *The Institute*. It was decided that this report should receive very thorough discussion at a later meeting. The chairman then called on Lieut.-Col. Garner, M.E.I.C., for his paper on the Hudson Bay Route.

H. S. Carpenter, M.E.I.C., led the discussion and in general concurred in the findings of the paper. In his discussion Mr. Carpenter made several references to a paper on the same subject by F. W. Cowie, M.E.I.C., consulting engineer to the Montreal Harbour Commissioners.

T. M. Molloy, Branch Affiliate, while thoroughly in sympathy with the project, wanted to know if opening cheap transportation into the country, wanted to know if opening cheap transportation into the country might not deter the growth of industries in western Canada; for instance, Welsh coal might supplant Alberta coal and the influx of cheap manufactured goods from Europe prevent the growth of industry here.

J. H. Chown, remarked that there is at present not enough business to keep the two existing railways busy throughout the year. He believed that if both railways could work their plant to capacity, considerable reductions could be made in freight rates. He also questioned whether any advantage in rates could be obtained by the Bay Route if shipping had to come in light.

M. B. Weekes, A.M.E.I.C., forecasted that in the near future both the C.P.R. and the C.N.R. would have terminals on the bay and said that the race was now on.

Ottawa Branch

F. C. C. Lynch, A.M.E.I.C., Secretary-Treasurer.

Another notable contribution to the series of instructive and entertaining addresses given in Ottawa by prominent scientists and professional men who have this year visited Europe and the Empire Exhibition at Wembley was made by Noel J. Ogilvie, M.E.I.C., D.L.S., director of the Geodetic Survey of Canada, to the Ottawa Branch at a luncheon held at the Chateau Laurier, November 11th, 1924.

There was a large attendance which included several distinguished guests who were all keenly interested. Mr. Ogilvie was the Canadian delegate to the second general conference of the International Union of Geodesy and Geophysics, which was held in October at Madrid, Spain. Thirty-one countries were represented at this convention and Mr. Ogilvie was able to report that all the representatives showed the greatest interest in what Canadian engineers were doing to meet the difficulties of the problems facing them and that universal praise was bestowed on the work of Canadian scientists and engineers.

Mr. Ogilvie dealt with a few of the technical aspects of his mission, but those of his audience who were not engineers, enjoyed his talk as he interspersed it with eloquent descriptions of the scenery and picturesqueness of the countries which he had visited, with an occasional humourous anecdote couched in witty terms.

When referring to the principal technical achievements of the convention, Mr. Ogilvie particularly mentioned the reading of a paper on the Gulf Stream, which was unanimously voted to be one of the outstanding contributions on geography. The paper was read by Admiral Sir John Perry, and was prepared by an Ottawan, Dr. W. Bell Dawson, M.E.I.C., whose name, Mr. Ogilvie said, was a byword in every country as one of the greatest authorities living on tides and currents.

At the conclusion of his talk, Mr. Ogilvie had some interesting lantern slides, taken in Spain, thrown on the screen, and these were greatly enjoyed.

The chairman of the branch, J. L. Rannie, M.E.I.C., was in the chair, and he thanked the speaker for his splendid address. Among those at the head table were: J. L. Rannie, M.E.I.C., Noel Ogilvie, M.E.I.C., Hon. Charles Stewart, Hon. James Murdock, J. B. Hunter, deputy minister of Public Works; Dr. Charles Camsell, M.E.I.C., deputy minister of Mines; R. R. Farrow, deputy minister of Customs; Hon. W. J. Roche, Clarence Jameson and William Foran, of the Civil Service Commission; General MacBrien, Department of National Defence; Dr. W. H. Collins, director of Geological Survey; R. A. Gibson, assistant deputy minister of Interior; J. M. Roberts, secretary of the Interior Department; A. L. Sauvé, passenger agent of the Canadian Pacific Railway; Dr. W. Bell Dawson, M.E.I.C., and J. A. Wilson, A.M.E.I.C., secretary of the Air Board.

Sodium Silicate and Its Industrial Applications*

The Ottawa Branch and the Society of Chemical Industry were favoured with a splendid illustrated address on "Sodium Silicate" and its industrial applications by E. T. Sterne, B.Sc., in the Victoria Memorial Museum, on Wednesday night, November 26th. Dr. A. McIntyre, chairman of the Society of Chemical Industry, was in the chair.

Toronto Branch

J. H. Curzon, A.M.E.I.C., Secretary-Treasurer.
J. A. Knight, A.M.E.I.C., Branch News Editor.

Engineering Education

On the evening of November 17th, the Toronto Branch joined with the other engineering societies of the city in a joint meeting, the speaker being W. E. Wickenden, of the Society for the Promotion of Engineering Education, his subject being "Engineering Education". Mr. Wickenden is not unknown to members of *The Institute*, who will look forward with pleasure to future opportunities to listen to this very interesting speaker.

Standards

R. J. Durley, M.E.I.C., secretary of the Canadian Engineering Standards Association, regaled the meeting on November 27th, with some surprising details of standardization covering the subject from standard specifications for steel bridges to the standardization of bed springs. The question was raised as to the official standing of the Imperial gallon which some American engineers claimed was never officially described. As Mr. Durley did not have this information at hand he promised to investigate and later forwarded to the branch a list of acts of both the Imperial and the Canadian parliaments, all of which proved that our gallon is perfectly standardized.

Branch Smoker

Engineers sometimes relax, and the Toronto Branch is no exception to this rule. Each year Prof. Tommy Louden and his boys from the "School" provide the entertainment, ably assisted by our old friend and adviser the general secretary. Such a combination cannot fail to induce the required relaxation and members of the branch to the number of about one hundred report a very happy evening at Hart House, on December 4th.

Mexico and Its Volcanoes

Professor A. P. Coleman requires no introduction to *The Institute*, and any branch that can report a meeting addressed by him is to be envied. The Toronto Branch turned out in large numbers to hear Professor Coleman on December 11th, and they were not disappointed. After listening for an hour which seemed like ten minutes, we all decided that aside from political upheavals, and upheavals of the earth's crust, Mexico would be a very pleasant spot to spend a holiday.

City Bridges

On December 18th, Thomas Taylor, C.E., M.E.I.C., gave a paper on "City Bridges" which was instructive and interesting, and promoted considerable discussion. Mr. Taylor dealt with four styles: park,

*Abstracts of these papers appear on another page of this issue.

subway, viaduct and roadway bridges. He stressed the fact that a bridge is often improved if the engineer calls in an architect to assist in the exterior design, while he himself attends to the structural features. Mr. Taylor showed slides to illustrate weaknesses which had been located in bridge design, particularly with reference to expansion, drainage and settlement.

Calgary Branch

G. P. F. Boese, A.M.E.I.C., Secretary-Treasurer.
W. St. J. Miller, A.M.E.I.C., Branch News Editor.

Central Heating for Business Communities

"Central heating for business communities" was the subject of the first paper of the season presented to the branch on November 14th. President R. S. Trowsdale, A.M.E.I.C., was in the chair. The author, W. B. Trotter, A.M.E.I.C., delivered a most interesting address the subject of which is, or at any rate should be, a very live one. Statistics quoted proved conclusively the advantages of such a system of heating, and wherever installations existed in the States the promoters had met with success. Initial cost of installing a central plant was, of course, the chief drawback, combined with the necessity of having to tear out existing plants. This latter can be somewhat offset if the plant can be sold to advantage.

As far as Calgary went, he would not advocate such a system to extend beyond the business sections, and he gave figures to substantiate his contention that plants on a small scale could advantageously be run connecting up several of the large buildings. The reduction of firemen's and engineers' wages was a consideration not to be overlooked.

Several slides were thrown on the screen giving views of existing systems and plans of layouts along streets, pointing out necessary booster supply pipes in long runs of mains. Also various forms of expansion joints were shown.

Mr. Trotter is to be congratulated on the preparation of a most useful paper which opened the eyes of those present to the actual possibility of the adoption of such a system in a city of our size. He went on to tell how high pressure steam was reduced at the building apparently much in the same manner as electricity is stepped down through transformers, and he advocated pipe lines being laid along lanes whenever possible.

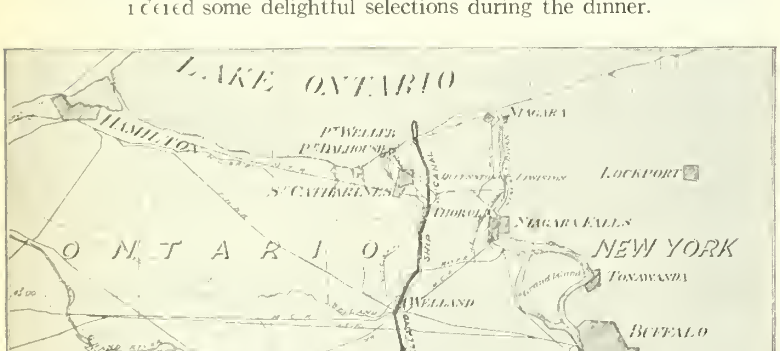
R. M. Dingwall, A.M.E.I.C., opened the discussion by relating how he had gone quite exhaustively into the matter of central heating in Calgary some time ago, and gave results of his investigations. He had mapped out the areas most suited to be served by a central installation. A. G. Graves, Affiliate, spoke of the congestion already existing in lanes of this city, as in others, and suggested that pipes might be laid through the basements of buildings and tapped as required.

A hearty vote of thanks was accorded the speaker, and the chairman expressed appreciation of the endeavours of Mr. Trotter as an expert to bring this subject before the public as he has done on more than one occasion.

At this meeting six names of members were drawn against six subjects for addresses relating to industries in Calgary. The object was to permit members who had never previously read a paper, an opportunity to show what they could do in this respect. A time limit for each paper was set, and ten days allowed to prepare statistics and get together any available data in connection with each industry.

Calgary's Industries

On November 24th the branch assembled at dinner, following which the results of the above mentioned draw were presented. Community singing was indulged in accompanied by a stringed trio who rendered some delightful selections during the dinner.



Map of the Survey of the New Welland Ship Canal.

The first victim, — shall we say! — was A. S. Chapman, A.M.E.I.C., who had drawn as his subject "Packing Plants". He certainly treated his subject well and got in an enormous amount of description and information in the short time allowed. The plant he visited covered a large area and he took his hearers through in considerable detail, ending up with the remark that they used every part possible of the cattle and hogs, excepting only the squeal, which they were endeavouring to also turn to some advantage!

R. M. Dingwall, A.M.E.I.C., digressed slightly from his subject of the "Leather Industry" in Calgary, in that he amused his hearers by relating his first experience with, or introduction to, the leather industry as a small boy at the hand of a somewhat stern though loving parent! However, he gave some general information relative to this Calgary industry.

R. L. Dunsmore, A.M.E.I.C., came next with a thoroughly practical description of the plant and operation of the Imperial Oil Company's refinery in East Calgary. Whilst of a technical nature his talk was readily comprehended by those present and he gave facts concerning the efficiency and successful operation at the plant that were eye-openers indeed. This paper though necessarily short was itself worthy of an evening's discussion.

Thos. Lees, A.M.E.I.C., who took the place of Col. W. S. Fetherstonhaugh, M.E.I.C., unavoidably absent, read some notes on railroad interests in Calgary. He referred in detail to the very large local payroll of the C.P.R., and the extensive trackage facilities to accommodate this huge business which, he claimed, was second to none in Calgary. He carefully enumerated the numbers of locomotives in the yards and serving the through traffic, the numbers of light overhauls and thorough overhauls of locomotives, freight, and passenger cars, and the amount of money put into circulation in the division. All these statistics proved of considerable interest and we are indebted to Mr. Lees for some valuable facts that perhaps many of us never had any conception of before.

R. C. Harris, A.M.E.I.C., followed Mr. Lees with a report on the local lumber industry, and emphasized the fact that pretty nearly every conceivable product could be turned out in our city in the woodworking line. He referred to the extensive machinery equipment at some of the larger sash and door factories, and indirectly reminded those present that they would not have to go beyond the local market when they were in need of a casket, as this product was by no means the least important one manufactured in our midst. The Calgary wood preserving plant was touched upon and the various methods employed were described in a general way.

Last but by no means least as a contribution to the evening's enjoyment came A. G. Willson, A.M.E.I.C., who had drawn a subject that apparently he was well fitted to talk upon, namely machine shop practice and acetylene welding plants in Calgary. His fluency with the subject convinced the members that it was one of which he knew not a little. His references to iron foundry work, precise machine-working tools, and the oxy-acetylene product and apparatus proved his ability to handle this somewhat wide subject. The importance of Calgary as a supply centre for liquid air came as a surprise. The speaker got through a mass of extremely interesting notes in the time available.

This last paper concluded an evening that proved a decided success, the results certainly justifying the experiment, for such it was, and it is to be hoped that other evenings of a like nature may be arranged in future.

P. Turner Bone, M.E.I.C., elected Alderman in Calgary

It is with considerable pleasure that we are able to announce the election of P. Turner Bone, M.E.I.C., as an alderman of the city of Calgary. Mr. Bone has been a member of *The Institute* for the last ten years. It may be remembered that both Major Walkem and Mayor Webster at a recent meeting of the branch strongly advocated that more engineers should enter public life. We are also gratified that an Affiliate, in the person of A. G. Graves, has been returned for a third term as one of the commissioners of this city.

Moncton Branch

M. J. Murphy, A.M.E.I.C., Secretary-Treasurer.

On the occasion of the first supper meeting of the season, held on December 9th, at the "Barker House", the branch was addressed by Geo. J. Trueman, Ph.D., president of Mount Allison University, the subject being "Psychology as applied to the employment of men". Dr. Trueman dwelt particularly on the use of psychological tests as an aid to the young man in the choice of a profession, and to the employer in hiring men to work for him. The speaker prefaced his remarks by emphasizing the difficulty of devising tests that are a measure of a man's intelligence and ability, and can, at the same time, be applied by different examiners with little variation in results.

In applying vocational tests, it is necessary to make a careful study of the various trades and professions, to see what kind of ability is required in their successful prosecution. What is known as the Barr scale, divides some 122 vocations, according to their degree of difficulty, into five classes. A general intelligence examination indicates the class from which the student may choose his profession. A further detailed study of his educational and intellectual qualifications, his inclinations and ambitions, will point out with a considerable degree of accuracy, the calling to which he is best adapted. For instance, the engineering student should have a fondness for mathematics; he must be mentally alert, accurate, and thorough.

Many ingenious trade tests are used by employers in selecting men for different kinds of work; in general, they are such as may be applied by any intelligent examiner, not necessarily familiar with the trade, and yield a rating independent of the examiner's individual judgment.

Furthermore, they are rapid and usually do not require the use of tools. In the case of an oral examination, the examiner is supplied with a sheet of questions and answers, the process of rating being reduced to one of mere routine. Written examinations may consist of questions, each followed by several answers, only one of which is correct. This one, the applicant is supposed to underline. For an occupation requiring a special physical or mental qualification, such as dexterity, speed, steadiness, good eyesight, etc., simple tests are used embodying the required qualification.

In conclusion, Dr. Trueman stated that while the construction and application of tests for placement purposes and vocational guidance are not out of the experimental stage, they are already of considerable value, and the prospect of a further development is hopeful.

Merger of Combustion Engineering and Canadian Vickers

A merger of far reaching significance to the engineering and industrial activities of Canada is apparent in the consolidation in Canada between Vickers Limited, and their subsidiary companies of Great Britain, and the Combustion Engineering Corporation Limited, a Canadian firm in the steam power plant field, and representing the Canadian interests of the International Combustion Engineering Corporation.

Under the consolidation which takes effect by the formation of a new company, known as Vickers and Combustion Engineering Limited, with established offices in Montreal, Toronto, Winnipeg, and Vancouver, the entire business of the Combustion Engineering Corporation Limited and of its parent company, the International Combustion Engineering Corporation of New York, and the Canadian Sales Agency of Vickers Limited and their subsidiary companies, along with the sales of the Industrial Department of Canadian Vickers of Montreal comes under one executive control.

Vickers & Combustion Engineering Limited will cover the range of engineering work in the Dominion, embracing steam power plants, by which is meant complete units, including both construction and equipment, hydraulic power plants, large Diesel oil engine installations, mining and general machinery, pulverized coal equipment, automatic stokers, boilers, turbines, both water and steam, oil engines and all types of prime movers.

Two entirely new lines of equipment in Canada are introduced by this amalgamation, namely the Ruths Steam Accumulator, a Swedish invention, which Vickers and International have had their engineers investigating since early in the spring, and which is said to be of importance to all heat-using industries, and the Nordstrom Waste Wood Refuse Dryer, which has also been under observation and investigation since early in the summer. This dryer is of special importance to the paper and saw mill industry, and for that reason is of particular interest in Canada. A further new line that is added to the equipment offered by the amalgamated companies are electric boilers for steam generation, which will form an important part of its activities.

The new company will carry on, on a more extensive scale than heretofore, the work done by both Canadian Vickers and Combustion Engineering Corporation in plant design and in contact and collaboration with consulting engineers in Canada, Great Britain and the States, with the underlying thought that Canadian power developments shall embrace the best thought and practice, both in Great Britain and the States.

The new company will have associated with it the manufacturing plants of Canadian Vickers in Montreal and the advantages of the splendid manufacturing facilities of these works. It will also have the manufacturing facilities and association of the many large manufacturing works of Vickers Limited in England, with the benefit of the joint engineering ability of International Combustion Engineering Corporation, New York, and its associated companies in London England, Berlin and Paris, together with the engineering experience of Vickers Limited, England, and its associated companies.

The personnel of the company will be largely composed of Canadian engineers. The strength of the Board of the new amalgamated company is indicated by the following make-up: — Commander Sir A. Trevor Dawson, Bart. R.N., Chairman; George E. Learnard, President of International Combustion Engineering Corporation, Vice-Chairman; A. J. T. Taylor, President of Combustion Engineering Corporation Ltd., President and Chief Executive Officer; A. R. Gillham, President Canadian Vickers, First Vice-President; J. V. Santry, President Combustion Engineering Corporation, New York, Vice-President; W. Hamilton Munro, Chief Hydraulic Engineer, Vickers Ltd., Barrow-in-Furness, Director; John Anderson, Secretary-Treasurer and Director; The solicitor for the company: Mr. John Jennings, K.C., Toronto; Bankers: Royal Bank of Canada; Auditors: Deloitte, Plender & Griffiths.

ANNOUNCEMENT OF MEETINGS

Further information may be secured from the secretaries of the various branches, whose addresses may be found under "Officers of Branches" on page 2 of *The Journal.*

WINNIPEG BRANCH:—

Secretary-Treasurer, P. Burke-Gaffney, A.M.E.I.C.

Jan. 8th. Address on "Mining in Manitoba", by Prof. DeLury, of the University of Manitoba.
Jan. 22nd. Address on "Manufacture and Uses of Industrial Alcohol", by C. D. Lill, Esq., Canadian Industrial Alcohol Company.
Feb. 5th. Address on "Railway Water Supply", by C. H. Fox, M.E.I.C., Canadian Pacific Railway Company.
Feb. 19th. Address on "Hot Treatment of Loco. Steels, Showing Application of Micro Photography", by James Gilcrist, and A. C. Turtle, A.M.E.I.C., Canadian Pacific Railway Company.
Mar. 4th. Address on "Steam Storage and Steam Accumulators", by A. J. T. Taylor, Combustion Engineering Corporation, Toronto, Ont.
Mar. 18th. Address on "New Koppers Gas Plant", by Hugh McNair, Winnipeg Electric Railway.
April 1st. Address on "Central Steam Heating", by N. W. Calvert, and J. W. Sanger, A.M.E.I.C.
April 15th. Address on "Application of Compressed Air to Industry", (Moving Picture). Ingersoll-Rand Company.
May 6th. Annual Meeting — Report of Committees.

LONDON BRANCH:—

Secretary-Treasurer, E. A. Gray, A.M.E.I.C.

Jan. 21st. Annual Dinner. Geo. Hogarth, O.L.S., M.E.I.C., Toronto, Ont. Address on a Subject Related to Provincial Highways.
Feb. 18th. Presentation of Branch Charter, by Vice-President, J. B. Challies, C.E., M.E.I.C.

ST. JOHN BRANCH:—

Secretary-Treasurer, W. J. Johnston, A.M.E.I.C.

Jan. 15th. Address by R. H. Macdonald, Vice-President, Ross and Macdonald, Inc., on "The Admiral Beatty Hotel".
Feb. 19th. Address by E. G. Evans, M.E.I.C., on "The Teredo".
Mar. 19th. Address by H. G. Acres, D.Sc., M.E.I.C., on "Deterioration of Turbine Runners".
April 16th. Address by H. O. McInerney, K.C., on "Law of Contracts as it Affects Engineers".

Details of Dates and Subjects to be announced later:—

A visit to the Admiral Beatty Hotel. under the direction of John B. Stirling, A.M.E.I.C.
Illustrated Lecture, "The Mount Royal Hotel", by Walter J. Armstrong, M.E.I.C.
Address on "Engineering Education" by W. E. Wickenden, Society for the Promotion of Engineering Education.
Address by Prof. Hammond, Polytechnique Institute, Brooklyn, N.Y.
A meeting during the winter to be held at Fredericton, N.B.

CALGARY BRANCH:—

Secretary-Treasurer, G. P. F. Boese, A.M.E.I.C.

Jan. 12th. Annual Dinner (Programme Brooks Members).
Jan. 26th. Address by C. A. Davidson, Esq., Provincial Highway Engineer.
Feb. 9th. Address by Prof. W. G. Worcester, M.E.I.C., Professor of Ceramics, University of Saskatchewan, Saskatoon, Sask.
Feb. 23rd. East Kootenay Power.
Mar. 9th. Annual Meeting.
Mar. 23rd. Prize Competition.

VICTORIA BRANCH:—

Secretary-Treasurer, E. P. Girdwood, M.E.I.C.

Jan. 14th. Address on "World Power Conference and Impressions of Scandinavia", by E. A. Cleveland, M.E.I.C., Comptroller of Water Rights, Dept. of Lands, B.C.
Feb. 11th. Discussion on "Bridges of British Columbia", by A. L. Carruthers, M.E.I.C., Dept. of Public Works, B.C.
Address on "Grain Elevators, and Grain Elevator Construction" (illustrated), by E. F. Carter, M.E.I.C.
Feb. 19th. Address on "Manufacture of Pulp and Paper", by Robert Bell-Irving, A.M.E.I.C.
Address on "Dominion Drydock", by J. P. Forde, M.E.I.C.

CORRESPONDENCE

Transportation as Related to National Development.

The Editor,
The Engineering Journal,
Dear Sir:—

In reading *The Engineering Journal* for December I find an interesting article by Mr. J. G. Sullivan, M.E.I.C., on "Transportation as related to National Development".

In all he says I quite agree, but there is one small error in his table No. 2, which, without in the slightest degree, wishing to detract from the credit due him for so ably expressing himself on this subject, I may be permitted to correct.

Construction work in *Manitoba* on the Canadian Pacific Railway began in June 1875; at the same time it was commenced at Port Arthur westward, also in British Columbia near the Pacific coast.

When the "Syndicate", so-called then, took over the whole enterprise from the government on May 1st, 1881, there was in Manitoba a length of 215 miles (approximately) of railway in operation. *Viz.*

St. Boniface to Emerson	60 miles
St. Boniface to East Selkirk	22 "
East Selkirk to Rat Portage	114 "
and the Stonewall Branch	18 "
	214 "

This was being operated for the government with a mixed freight and passenger service under Superintendent T. J. Linskey, although, as yet, there was no bridge connecting St. Boniface and Winnipeg, the intention originally being that the main line of the railway would cross the Red river at Selkirk.

On May 1st, 1881, A. B. Stickney, general manager; J. M. Egan, superintendent; J. G. Ogden, auditor; Joel May, master mechanic; with General Rosser, chief engineer, arrived in Winnipeg and took over on behalf of the "Syndicate" all the work completed and uncompleted from Port Arthur westward. In 1882, Mr. Van Horne succeeded A. B. Stickney.

It certainly was in 1881 that "construction" started forward, with a rush.

H. W. D. Armstrong, M.E.I.C.

The Report of the Institute Fuel Committee

November 8th, 1924.

The Editor,
The Engineering Journal,
Dear Sir:

I have been following with interest the reports of *The Institute* Fuel Committee and have just read the full report as published in your issue of November.

I am astonished to note that no reference has been made in this report to the use of fuel oil as a substitute for coal, particularly in so far as domestic heating is concerned, where anthracite coal has been normally used in the past. The Montreal Branch Committee went into this matter very fully and made a report which showed oil in favourable comparison with other fuels, and I cannot understand why the matter has been neglected entirely in the final report. It is impossible to overlook the fact that in Toronto alone nearly five million gallons of fuel oil is being burned to-day, mainly for domestic heating. This means the replacement of between thirty and forty thousand tons of American anthracite. Many of the installations using this fuel oil have been in operation from four to nine years, and results have been unquestionably satisfactory, and the reason that they have been satisfactory is mainly because the oil has been burned in suitable equipment.

I am sure that those of us, like myself, who are devoting the whole of their time and energy in an industry that is leading to the solution of the fuel problem, particularly in Ontario and Quebec must feel very keenly indeed the lack of recognition of their efforts, and the failure to appreciate the importance of the developments that are occurring.

It is surprising to me to note, and I do so now for the first time, that the Fuel Committee does not appear to have a single member connected in any way with the fuel oil burning industry, at least in so far as domestic work is concerned. This, perhaps, may be an explanation of the situation, although this is hard to understand in view of the report issued by the Montreal Branch Committee.

Yours very truly,

Lionel Jacobs, A.M.E.I.C.

The Editor, November 26th, 1924.
The Engineering Journal,
Dear Sir:

The attention of the Fuel Committee has been drawn to a letter from Mr. Lionel Jacobs dated November 8th, in which he calls attention to the fact that in their final report the Fuel Committee of *The Institute* did not discuss the question of fuel oil. On behalf of the Fuel Committee may I submit one or two comments.

The main Fuel Committee attempted to deal with the problem of fuel for Canada as a whole, and consequently devoted the major portion of their attention to coal which is unquestionably the principal fuel for Canada either at present or the not distant future. Under these circumstances the Fuel Committee of *The Institute* felt that the question of fuel oil as available in the different localities should be dealt with by the branch fuel committees, and to that end suggested to them the suitability of such activity. (See page 678 November *Journal.*) As an example of the carrying out of this policy, the Montreal Branch Fuel Committee went very sympathetically into the question of fuel oil, and Mr. Jacobs calls attention to the value of their report thereon.

Coming next to Mr. Jacobs' remarks about the personnel of *The Institute's* Fuel Committee, the writer would point out that in view of the policy above referred to it may be noted that the fuel oil interests were directly represented on the personnel of the Montreal Branch Fuel Committee. It may also be noted that the chairman of the Montreal Branch Committee became the chairman of the main Committee and was therefore in a position to transmit the views and opinions expressed.

The writer trusts that the foregoing observations will make clear the reasons why fuel oil was not specifically mentioned in the final report. In closing the thanks of the Committee should be extended to Mr. Jacobs for his very courteous criticism and suggestion.

On behalf of the Committee,

Very truly yours,

Lesslie R. Thomson, M.E.I.C.

Hydraulic Efficiency Tests

November 24th, 1924.

The Editor,
The Engineering Journal,
Dear Sir:

The paper by W. R. Way, Jr.E.I.C., in the October issue of *The Journal* was followed by a letter of discussion in the November issue from Mr. H. B. Muckleston, M.E.I.C. In the latter certain conclusions are reached based on a serious error on the part of Mr. Muckleston that cannot be allowed to pass without comment.

The statement in Mr. Muckleston's letter which is incorrect in his application thereof is,—

> "Practically all hydrodynamic theory is based on the hypothesis that the kinetic energy of a stream is proportional to $\frac{v^2}{2g}$ where v is the mean forward velocity."

No one will question this statement unless it is by way of changing the words "Practically all" to "much". The error in the application however is the assumption that the "Gibson method for measuring the flow of water" depends on this principle. Had Mr. Muckleston read Mr. Way's paper at all carefully he would have found therein this statement, viz. "The basic principle of this method is found in Newton's second law of motion, which states that 'Change of momentum is proportional to the impressed force ————' ". The method then depends on the first power of the velocity and any variation in velocity from point to point on the cross-section of the conduit in which the flow is being measured by the Gibson method does not affect the accuracy of the method at all, the principle being rigidly true for the actual conditions in the conduit.

There are thus no "defects in theory" in the Gibson method, and the chances for systematic error of magnitude are more imaginary than real. The calibrations and measurements in which systematic errors might occur are made under laboratory conditions, and errors of this kind become very small. For example, three calibrations of the same glass tube and riser were made by the writer and another observer and of these one differed from the mean by one tenth of one per cent and two by one twentieth of one per cent.

It is regrettable that Mr. Muckleston should not examine the information before him carefully before submitting a criticism so unjustifiable. His standing in the profession adds weight to any statement he might make which should, therefore, be carefully considered before being given out. With so complete an explanation of the theory of the method before him, his mistake was quite inexcusable.

Yours truly,

J. J. Traill, A.M.E.I.C.

Preliminary Notice

of Applications for Admission and for Transfer

December 20th, 1924.

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in January 1925.

FRASER S. KEITH, Secretary.

*The professional requirements are as follows:—

A Member shall be at least thirty-five years of age, and shall have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office, or a term of instruction in a school of engineering recognized by the council. The term of twelve years may, at the discretion of the council, be reduced to ten years in the case of a candidate for election who has graduated from a school of engineering recognized by the council. In every case the candidate shall have held a position in which he had responsible charge for at least five years as an engineer qualified to design, direct or report on engineering projects. The occupancy of a chair as a professor in a faculty of applied science or engineering, after the candidate has attained the age of thirty years, shall be considered as responsible charge.

An Associate Member shall be at least twenty-seven years of age, and shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years. The occupancy of a chair as an assistant professor or associate professor in a faculty of applied science of engineering, after the candidate has attained the age of twenty-seven years, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council, shall be required to pass an examination before a board of examiners appointed by the council. The candidate shall be examined on the theory and practice of engineering with special reference to the branch of engineering in which he has been engaged. This examination may be waived at the discretion of the council if the candidate has held a position of professional responsibility for five or more years.

A Junior shall be at least twenty-one years of age, and shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the council, if the candidate for election has graduated from a school of engineering recognized by the council. He shall not remain in the class of Junior after he has attained the age of thirty-three years.

Every candidate who has not graduated from a school of engineering recognized by the council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects: geography, history, (that of Canada in particular), arithmetic, geometry, euclid (books I, IV and VI), trigonometry, algebra up to and including quadratic equations.

A Student shall be at least seventeen years of age, and shall present a certificate of having passed successfully an examination equivalent to the final examination of a high school or the matriculation of an arts or science course. He shall either be pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall not remain in the class of student for more than two years after graduation; or he shall be receiving a practical training in the profession, in which case he shall pass an examination equal to that prescribed for admission to the grade of Junior in the foregoing section and he shall not remain in the class of Student after he has attained the age of twenty-seven years.

An Affiliate shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience, qualify him to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

COTTER—JAMES PETER, of North Charlotte Street, Sydney, N. S. Born at Sherbrooke, Que., Dec. 27th, 1875; Educ., St. Charles Seminary, Sherbrooke, and private study. Professional studies during ap'ticeship to Ingersoll Rand; mach. shop practice ap'tice, 1892-93, general, 1893-1900; machine design with Can. Ingersoll Rand Co., foreman, 1900-1904; 1904-10, asst. works manager, Ingersoll Rand, and supt. of erection; 1910 to date, manager, Sydney Branch, Canadian Ingersoll-Rand Co., Sydney, N.S.

References: W. Herd, A. P. Theuerkauf, S. C. Mifflen, A. L. Hay, G. D. Macdougall, G. Morrison, J. S. Whyte, A. Dawes.

DAVIES—PERCY TREVOR, of Montreal, Que. Born at Newport, Mon., England, July 31st, 1882; Educ., gold medallist, Newport Technical Institute, 1900-03. Honors, City and Guilds mech. engrg., 1903; 1900-05, pupil at Uskside Engineering; 1905-07, asst. engr., South Wales Power Distribution Co., Cardiff, Wales; 1907-17, with Montreal Light, Heat & Power Co., as follows: 1907, motor testing, charge outside meter dept., 1908, asst. operating supt., 1909-12, operating supt., 1912, asst. to chief engr. in charge operating and power sales, and 1912-17, asst. to chief engr. and in charge of all operating work, meter lines, power bldg., steam heating and power sales engr; 1917 to date, commercial manager, Southern Canada Power Company, Montreal.

References: J. B. Woodyatt, L. H. Marrotte, C. V. Christie, J. H. Trimingham, J. B. Challics, J. M. Robertson, E. Brown, L. A. Herdt.

DWYER—MICHAEL, of Sydney Mines, N.S. Born at Parkstown, Ireland, Feb. 4th, 1877; Educ., night classes and corr. course; six years machine shop and dfting; two years laboratory work in connection with open hearth practice; 1902-22, with the Nova Scotia Steel & Coal Co. Ltd., as follows: 1902-03, chief dftsman., 1903-13, master mechanic, 1913-15, asst. mgr., collieries, coke ovens and wash plant, 1915-20, mech. supt., 1920-22, asst. works supt.; At present president and general manager in direct charge of operations, Indian Cove Coal Co. Ltd., Sydney Mines, N. S.

References: J. Purves, A. Dawes, H. Longley, D. H. McDougall, A. R. Chambers, J. S. Whyte.

GODFREY—ALBERT EARL, of 1175-11th Ave., West, Vancouver, B.C. Born at Killarney, Man., August 1890; Educ., public and high school, Vancouver, mech. engrg.; Aug. 1916, commissioned as an officer R.F.C. Promoted Capt. and Flight Commander, Aug. 1917. Promoted Major, Aug. 1918. Appointed to command No. 123 Squadron, Sept. 1918. Demobilized, Sept. 1919. Appointed Squadron Leader, R.C.A.F., and to command R.C.A.F. Station, Camp Borden, May 1922. Appointed to command R.C.A.F. Station, Ottawa, July 1922. Nov. 1922 to date. Commanding R.C.A.F. Station, Vancouver, B.C.

References: A. G. L. McNaughton, D. C. M. Hume, A. Ferrier, J. A. Wilson, E. Forde.

GRAHAME—DALLAS FORREST, of Westmount, Que. Born at Lachine, Que. July 10th, 1885; Educ., B.Sc. McGill Univ. 1910. 1912-15, inspector of power plants, C.P.R.; 1915-17, asst. to director, heat, light and power, Ontario Govt.; 1917-20, chief engr., Dept. S.C.R., Ottawa; 1920-23, chief engr., Underfeed Stoker Co. of Canada; 1924, designer, Sanford Riley Stoker Co., Worcester, Mass.; At present, supervisor of buildings, Bell Telephone Company of Canada, Montreal. Also acting in consulting capacity for engrg. dept. on heating plants for new buildings.

References: H. J. G. McLean, I. J. Tait, F. A. Combe, W. Taylor Bailey, R. E. Cleaton, J. A. Shaw, N. F. Parkinson, H. S. Johnston.

KEANE—JEFFERY FRANCIS, of 1303 Bank of Hamilton Building, Toronto, Ont. Born at Ithaca, N.Y., June 19th, 1891; Educ., two years, engrg., Cornell Univ. 1910-11; Private study; 1912-16, two years, topographic and hydrostatic survey, Toronto Harbour Commn., one year, engrg., gen. and constrn., Grub & Harries, Toronto; one year, inspr. on steel and concrete constrn., Canadian Kodak Co., Toronto; Jan. 1916-Mar. 1917, asst. res. engr., Toronto, Harbour Commn.; Mar. 1917-Jan. 1918, asst. engr., Canadian Stewart Co., Toronto, Toronto Harbour contracts; 1918, mech.'l. dfting., Dunlop Tire Co. & Goodyear Tire Co., Toronto; 1919-22, asst. district mgr. and chief inspr., R. W. Hunt & Co., Toronto; Nov. 1922 to date, district manager, with headquarters at Toronto, for R. W. Hunt & Co., Toronto.

References: G. P. MacLaren, E. L. Cousins, A. L. Harkness, G. L. Berkley, C. G. Ericson, N. D. Wilson, R. S. C. Bothwell.

MACKINNON—JOHN GEORGE, of 79 Portledge Avenue, Moncton, N.B. Born at Underwood, Bruce Co., Ont., Oct. 19th, 1884; Educ., Grad. in Civil Engrg., S.P.S., Toronto, 1909. Fellow in drawing S.P.S., 1910-11; 1904, rodman, Guelph & Goderich Rly.; 1905-06, rodman and instr'man., James Bay Rly.; 1907, instr'man., Temiskaming & Nor. Ont. Rly.; 1908, rodman, roadways dept., City of Toronto; 1909, inspr. and foreman, asphalt paving, Board of Works, Toronto; 1911, dftsman., Can. Nor. Rly. (Yellowhead Pass); 1911-12, transitman and locating engr., Can. Nor. Rly. (Yellowhead Pass); 1912-13-14, res. engr. on constrn., Can. Nor. Rly., Yellowhead Pass; 1915-16, private practice, civil engr., Stettler, Alta.; Also retained by Dept. of Public Works, Govt. of Alta., as roadway engr. for constituencies of Stettler and Coronation; 1916-19, engr., lieut., "D" Co., 3rd Battn., C.R.T. (France) under Major Jas. McGregor, M.E.I.C.; At present, engr. and asst. to the bldg. supt., T. Eaton Co., Moncton, N.B.

References: J. McGregor, A. G. Lefebvre, R. J. Marshall, H. T. Routly, S. H. Sykes, F. V. Seibert, G. G. Powell, J. G. Dryden, M. J. Murphy.

McDONALD—DANIEL WILLIAM, of 27 Tain Street, Sydney, N.S. Born at Big Bras d'Or, N.S., Dec. 6th, 1876; Educ., I.C.S. locomotive engrg., 1895-96. Can. Corr. Sch. Stat'y. engrg., 1909-10. Prov. Cert. of Competency, stat'y. engrg., 1911. Technical night School; Mach. ap'tice with International Coal Co. to 1894, and locomotive fireman, 1894-96; 1896-1919, locomotive engr., 1919-23, asst. supt., and 1923 to date, gen. supt., Sydney and Louisburg Rly., Sydney, N.S.

References: K. H. Marsh, D. H. McDougall, S. C. Mifflen, A. L. Hay, G. D. Macdougall, A. Dawes, W. C. Risley, J. H. Fraser.

McHUGH—FREDERICK JOSEPH, of 65 Riverside Drive, Lachine, Que. Born at Dorval, Que., July 23rd, 1889; Educ., Evening classes, Montreal Tech. High, and Dominion Bridge Company classes (three years); 1905-12, dftsman., Dom. Bridge Co., one year in mech. dept., checking; 1912-20, checking detail drawings, Dom. Bridge Co.; 1920 to 1923, squad leader, and six months to date, asst. chief dftsman., Dom. Bridge Co., Lachine, Que.

References: L. R. Wilson, F. Newell, D. C. Tennant, F. P. Shearwood, A. Peden, J. P. Piche, J. E. Bertrand, A. R. Dufresne.

OSLER—STRATTON HARRY, of Ottawa, Ont. Born at Cobourg, Ont., Oct. 18th, 1882; Educ., Grad. with honours, R.M.C., 1903; B.Sc., McGill Univ. 1904; 1904-10, map work, field and office, survey divn., Dept. Militia and Defence; 1911, engr. work in connection with constrn. and mtce. Halifax defences, and 1912-13, in charge of above work; 1915-19, overseas. Colonel, Can. Engrs.; 1913-14, and 1920-24, asst. director, Engineer Services, Headquarters, Dept. Militia and Defence, Ottawa. Colonel, Royal Can. Engrs.

References: A. C. Caldwell, A. P. Deroche, J. D. Craig, H. L. Trotter, C. E. W. Dodwell, A. G. L. McNaughton, H. F. H. Hertzberg.

STOKES—PERCY FRANK, of 1910, Viau Avenue, Montreal, Que. Born at Bedford, England, August 20th, 1890; Educ., Rugby Evening Tech. Sch., mech. engrg., 1919-20, Goldsmiths College, London, mech., engrg.; 1906-11, ap'ticeship. in engrg. shops and drawing office, W. Hallen Son & Co., Bedford, England; 1911-14, 2 years dftsman. on design of steam turbines, condensing plants and diesel engines, 1 year as senior dftsman., Williams & Robinson, Rugby, England; 1914-19, Imperial Army. 3 years staff instructor of signalling and telephony, southern army and 23rd Army Corps; 1919-20, with English Electric Co., London, England, having charge of layout and general design of 10,000 k.w. turbo generator plant with auxiliaries, for Blackburn Corpn., England; 1920-21, on design, testing, and erection of semi-diesel crude oil engines up to 450 B.H.P. capacity for Messrs. Vickers-Petters, England; 1922-24, asst. in charge of industrial drawing office on constrn. of grain elevator, pulp mill, and mining machinery, etc., for Canadian Vickers, Limited, Montreal, Que.

References: E. S. Mattice, L. C. Hill, A. Dawes, R. Ramsay, G. Agar, A. W. K. Massey.

THOMSON—OSCAR ROLAND, of Belleville, Ont. Born at Blenheim, Ont. March 10th, 1882; Educ., B.A.Sc. Univ. of Toronto, 1907. Post grad. work 1908; 1901-02, Algoma Steel Co.; 1903-04, Snoqualie Falls & White River Power Co.; Tacoma, Wash.; 1904-08-09, city of Washington; 1905-06-07 (vacations), with Ontario Power Co. & Elec. Development Co., Niagara Falls, Ont.; 1910, engaged by Smith Kerry & Chace as one of their engrs. on constrn. of transmission lines and distributing stations of the Electric Power Com. of Ontario. In 1911, on completion of constrn. work, transferred to operating dept. of same organization and continued to the present in that capacity. 1911-16, with the Electric Power Co. in charge of operation and maintenance, and in 1916, when the H.E.P.C. of Ontario bought out the Electric Power Company, continued the above position with what is now known as the Central Ontario Region of the H.E.P.C. of Ontario.

References: H. O. Fisk, A. H. Munro, J. Mackintosh, A. L. Killaly, R. B. Rogers.

WYMAN—HUGH KENNEDY, of St. Narcisse, Que. Born at Essex, Ont., Oct. 5th, 1890; Educ., B.A.Sc., Univ. of Toronto, 1915; 1911-12, Can. Gen. Elec. Co., test courses; 1913-14, switchboard engr. on factory engrg. and preparation of estimates; 1915-19, overseas; 1919-20, with Can. Gen. Elec. Co., Toronto, as engr. on proposals for induction motors and industrial control; 1920 to date, master mechanic in charge of elect'l. and mech. work with the Shawinigan Engineering Company, for Shawinigan Water & Power Company at Shawinigan Falls and La Gabelle.

References: S. Svenningson, C. S. Saunders, J. A. McCrory, A. S. Runciman, G. R. Langley, A. B. Gates, W. A. Bucke, L. DeW. Magie.

FOR TRANSFER FROM CLASS OF ASSOCIATE MEMBER TO MEMBER

BUNNELL—ARTHUR EDWARD KENNEDY, of Toronto, Ont. Born at Brantford, Ont., Jan. 21st, 1886; Educ., B.A.Sc. Univ. of Toronto, 1907; 1906 (4 mos.), divn. engr's. office, G.T.R., Montreal; Summers 1905 and 1907, city engr's. office, Brantford, Ont.; 1907-09, asst. engr. mtce., divn. engr's. office, G.T.R., Toronto; 1910, res. engr. on sewer and water install'n. at Estevan and Weyburn, Sask., for Messrs. Chipman & Power; 1911-12, asst. engr., city of Toronto, Dept. of Works; 1912-13, asst. engr. in charge of location and constrn., Lake Erie & Northern Rly.; 1914, engr. in charge of surveys and development of engrg. data on which plan studies were based, Federal Plan Commission of Ottawa and Hull; 1915, asst. engr. in development of report on city transit and radial entrances, Civic Transportation Commission, Toronto, 1916-18, Imperial Munitions Board, Toronto; asst. mgr., shell production dept., Ontario District; 1918-19, office mgr., ordnance dept., Standard Sanitary Mfg. Co.; 1920, managing engr., Toronto Civic Guild; 1921 to date, private practice, since 1923 in partnership with N.D. Wilson as Wilson & Bunnell, Toronto, transportation and town planning engrs.

References: E. L. Cousins, J. R. W. Ambrose, F. A. Gaby, F. A. Dallyn, D. W. Harvey, E. G. Hewson, T. D. LeMay.

CHRISTIE—CLARENCE VICTOR, of 37 Holton Avenue, Westmount, Que. Born at Couva, Trinidad, B. W. I., Feb. 2nd, 1882; Educ., M. A. Dalhousie Univ. 1902. B.Sc., McGill Univ. 1906; 1907-08, lecturer, 1908-12, asst. professor, elect'l. engrg. 1912-24, associate professor elect'l. engrg., McGill University, Montreal, and 1918-24 consulting engineer, Shawinigan Water & Power Company, Montreal.

References: L. A. Herdt, G. R. MacLeod, E. Brown, F. B. Brown, J. L. Busfield, P. S. Gregory.

GREGORY—PHILIP STANCLIFFE, of Montreal, Que. Born at Fredericton, N.B. July 25th, 1888; Educ., B.Sc., McGill Univ., 1911; 1911-12, Canadian Westinghouse Company; 1912-14, Montreal Tramways Co.; 1914-16, chief dftsman in charge of designing underground conduit system, Electrical Service Commn., City of Montreal; 1916-18, special engr. for city of Montreal in charge of constrn. underground lighting system; 1918 to date, elec't. engr. and at present asst. to vice-president, Shawinigan Water & Power Co., Montreal, Que.

References: J. C. Smith, L. A. Herdt, G. R. MacLeod, J. L. Busfield, O. O. Lefebvre, de G. Beaubien, J. B. Challie, F. B. Brown, C. V. Christie.

HUGHES—HENRY THORESBY, Brig.-Gen. C.M.G., D.S.O., of East Saawich Road, Victoria, B.C. Born at Exeter, England, May 1st, 1870; Educ., Articled to Messrs. Alexander & Gibson, London. Polytechnic student; 1893-1900, engr., location, constrn. and mtce., C.P.R.; 1900-03, asst. to chief engr., Quebec & Lake St. John & Great Northern Rly.; 1903-04, private practice in Quebec City; Commissioner in R.C.E. July 1st, 1904 to date; 1914, Camp engr., Valcartier; 1919 to date, chief engineer, Canadian Battlefields Memorial Commission, France and Belgium.

References: C. H. Mitchell, A. E. Doucet, A. G. L. McNaughton, C. Caldwell, A. Macphail.

HUNT—WILLIAM HENRY, of Edmonton, Alta. Born at Blackpool, England, June 21st, 1883; Educ., High School; 1903-05, topog'r., dftsman., leveller and transitman, govt. and rly., surveys; 1907-09, res. engr. on constrn., 1910-11, res. engr. in charge constrn. of Wolf Creek and McLeod River Bridges. 1912-13, asst. and office engr., Grand Trunk Pacific Rly.; 1914, private practice, extended reconnaissance survey, Northern Alberta, in interests of late Lord Rhondda; 1915-19, overseas. Royal Engrs., France and Russia, Major, M.C ; 1920-21, private practice, survey work in British West Indies; 1922-24, res. engr., Gold Coast Harbours, on constrn. Takoradi Harbour, British West Africa; Sept. 1924 to date, sectional engr., Takoradi Harbour, British West Africa, with Sir Robert McAlpine and Sons.

References: B. B. Kelliher, M. Murphy, C. Ewart, W. S. Fetherstonhaugh, R. J. Gibb, R. W. Jones, W. E. Davis, J. R. Grant, J. Callaghan.

SMITHER—WILLIAM JAMES, of Toronto, Ont. Born at St. Thomas, Ont. Nov. 29th, 1880; Educ., B.A.Sc. Univ. of Toronto, 1905; 1903-05 (summers), testing dept., General Electric Co., Schenectady, N.Y.; 1905-08, supervising engr. on constrn., Abner Doble Co., Engineers, San Francisco, Cal.; 1908-11, confined to bed due to accident; 1911 to date, Faculty of Applied Science, University of Toronto, as follows: 1911-15, demonstrator in charge of senior work in struct'l. design; 1915-21, lecturer in structural engineering; 1921 to date, asst. professor in structural engineering. Also private practice as consulting engineer in design and constrn. of reinforced concrete, steel and timber bldgs., etc.

References: C. R. Young, P. Gillespie, J. R. Cockburn, T. R. Loudon, H. E. T. Haultain.

WILSON—NORMAN DOUGLAS, of Toronto, Ont. Born at Toronto, August 26th, 1883; Educ., B.A.Sc., 1904, C.E. 1923, Univ. of Toronto; D.L.S. 1909, O.L.S. 1910; 1902, surveyor's asst.; 1903, dftsman., Dominion Bridge Co., Montreal; 1904-05, dftsman., Toronto Niagara Power Co.; 1905, rodman, C.P.R.; 1905-06, instr'man on rly. constrn.; 1907, instr'man, on rly. location for city of Toronto; 1907 (Apr.-Nov.), res. engr. on constrn., C.P.R., east from Saskatoon; 1907-08, asst. to John Waldron, D.L.S.; 1908-10, partner, Gardner & Wilson, engrs. and surveyors, Niagara Falls, Ont.; 1910-12, private practice, Ontario land surveyor, Toronto, including during 1911, survey of Falls of Niagara for International Waterways Commission (Can. Section); Feb. 1912 to May 1923, engr. of surveys and lands, Toronto Harbour Commission, 1915 (June-Nov.), asst. engr., Civic Transportation Committee, Toronto, on analysis of traffic conditions, and location of radial rly. entrances, Nov. 1920 to Aug. 1921, principal asst. to P. H. Lazenby, consltg. engr., New York, on report to Toronto Transportation Commission, prelim. to taking over and co-ordinating Toronto Rly. Co. and the Civic Rly., Sept. 1921 to date (part time), engr. on traffic study, Toronto Transportation Commission; May 1923 to date, private practice, Wilson & Bunnell, transportation and town planning engrs., Toronto. At present in Mexico City for the Mexico Tramways Co., reporting on necessary extensions, rerouting and general betterment of service in that city.

References: E. L. Cousins, F. A. Gaby, E. G. Hewson, T. D. LeMay, G. A. McCarthy, A. C. Oxley, C. R. Young, D. W. Harvey.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

FORD—ROBERT, of Timiskaming, Que. Born at Chatham, N.B., Dec. 16th, 1894; Educ., B.Sc., McGill Univ. 1922; 1916-1919, overseas, C.F.A.; Summers: 1919, instr'man., geol. survey, Dom. Govt.; 1920-21, actuarial clerk, Dom. Govt.; 1922-23, asst. constrn. and mtce engr., Riordon Pulp Co. Ltd., and 1923 to date, engr. in charge barking plant, wood room and log yard.

References: W. L. Ketchen, A. K. Grimmer, J. G. MacLaurin, E. S. M. Lovelace, C. M. McKergow.

HARRISON—RONALD, of Kingston Road, Birch Cliff P. O., Ont., Born at Toronto, Jan. 15th, 1897; Educ., B.A.Sc. Univ. of Toronto, 1920; Lieut. Cert. Can. Militia, C.O.T.C.; 1915 (summer), traffic data, Toronto Harbour Commission; 1916-18, overseas, Can. Engrs.; 1918 (summer); dftsman and checker, Canadian Aeroplanes Limited, Toronto; 1919 (summer) and 1920-22, dftsman., H.E.P.C. of Ontario; May 1922, traffic study dept., Toronto Transportation Commission; June 1922, city arch'ts. dept., Toronto; 1922-23, res. engr. Thessalon Power Development and Trenton Water Works, for James Procter & Redfern Ltd., Toronto; April 1923 to date, engr. and supt., Scarboro Township Waterworks System.

References: E. M. Proctor, E. A. James, W. Harland, O. Holden, L. L. Campbell.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

REID—ANTHONY MEREDITH, of 5 Basset Street, Montreal, Que. Born at Uxbridge, Ont., Dec. 24th, 1894; Educ., B.A.Sc. Univ. of Toronto 1923; 1915-19, overseas, Can. Engrs., Capt. M.C.; Summers: 1920, rodman, etc., Kerry & Chace, Toronto; 1921, rodman, dftsman., municipal work, Barber, Wynne-Roberts & Seymour, and 1922, as above with Frank Barber & Associates; May 1923 to July 1924, student engr., constrn. supervisor, Bell Telephone Co., Toronto; Aug. 1924 to date, on staff of outside plant engr., engrg. dept., Bell Telephone Company, Montreal.

References: A. Macphail, A. L. Mudge, H. L. Seymour, A. M. Mackenzie, C. H. Mitchell, R. O. Wynne-Roberts.

TAYLOR—FRANK HAROLD, of 43 S. 13th, Street, Allentown, Pa., U.S.A. Born at Toronto, Ont., Aug. 11th, 1896; Educ., B.A.Sc. Univ. of Toronto, 1921; Two years Royal Flying Corps-Capt. and Flight Commander, awarded M.C.; 1920 (summer), dfting and Survey, C.P.R., Toronto; 1922 (summer), detailer, Llewellyn Iron Works, Los Angeles, Cal.; Sessions 1921-22 and 1922-23, instructor in structural design, Univ. of Toronto; 1923-24, designer and estimator, Lehigh Structural Steel Co., Allentown. Pa.

References: W. J. Smither, C. R. Young, P. Gillespie.

TOMKINS—JOHN, of Timiskaming, Que. Born at London, England, Aug. 16th, 1894; Educ., B.Sc. Queen's Univ., 1923; 1915-16, estimator and salesman, woodworking factory and contractors supplies; 1916-19, overseas. R.N.A.S. and R.A.F.; Summers: 1920, estimator and salesman, contractors supplies, 1921, geodetic survey, 1922, designing and drawing of all plans and details for Queen's Univ. skating rink; 1923-24, constrn. engr. and asst to chief engr. in charge of all new constrn. and rebldg., Howard Smith Paper Mills, Ltd.; Sept. 1924 to date, constrn. engr., Riordon Pulp Corporation, Ltd., Timiskaming, Que.

References: W. P. Wilgar, L. T. Rutledge, E. G. M. Busso, J. G. MacLaurin, A. Macphail.

Engineering Index

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A

AERODYNAMICS

Resistance of Bodies to Air. Law of Variation of Coefficient of Resistance to Air of Some Bodies (Sur la loi de variation du coefficient de résistance de l'air pour quelques corps), L. Marchis. Bul. Technique du Bureau Veritas, vol. 6, no. 6, June 1924, pp. 109-114, 6 figs. Reynolds number in aerodynamics; geometric form of bodies; resistance of cylinders, spheres, ellipsoides, circular disks, and other bodies.

AIR COMPRESSORS

Diesel-Engine. Diesel-Engine Air Compressors, Rob. Melrose. Power, vol. 60, no. 21, Nov. 18, 1924, pp. 800-801, 1 fig. Common troubles and symptoms that precede them.

AIR PUMPS

Contraflo Reciprocating. Contraflo Reciprocating Air Pumps; Empire Exhibition. Engineering, vol. 118, no. 3069, Oct. 24, 1924, p. 573, 2 figs. Constructed by Vickers and specially designed for marine use, but can be applied to land installations where conditions are suitable.

AIRPLANES

A-1. Wind Tunnel Test of the A-1 (Ambulance) Airplane, A. L. Morse. Air Service Information Circular, vol. 5, no. 463, May 1, 1924, 13 pp., 26 figs. Results of tests made in 4-ft. and 7½-ft. wind tunnel at Mass. Inst. Technology on A-1 airplane, a single Liberty-motored single-bay biplane of diagonally braced lower-wing, stub type, to determine aerodynamic characteristics.

Metal. Production Airplanes of Metal, E. B. Carns. Mech. Eng., vol. 46, no. 11a, mid-Nov. issue, 1924, pp. 733-738, 12 figs. Describes construction of airplane which author claims to be a production proposition; type best suited to this is stated to be biplane, and metal the most suitable material of which to make it; covers whole construction of airplane, together with cost of its production in lots of from 1 to 10; gives lists of things to do and to avoid in constructing metal airplanes and explanation of methods used in making fittings and certain parts.

Scale Effect. The Work of the Aeronautical Research Committee's Panel on Scale Effect, W. S. Farren. Roy. Aeronautical Soc.—Jl., vol. 28, no. 164, Aug. 1924, pp. 526-544 and (discussion) 544-550, 14 figs. Discusses design panel of Aerodynamics Sub-Committee; plan underlying work from 1918 to 1924 and results.

Yawing Moment, Induced. A new Relation between the Induced Yawing Moment and the Rolling Moment of an Airfoil in Straight Motion, M. M. Munk. Nat. Advisory Committee for Aeronautics—Report, no. 197, 1924, 5 pp., 1 fig. Computation of induced yawing moment which is said to be greatest part of entire yawing moment encountered by wings.

AIRSHIPS

Pressure Distribution over Ellipsoid Surface. Remarks on the Pressure Distribution over the Surface of an Ellipsoid, Moving Translationally through a Perfect Fluid, M. M. Funk. Nat. Advisory Committee for Aeronautics—Tech. Notes, no. 196, June 1924, 8 figs. Describes easy and convenient way to determine magnitude of velocity and of pressure at each point of surface of ellipsoid of rotation; knowledge of such pressure distribution is of great practical value for airship designer.

ALIGNMENT CHARTS

Construction. Graphic Charts for Calculating (Graphische Rechentafeln), H. Pflieger-Haertel. Dinglers Polytechnisches Jl., vol. 339, no. 16, Aug. 1924, pp. 151-154, 8 figs. Discusses Cartesian and general alignment charts and their construction and application.

ALLOYS

Aluminum. *See Aluminum Alloys.*
Iron. *See Iron Alloys.*
White Metals. Analysis of White Metals (Analisi dei metalli bianchi), A. Trucco. Metallurgia Italiana, vol. 16, no. 9, Sept. 1924, pp. 378-388, 3 figs. Discusses metals with high and medium lead content, and with antimony and tin base, and methods for determining constituents.

ALUMINUM

Metallurgy. The Metallurgy of Aluminum, F. A. Livermore. Foundry Trade Jl., vol. 30, nos. 417, 419, 420, 423 and 425, Aug. 14, 18, Sept. 4, 25 and Oct. 2, 1924, pp. 163-166, 187-189, 205-206, 265-267 and 311-313, 13 figs. Occurrence: natural compounds, including bauxite, cryolite, corundum, aluminum sulphate, etc.; chemical and electrochemical methods of production; physical and chemical properties; alloys; care of crucibles; melting conditions and melting furnaces.

Protective Coatings for. Protective Coatings for Aluminum, C. Commentz. Chem. & Met. Eng., vol. 31, no. 18, Nov. 3, 1924, p. 698, 1 fig. Describes two new electrical methods developed in Germany for providing aluminum articles with anti-corrosion oxide coatings.

AMMONIA

Synthetic. Synthetic Ammonia Production in Coke Oven and Gas Works. Gas Engr., vol. 40, nos. 578 and 581, June and Sept. 1924, pp. 120-121 and 190-191. Discusses increased demand for fertilizers, Claude and Haber-Bosch processes, consumption of current, large power requirements, carbon monoxide and steam and use of spathic iron ore.

AMMONIA COMPRESSORS

Bernat System. A French Ammonia Compressor. Cold Storage, vol. 27, no. 319, Oct. 16, 1924, pp. 423-424, 1 fig. Design and operation of a new compressor, Bernat system. Can attain speed of 1200 to 2000 r.p.m.

Flywheels. The Flywheel Problem in Compressors Direct Connected to Synchronous Motors, A. R. Stevenson, Jr. Refrig. Eng., vol. 11, no. 4, Oct. 1924, pp. 123-140 and (discussion) 140-142, 23 figs. Discussion of reasons for limiting current pulsation of synchronous motors driving ammonia compressors; brief outline of history of the various methods of calculating flywheels; discussion of a set of curves used since November, 1921, for rapid and accurate calculation of flywheels. Am. Soc. Refrig. Engrs. specifications covering design of synchronous motors for direct connection to ammonia compressors.

ANTIMONY

Ore Concentration. The Lake George Antimony Ores and their Concentration, C. S. Parsons. Can. Min. Jl., vol. 45, no. 40, Oct. 3, 1924, pp. 984-985. History, geology, concentration, and flotation; tests.

ARCHES

Symmetrical Concrete. Design of Symmetrical Concrete Arches, Chas. S. Whitney. Am. Soc. Civ. Engrs.—Proc., vol. 50, no. 9, Nov. 1924, pp. 1327-1425, 56 figs. Gives method of analysis believed to be considerably simpler than any accurate method of applying elastic theory to symmetrical arches heretofore published; results given by tables and diagrams may be used for final design since they are as accurate as can be obtained by any other method of applying elastic theory.

ASPHALT

Roofing, Specifications. United States Government Master Specification for Asphalt for Unsurfaced Built-Up Roofing. U. S. Bur. Standards—Circular, no. 168, July 7, 1924, 10 pp., 3 figs. Specifications for grades, material and workmanship, requirements, methods of inspection, packing and marking, etc.

AUTOMOBILE ENGINES

Crankcase-Oil Dilution. Determination of Dilution of Crank-Case Oil, H. H. Knoch, P. A. Crosby and R. R. Matthews. Indus. & Eng. Chem., vol. 16, no. 11, Nov. 1924, p. 1153. Shows results of using vacuum distillation as method of determination.

AUTOMOBILE FUELS

Theory. Theory of Fuels for Internal-Combustion Engines (Zur Theorie der Brennstoffe für die Brennkraftmaschinen), M. Brutzkus. Brennstoff-u. Wärmewirtschaft, vol. 6, nos. 6, 7 and 8, June, July and Aug., 1924, pp. 129-138, 154-160 and 181-185, 1 fig. Discusses theory of combustion at variable pressure, calculation of variability, volume changes, heat of combustion, etc., of various liquid and gaseous fuels, most important technical fuels; theory and practice.

AUTOMOBILES

Shock Absorbers. Making Shock Absorber Parts for Light Cars. Can. Machy., vol. 32, no. 16, Oct. 16, 1924, pp. 19-20 and 42, 4 figs. Metal working operations at Hamilton, Ont., plant of Hassler Co. Spiral telescoping spring used is made from chrome vanadium steel 7-16-in. hot rod, wire drawn to a diameter of 25-64 in.

Shock-Absorbing Devices. Autocar, vol. 53, no. 1511, Oct. 3, 1924, pp. 587-589, 19 figs. Consideration of some of the various types of mechanism used to damp vibration of springs.

AVIATION

Developments, Canada. Further Notes on Aviation in Canada, C. W. Stedman. Roy. Aeronautical Soc.—Jl., vol. 28, no. 165, Sept. 1924, pp. 585-594, 8 figs. New fields of work; progress of research.

Tires. *See Tires, Rubber.*

B

BAROMETERS

STANDARD. A Standard Barometer of New Design, T. H. Laby. Jl. Sci. Instruments, vol. 1, no. 11, Aug. 1924, pp. 342-345, 1 fig. Describes barometer in which distance between mercury surfaces is measured by means of equivalent of 30-in. steel screw micrometer; design eliminates cathetometer usually used with such instruments, and difficulties and errors of reading mercury surfaces enclosed in glass tubes.

BEARINGS, ROLLER

RAILWAY JOURNAL BOXES. Standardization of Journal Boxes with Roller Bearings for Railway Cars (Normung von Achsbuchsen mit Rollenlagern von Schienenfahrzeugen), O. R. Wikander. Zeit. des Vereines deutscher Ingenieure, vol. 68, no. 19, May 10, 1924, pp. 474-475, 3 figs. Reasons for installation of only one roller bearing in railway journal boxes; advantages of journal-box standardization for simple determination of suitable roller bearing, based on proposed international standard dimensions and tolerances of roller bearings.

BELTING

LEATHER. Chrome Leather for Belts, L. Balderston. Am. Leather Chemists Assn.—Jl., vol. 19, no. 9, Sept. 1924, pp. 521-525 and (discussion) 525-527. Discusses chrome belts and divergent views as to their keeping quality, some behaving as well as oak belts, others failing. Question of free H_2SO_4.

BLAST FURNACES

PRACTICE. Blast Furnace Practice in Birmingham District, R. H. Ledbetter. Iron Age, vol. 114, no. 18, Oct. 30, 1924, pp. 1128-1130. Number of furnaces and their features; cleaning gas; Bessemer iron from scrap. (Abstract.) Paper read before Am. Iron & Steel Inst.

BOILER FEEDWATER

FOAMING. Foaming of Boiler Water, C. W. Foulk. Indus. & Eng. Chem., vol. 16, no. 11, Nov. 1924, pp. 1121-1125. Advances theory according to which soluble salts in water, by creating difference in concentration between surface and mass of liquid, make possible formation of films; experiments with various mixtures in flasks showed no exceptions to this theory.

TREATMENT. The Scientific Treatment of Boiler-Water, Introducing the Colloidal Aspect, H. W. Bannister. North of England Inst. Min. & Mech. Engrs.—Trans., vol. 74, part 4, June 1924, pp. 113-120. Discusses problems and suggests remedies in treatment of feedwater; application of principles of colloid chemistry to feedwater treatment.

Water Treatment for Continuous Steam Production, R. E. Hall. Mech. Eng., vol. 46, no. 11a, mid-Nov. issue, 1924, pp. 810-817, 13 figs. Particulars regarding investigation in which water treatment is considered in its relation to prevention of scale formation, corrosion, control, delivery of dry steam, and maintenance of minimum blow-down.

BOILER FIRING

PULVERIZED-COAL. *See Pulverized Coal, Boiler Firing.*

BOILER FURNACES

AIR PREHEATERS. The Preheating of Combustion Air, W. H. Badger. S. African Inst. Elec. Engrs.—Trans., vol. 15, part 8, Aug. 1924, pp. 437-438. Discussion of paper by J. B. Bullock.

ASH-SOFTENING TEMPERATURES OF COAL. Ash-Softening Temperatures and Clinkering of Coals in a Boiler Furnace, J. F. Barkley. U. S. Bur. Mines—Reports of Investigations, no. 2630, Aug. 1924, 3 pp. Comparison of ash-softening temperature of each coal, with clinkering tendencies of coal when burned in furnace; tabulation of proximate analyses, ash-softening temperatures and plant reports as to clinkering.

DEVELOPMENTS. Stokers and Furnaces. Combustion, vol. 11, no. 5, Nov. 1924, pp. 372-377, 8 figs. Furnace developments; air heaters; mixing of gases in boiler furnaces; water-cooled furnace walls; test results of Hell Gate radiant tube boilers; furnace construction; characteristics of Eastern firebrick. (Abstract.) 1924 report of Prime Mover Committee of Nat. Elec. Light Assn.

DUTCH OVENS FOR BAGASSE. Dutch Ovens for Bagasse, J. O. Frazier. Power, vol. 60, no. 18, Oct. 28, 1924, pp. 682-683, 3 figs. Practical experiences with three types of settings; Dutch oven with auxiliary combustion chamber gave best results; formation of "moss" on roofs and walls of Dutch ovens.

BOILERS

DAMPERS. Notes on Boiler-flue Dampers, D. Wilson. Mech. Wld., vol. 76, no. 1968, Sept. 19, 1924, pp. 184-185, 6 figs. Discusses design of dampers for flues conveying gases of combustion in connection with steam-boiler and high-temperatures furnace installations.

RIVETING. Modern Demands on Hydraulic Boiler Riveting (Neuzeitliche Forderungen an die hydraulische Kesselnietung und die Möglichkeiten ihrer Erfüllung in der Praxis), H. Müller. Werkstattstechnik, vol. 18, no. 19, Oct. 1, 1924, pp. 528-543, 7 figs. Production of riveted joints free from objections, water-tight and steam-tight; types of riveting; riveting control apparatus; etc.

BOILERS, WATER-TUBE

BAFFLING. Increased Efficiency Through Changes in Boiler Baffling, H. E. Osgood. Power, vol. 60, no. 20, Nov. 11, 1924, pp. 769-770, 4 figs. Changes made in well-known type of water-tube boiler illustrate influence exerted by baffling of boiler on its efficient operation.

VERTICAL. Foreign Practice in Vertical Water-Tube Boilers, F. Johnstone-Taylor. Power Plant Eng., vol. 28, no. 22, Nov. 15, 1924, pp. 1140-1141, 3 figs. Describes number of European types of boilers together with their relative advantages; the Nesdrum boiler, a British design.

BORING MACHINES

MULTI-SPINDLE ATTACHMENT FOR HORIZONTAL. Multi-spindle Attachment for Horizontal Boring Machine, H. C. Town. Machy. (Lond.), vol. 25, no. 627, Oct. 2, 1924, pp. 15-16, 3 figs. Attachment for converting horizontal boring machine into multiple-spindle machine for operating simultaneously on bores of gear cases or cylinder blocks.

BRAKES

VACUUM. Vacuum Brakes for Electric Rolling Stock (Freinage par le vide du matériel des chemins de fer à traction électrique), J. Netter. Technique Moderne, vol. 16, no. 17, Sept. 1, 1924, pp. 577-582, 8 figs. Design and construction of automatic vacuum brakes, and application to electric locomotives.

BRAKING

PNEUMATIC. Hump Yard Operates Without Car Riders. Ry. Age, vol. 77, no. 20, Nov. 15, 1924, pp. 895-898, 8 figs. All car riders have been eliminated on north hump of Indiana Harbor Belt freight classification yard at Gibson, Ind., as result of installing pneumatic braking system.

RAIL-BRAKE APPARATUS FOR FREIGHT YARD. A New System of Braking Wagons in Gravity Shunting Yards. Ry. Gaz., vol. 31, no. 18, Oct. 31, 1924, pp. 575-578, 8 figs. System, which has been laid down at several points on German State railways, has as its basis hydraulically operated braking apparatus applied at tack level from operating tower.

Season Cracking of Brass and Bronze (Om självsprickor i gulmetall), O. Forsman. Teknisk Tidskrift, vol. 54, no. 42, Oct. 18, 1924, pp. 115-120 (Mekanik), 5 figs. This cracking is, according to author, produced either by excessive cold working of metal or by impurities. Annealing is proper remedy. Bibliography.

BRIDGE ERECTION

ARCH CLOSURE. Closing 640-Ft. Michigan Central Arch Over Niagara Gorge. Eng. News-Rec., vol. 93, no. 18, Oct. 30, 1924, pp. 716-718, 3 figs. Cantilevered halves lowered to junction by 39-in. jacks in backstays; centralized jacking control facilitates operation.

SKEW BRIDGE. Skew Bridge for Fly-Over Junction at Chicago: I.C.R.R. Eng. News-Rec., vol. 93, no. 19, Nov. 6, 1924, pp. 748-750, 5 figs. Bridge replaces main track grade crossing; ball bearings for girders; derrick cars place long heavy girders.

BRIDGE PIERS

HOLLOW CONCRETE. Hollow Concrete Bridge Piers Built Like Chimneys. Eng. News-Rec., vol. 93, no. 19, Nov. 6, 1924, p. 757, 3 figs. Piers 181 feet and 221 feet high of reinforced concrete to carry highway bridge over Dix River gorge.

BRIDGES, CONCRETE

TORONTO, CAN. Reinforced Concrete Bridge Construction Involves New Features. Concrete, vol. 25, no. 2, Aug. 1924, pp. 55-58, 11 figs. Construction details of bridge over Belt Line Ravine at Toronto, Ont. Constructed at a cost of $93,000, of which about $22,000 was for steel reinforcing. Overall length 672 ft., main span 200 ft., width 28 ft. 4 in.

BRIDGES, HIGHWAY

TORONTO, CAN. Humber River Highway Bridge, Toronto, A. P. Crealock. Can. Engr., vol. 47, no. 17, pp. 431-437, 13 figs. Describes new bridge on Bloor Street West provincial highway, having a total length of 745 ft. face to face of abutments and composed of 4 arch spans of 135 ft., two truss spans of 67 ft. 6 in. each, four piers with a width of 10 ft. at top and two abutments.

BRIDGES, RAILWAY

CANTILEVER ARCH. New Niagara Gorge Arch Nearing Completion. Ry. Age, vol. 77, no. 19, Nov. 8, 1924, pp. 830-836, 10 figs. Bridge has span of 640 ft. from center to center of hinge pins and rise of 105 ft.; planned to carry two railway tracks on deck at 13-ft. centers, and designed for cantilever method with pin bearing between two halves of lower chord at crown; noteworthy features of erection; closing operations.

PLATE-GIRDER. Remarkably Heavy Plate Girders in Skew Railroad Bridge. Eng. News-Rec., vol. 93, no. 18, Oct. 30, 1924, pp. 710-711, 3 figs. Buffalo road crossing required girders weighing 130 tons each; heavy flange sections and web reinforcement.

BRIDGES, STEEL

STRESSES. Secondary Stresses in Steel Riveted Bridges, O. H. Ammann. Eng. News-Rec., vol. 93, no. 17, Oct. 23, 1924, pp. 666-668, 5 figs. Notes on comprehensive series of tests and analytical studies carried out by Assn. Swiss Steel Fabricators.

BUILDING CONSTRUCTION

WINTER CONSTRUCTION. Winter Construction, C. S. Hill. Eng. News-Rec., vol. 93, nos. 14, 15, 16 and 17, Oct. 2, 9, 16 and 23, 1924, pp. 532-535, 588-590, 632-635 and 674-675, 12 figs. Responsibilities and difficulties of contractor. Oct. 2: Labor and climate. Oct. 9: Processes and plant. Oct. 16: Methods and costs. Oct. 23: Coordinate services.

BUILDINGS

LAYOUT, HOSIERY MILL. Special Design for Hosiery Mill on Pacific Coast, J. R. Poteat. Eng. News-Rec., vol. 93, no. 18, Oct. 30, 1924, pp. 707-708, 3 figs. Axis of line of buildings chosen to eliminate excess sunlight; bracing against vibration and to withstand earthquake tremors; layout and column spacing to fit machine sizes.

C

CABLES, ELECTRIC

HIGH-TENSION. High Tension Cables, L. B. Atkinson. World Power, vol. 2, no. 10, Oct. 1924, pp. 218-225, 4 figs. Summary of situation as regards cables up to 11,000-volts, illustrated by two diagrams; properties of dielectrics; process of manufacture of cables; problems arising from geometrical form of cables; economic uses of high-voltage cables; present state of practice. (Abridged.) Paper presented at World Power Conference.

JOINTS. Design of High-Tension Cable Joints, C. G. Watson. Elec. World, vol. 84, no. 17, Oct. 25, 1924, pp. 896-897. Points out that original design of cable should be followed when making joints; outlines methods of properly insulating-conductors.

PAPER-INSULATED. High-Voltage Impregnated Paper Cables, Wm. A. Del Mar and C. F. Hanson. Am. Inst. Elec. Engrs.—Jl., vol. 43, no. 10, Oct. 1924, pp. 950-957, 18 figs. Shows that useful conception of danger of air films is that they promote internal surface leakage, and that it is not the case that air films can be detected by slope of voltage power-factor characteristic; testing of raw and process materials; compounds with and without rosin; hot spots in cables.

CABLES, HOISTING

MANUFACTURE. Torsion in the Manufacture of Metal Cables (Les questions de torsion dans la fabrication des câbles métalliques), J. Seigle. Revue de l'Industrie Minérale, no. 92, Oct. 15, 1924, pp. 485-501, 30 figs. Principle of cabling machines. Stranding; geometric and physical torsion; fatigue due to torsion.

CABLEWAYS

COAL-HANDLING. Taking Coal by the Air Route to Coaling Station. Coal Trade Bul., vol. 51, no. 9, Oct. 1, 1924, pp. 397-399, 4 figs. Aerial tramway at Williamson, W. Va., eliminates two bridges, much track and trestling, cuts hauling costs, and easily handles thousands of tons in eight hours.

CAISSONS

SINKING. Sinking Pier Caissons for Four Missouri River Bridges, L. J. Sverdrup. Eng. News-Rec., vol. 93, no. 16, Oct. 16, 1924, pp. 628-630, 6 figs. Subaqueous difficulties met by Missouri State Highway Dept. on structures now under construction.

CALORIMETERS

JET. A Jet Calorimeter, W. Payman. Fuel, vol. 3, no. 11, Nov. 1924, pp. 406-407, 1 fig. Instrument consists of two parts, observation chamber, containing burner and scale, and differential manometer.

CAR WHEELS

HANDLING IN REPAIR SHOPS. Handling Wheel and Axle Work on the Brooklyn-Manhattan Railways, F. H. Colvin. Am. Mach., vol. 61, no. 20, Nov. 13, 1924, pp. 753-755, 4 figs. How cars are inspected and motor trucks handled when axles or tires require repairs; novel wheel-turning department with storage tracks and hoist for wheels and also for chips.

CARBON MONOXIDE

DETERMINATION. Determination of Carbon Monoxide (Sur le dosage de l'oxyde de carbon 3), P. Lebeau and Ch. Bedel. Académie des Sciences—Comptes Rendus, vol. 179, no. 2, July 16, 1924, pp. 108-110. Addition of phenolic substances to suspension of cuprous oxide in sulphuric acid increases solubility of former, yielding solution which is good absorbent for CO; addition of water also causes no decomposition or loss of CO.

CARS, FREIGHT

GONDOLA. New 70-ton Capacity Gondola Car for the Wabash. Ry. Rev., vol. 75, no. 18, Nov. 1, 1924, pp. 657-659, 3 figs. Drop-end steel gondola car built for shipment of pipe and tubing permits loading to full capacity.

CASE-HARDENING

CHARCOAL FOR. The Influence of Barium Carbonate upon Wood Charcoal Used for Cementation, B. F. Shepherd. Am. Soc. Steel Treating—Trans., vol. 6, no. 5, Nov. 1924, pp. 606-614, 17 figs. Illustrates effect of barium carbonate in intensifying carburizing properties of wood charcoal; also shows that quantity of barium carbonate which produces best results is not mixture which has been standard since 1861; chrome-vanadium steel is shown to absorb carbon much more readily than simple carbon steel and to produce hypereutectoid zone of such depth and carbon concentration as to be extremely harmful.

CAST IRON

COMPOSITION AND STRUCTURE, A.S.T.M. BAR. Notes on Composition and Structure of A.S.T.M. Bar, J. W. Bolton. Foundry Trade Jl., vol. 30, no. 427, Oct. 23, 1924, pp. 349-354, 18 figs. Shows effects of variation in composition and structure on properties of standard bar. Paper read before Am. Foundrymen's Assn.

FILTRATION. The Filtration of Cast Iron, C. Brunelli. Foundry Trade Jl., vol. 30, no. 424, Oct. 2, 1924, pp. 283-286. Describes author's process and discusses principal defects in castings and their causes; impurities in raw materials; action of filter grates; large and small risers; influence of atmospheric air; distribution of useful heat; origin of blowholes. See also editorial, p. 279. Translated from Italian.

IRON-CARBON EUTECTOID. Structural Evidence of an Iron-Carbon Eutectoid, A. Hayes and H. E. Flanders. Am. Soc. Steel Treating—Trans., vol. 6, no. 5, Nov. 1924, pp. 623-629, 10 figs. Results of experimental work which indicates that carbon existing in solid solution when lower critical range is traversed very slowly is distributed in form of small rounded specks throughout the ferrite; this is considered structural evidence of eutectoid action; gives mechanism formation of ferrite shell about primary carbon spots, in partially graphitized white iron.

PEARLITIC. Notes on Pearlitic Cast Iron, J. E. Hurst. Foundry Trade Jl., vol. 30, no. 426, Oct. 16, 1924, pp. 327-332, 5 figs. Refers to Professor Bauer's definitions of pearlitic cast iron, and discusses ductility, chemical composition, formation of pearlite, border-line compositions, grain size, and rate of cooling.

SULPHUR, INFLUENCE OF. The Influence of Sulphur in Cast Iron, J. E. Hurst. Foundry Trade Jl., vol. 30, no. 428, Oct. 30, 1924, pp. 377-380, 3 figs. Sulphur in commercial cast irons in presence of sufficient manganese exists almost wholly as sulphide of manganese—MnS; in this form it is practically without influence on structure and properties of cast iron; in absence of sufficient manganese sulphur exists as iron sulphide which is soluble in liquid iron and which has tendency to prevent formation of graphite.

CASTING

CENTRIFUGAL. Centrifugal Casting of Iron Piston Rings, J. A. Rathbone. West. Machy. Wld., vol. 15, no. 9, Sept. 1924, pp. 299-300, 3 figs. Uses of cores; carbon precipitated as temper carbon on annealing; annealed metal proves excellent for pipe nipples; note on English practice.

CEMENT

BURNING. Cement Burning, R. K. Meade. Concrete, vol. 25, no. 2, Aug. 1924, pp. 20-23 (Cement Mill Sec.), 1 fig. What takes place in a rotary kiln and what is sought to be accomplished in this. Discussion of the various factors which enter into burning of cement.

CEMENT MANUFACTURE

GRINDING. New Laws Govern Fine Grinding, C. E. Blyth, G. Martin and H. Tongue. Concrete, vol. 25, no. 3, Sept. 1924, pp. 42-44 (Cement Mill Sec.), 1 fig. Some general underlying laws discovered by British Portland Cement Research Assn. as result of experiments carried out during last two years. Paper read at Int. Cement Congress, Lond., and reprinted from Structural Engr. See also Cement, Mill and Quarry, vol. 25, no. 7, Oct. 5, 1924, pp. 37-38.

CEMENT, PORTLAND

MILLS. The New Wet Process Plant of the Lehigh Portland Cement Company. Concrete, vol. 25, no. 4, Oct. 1924, pp. 52-59 (Cement Mill Sec.), 16 figs. Description of plant located near Birmingham, Ala., having a total capacity of about 5,000 bbls. per day.

PROPERTIES. New Studies in the Properties of Portland Cement, T. Merriman. Eng. News-Rec., vol. 93, no. 17, Oct. 23, 1924, pp. 669-672, 4 figs. Solubility of cement in sugar solutions; relation between solubility and tensile strength shown to be marked and useful; effect of CO_2 on cement.

CENTRAL STATIONS

CRAWFORDSVILLE, IND. New Crawfordsville Unit Shows High Economy. Power Plant Eng., vol. 28, no. 22, Nov. 15, 1924, pp. 1128-1133, 11 figs. Municipally owned public service plant in Indiana installs new 3,000-kw. turbo-generator which shows steam consumption of less than 15 lb. per kw-hr.; coal consumption is considerably reduced; boiler tests and method of testing.

DIESEL-ENGINED. Diesel Engines Eliminate Losses in Carthage Light Plant. Power, vol. 60, no. 18, Oct. 28, 1924, pp. 684-686, 3 figs. By installation of Diesel engines production costs were reduced to below 1 cent per kw.hr.

Diesel Engine Operating Experience, J. A. Beggs. Elec. World, vol. 84, no. 19, Nov. 8, 1924, pp. 995-998, 5 figs. How installation of two 550-hp. units of type named saved Neodesha, Kan., $18,624 in 10 months; analysis of operating results; details of installation.

WILLIAMSPORT, MD. Some Operating Provisions at the Williamsport Station. Power, vol. 60, no. 20, Nov. 11, 1924, pp. 762-764, 2 figs. Describes special ways in which instruments were chosen and arrangements made with view to maintaining both economy and service continuity; generators are to operate in multiple only through transformers.

CHAIN DRIVE

LUBRICATION. Lengthening the Life of the Chain Drive, A. F. Brewer. Indus. Mgt. (N. Y.), vol. 68, no. 5, Nov. 1924, pp. 266-272, 12 figs. Lubricating requirements of driving-chain installation; lubrication must be suited to type of chain and to operating conditions.

CIRCUIT BREAKERS

OIL TYPE. Maintenance of Oil Circuit Breaker Operating Mechanisms, H. L. Biggin. Power, vol. 60, nos. 19 and 20, Nov. 4 and 18, 1924, pp. 721-723 and 797-800, 14 figs. Operation and care of oil circuit breakers of ratings up to 15,000 volts. Nov. 4: Care of operating mechanisms. Nov. 18: Care of switch contacts and Oil

CLUTCHES

DESIGN. Considerations in Clutch Design, A. Clegg. Machy. (Lond.), vol. 24, no. 619, Aug. 7, 1924, pp. 597-599, 6 figs. Plate and coil clutches.

COAL

CARBONIZATION. The Parker Low-Temperature Carbonization Plant. Engineering, vol. 118, no. 3069, Oct. 24, 1924, pp. 588-589, 3 figs. Details of plant erected at Barugh works of Low-Temperature Carbonization, Ltd., consisting of two settings, each of 32 retorts; results of test.

ROCK-DUST CARTRIDGE STEMMING. The Rock-Dust Cartridge Method of Stemming Shots, H. M. Roscoe. Can. Inst. Min. & Metallurgy—Monthly Bul., no. 150, Oct. 1924, pp. 638-642, 4 figs. Explains method and points out its advantages.

COAL MINES

BRITISH EMPIRE EXHIBITION. The Colliery at the British Empire Exhibition. Engineering, vol. 117, nos. 3047, 3049, 3050 and 3051, and vol. 118, nos. 3054, 3057, 3058, 3059, 3060, 3062, 3064 and 3067, May 23, June 6, 13, 20, July 11, Aug. 1, 8, 15, 22, Sept. 5, 19 and Oct. 10, 1924, pp. 677-680, 726-729, 756-759, 793-795, 49-51, 158-160, 190-193, 224-227, 251-252, 338-342, 411-414 and 528-530, 174 figs. partly on supp. plates. Full-size representation of actual working colliery, with all essential features of modern high-class installation; details of engine room, brake engine and overwinder, overwinding prevention gear, head gear, safety hooks and gears, safety gates, decking control, liquid controller, motors, high- and low-tension switchgear, transformer-room supply, air compressors, meters, coal cutters, conveyors, coal-washing apparatus, etc.

CONVEYORS. Conveyor That Facilitates Concentrated Mining, N. D. Levin. Coal Age, vol. 26, no. 16, Oct. 16, 1924, pp. 541-544, 12 figs. Describes type of conveyor developed by Jeffrey Mfg. Co., Coumbus, O.; so constructed that it can be lengthened for shortened quicklly.

COKE OVENS

PIETTE. Piette Coke Ovens. Engineering, vol. 118, no. 3067, Oct. 10, 1924, pp. 510-512, 12 figs. partly on supp. plate. New Coke ovens of Semet-Solvay and Piette Coke Oven Co. of Sheffield, England, with special reference to their battery of 24 coke ovens at Shelton Iron, Steel & Coal Co. of Stoke-on-Trent; each of these can produce 60 tons of coke per week.

PRACTICE, COMPARATIVE SURVEY. Comparative Survey of Coke-Oven Practice in Various Countries, G. A. Hebden. Can. Min. Jl., vol. 45, nos. 41 and 42, Oct. 10 and 17, 1924, pp. 1011-1014 and 1035-1036. Brief survey of practice in Great Britain, Continental Europe, the Dominions and America. Paper presented before Empire Min. & Met. Congress.

CONCRETE

CEMENT ADDITION. The Addition of Cement as a Means of Increasing Concrete Workability, Duff A. Abrams. Contract Rec. & Eng. Rev., vol. 38, no. 39, Sept. 24, 1924, pp. 946-947, 1 fig. Experiments at Lewis Inst. lead to conclusion that it is more economical to obtain desired workability by means of cement than by use of other admixtures.

IMPURE MIXING WATERS, TESTS OF. Tests of Impure Waters for Mixing Concrete, Duff A. Abrams. Lewis Inst., Structural Matls. Research Laboratory—Bul., no. 12, Sept. 1924, 44 pp., 7 figs. Strength tests on portland cement were made at ages of 3 days to 2— years using mixing waters of wide range of types, many of which were thought to be unsuitable for use in concrete; 68 samples of water were tested, including sea and alkali waters, bog waters, mine and mineral waters, waters containing sewage and industrial wastes, and solutions of common salt; tests of fresh waters (including distilled) were made for purpose of comparison.

NOVOCRETE. Laboratory Tests on Novocrete. Eng. & Contracting (Buildings), vol. 62, no. 4, Oct. 22, 1924, pp. 896-898. A product composed of Portland cement and specially treated, known in United States and Canada by name of "Novocrete" or "mineralized" sawdust, and in Europe as "Durocrete". Characteristics, uses, and results of different tests made.

SPECIFICATIONS. Standard Specifications for Concrete and Reinforced Concrete. Am. Soc. Civ. Engrs.—Proc., vol. 50, no. 8, Oct. 1924, pp. 1163-1284, 30 figs. Submitted by joint committee on standard specifications. General instructions; definitions; quality of concrete; materials; proportioning and mixing; depositing concrete; forms; details of construction; waterproofing and protective treatment; surface finish; design; includes tables on grading of fine and coarse aggregate, size and areas of reinforcement bars, proportions for and workability of concrete, and moments to be used in design of flat slabs. Mandatory and advisory appendices.

CONCRETING

COLD-WEATHER. Report on Placing Concrete in Winter. Ry. Rev., vol. 75, no. 17, Oct. 25, 1924, pp. 625-629. Feasibility, economy and desirability of winter concrete work and approved methods of such construction. (Abstract.) Report of committee before Am. Ry. Bridge and Bldg. Assn.

CONDENSERS, STEAM

SURFACE. Steam Used by Surface Condenser Auxiliaries, J. D. Morgan. Power Plant Eng., vol. 28, no. 22, Nov. 15, 1924, pp. 1135-1136, 3 figs. Higher vacuum is accompanied by greater power demand for driving auxiliaries; auxiliary steam consumption of surface-condensing plants.

Surface Condensers (Note sur les condenseurs par surface). Bul. Technique du Bureau Veritas, vol. 6, no. 7, July 1924, pp. 131-133, 5 figs. Details of an improved surface condenser and tests carried out showing saving of steam of 4.5 per cent.

CONDUITS

ECONOMIC DESIGN. A Method for the Economic Design of Penstocks, H. L. Doolittle. Mech. Eng., vol. 46, no. 11a, mid-Nov. issue, 1924, pp. 785-792, 13 figs. Presents original, simple graphic method for economic design; given certain flow of water, length of piping, and profile of penstock, curves can be rapidly drawn for pipes of varying diameter which indicate frictional loss and its value in dollars. Paper is accompanied by discussion, by R. L. Daugherty, in which algebraic solution of problem is presented.

CONVEYORS

FACTORY. Conveyor Plants for Modern Manufacturing Processes, Hauck. Eng. Progress, vol. 5, no. 10, Oct. 1924, pp. 219-223, 16 figs. Describes various types employed by large manufacturing firm, including gravity conveyors, lifts, belt conveyors, etc.

COOLING TOWERS

EFFICIENCY. Water-Cooling-System Efficiency, V. J. Azbe. Mech. Eng., vol. 46, no. 11a, mid-Nov. issue, 1924, pp. 799-805, 12 figs. Formulas and charts for use in predetermining performance of water-cooling systems at different seasons; cooling possibilities under different weather conditions and in different sections of country.

COPPER CASTINGS

CUPOLA. Cupola Castings, T. F. Jennings. Metal Industry (N. Y.), vol. 22, no. 11, Nov. 1924, pp. 444-445. Making copper castings from cupola melted metal. Paper presented at joint meeting of Am. Foundrymen's Assn' and Inst. Metals.

COPPER METALLURGY

SMELTING. The New Magma Copper Smelter, H. A. Ruth. Eng. & Min. Jl.—Press, vol. 118, no. 18, Nov. 1, 1924, pp. 685-693, 13 figs. Engineering details of model installation of Magma Copper Co., near Superior, Ariz., equipped with latest features of modern smelting practice. Designed for treating flotation and table concentrates, direct-smelting ores, custom ores, and concentrates.

CORONA

LOSSES BETWEEN WIRES. Corona Losses Between Wires at Extra High Voltages, C. F. Harding. Am. Inst. Elec. Engrs.—Jl., vol. 43, no. 10, Oct. 1924, pp. 932-940, 26 figs' Results of corona loss tests upon three sizes of cables at voltages varying from 100 to 620 kv. and spacings from 18 to 38 ft. are reported from Engng. Experiment Station of Purdue University; these results, reduced to standard 1,000 ft. of transmission line, are compared with corresponding values calculated from Peek's formula for similar conditions of operation; describes tower line and method of measurement of losses in high-voltage circuit; three methods of attacking problem of modified transmission-line design for elimination of excessive corona losses are outlined.

COST ACCOUNTING

BALANCE-SHEET ANALYSIS. Balance Sheet Analysis, A. Wall. Mgt. & Administration, vol. 8, no. 5, Nov. 1924, pp. 521-524. Purpose is to read figures of series of balance sheets so as to bring out more clearly, or emphasize, trends or strains in financing not easily recognizable in dollar figures.

SMALL PLANTS. Correct Costs at Little Expense, G. G. Thompson. Mgt. & Administration, vol. 8, no. 5, Nov. 1924, pp. 517-520. System for small and medium-size plant.

CRANES

LOCOMOTIVE. Putting Locomotive Cranes to Work, Geo. E. Titcomb. Mgt. & Administration, vol. 8, no. 5, Nov. 1924, pp. 475-478, 10 figs. Discusses types which are of greatest use in manufacturing plants.

CRANKSHAFTS

FAILURES. Crankshaft Failures on Gas and Oil Engines, E. Ingham. Power, vol. 60, no. 19, Nov. 4, 1924, pp. 719-720. Testing for alignment; Wöhler's experiments on fatigue of metals; brittleness in crankshafts; points out that failure is rarely sudden, and shaft should be examined frequently for signs of fracture.

CULVERTS

CORRUGATED. Corrugated Culverts on the Western Pacific, C. P. Gilmore. Eng. & Contracting (Railways), vol. 62, no. 4, Oct. 15, 1924, pp. 875-878, 3 figs. Twelve years experience in replacement of wooden structures through high and low fills. Costs of installation.

CORRUGATED IRON. Solving the Small Bridge Problem with Large-Diameter Corrugated Iron Pipe, H. B. Kenny. Good Roads, vol. 67, no. 3, Sept. 1924, pp. 83-84, 2 figs. Discusses installation of large-diameter corrugated-iron culverts, and methods employed.

CUTTING METALS

OXYGAS MACHINE. Oxygas Cutting-out Machine. Machy. (Lond.), vol. 25, no. 631, Oct. 30, 1924, pp. 153-154, 3 figs. Details of oxygen cutting machine using coal gas as combustible for providing initial and auxiliary heat.

CYLINDERS

AUTOMOBILE, MACHINING. Machining Cylinders for the Gray Motor, H. Campbell. Am. Mach., vol. 61, no. 17, Oct. 23, 1924, pp. 659-662, 10 figs. Departmental layout; routing of work with descriptions and illustrations of interesting operations; three-station cylinder fixture; multiple tapping machines; finish boring.

D

DAMS

BARRAGE. Barrage Dams of Great Height Resisting by Their Own Weight (Barrages de grande hauteur résistant par leur propre poids), E. Suter. Bul. Technique de la Suisse Romande, vol. 50, nos. 20 and 22, Sept. 27 and Oct. 25, 1924, pp. 249-252 and 273-277, 7 figs. Discusses recent French regulations and triangular profiles; calculation of resistance.

CONCRETE. Building Black Canyon Irrigation Dam in Western Idaho, W. Ward. Eng. News-Rec., vol. 93, no. 21, Nov. 20, 1924, pp. 818-823, 5 figs. Concrete dam of 184-ft. max. height built by Bur. of Reclamation to save private irrigation district; water level controlled by drum gates: concrete proportioned by Abrams method.

Large Concrete Dam to Be Built at American Falls. Eng. News-Rec., vol. 93, no. 19, Nov. 6, 1924, pp. 741-742, 2 figs. Designs out for bids call for gravity overfall dam in gorge with non-automatic radial crest gates.

MOVABLE. New Type Movable Dam Guards Soo Canal Locks, L. C. Sabin. Eng. News-Rec., vol. 93, no. 17, Oct. 23, 1924, pp. 656-660, 6 figs. Emergency structure insures service continuity to lock gates of St. Marys Falls canal, Mich.; bridges, wicket frames and needles handled by huge derricks.

MULTIPLE-ARCH. The Tirso Dam, Sardinia. Engineering, vol. 118, no. 3071, Nov. 7, 1924, pp. 632-635, 15 figs. partly on supp. plate. Project involves regulation of river and conservation of water for irrigation purposes, production of hydro-electric power and drainage of large area to be served by irrigation; multiple-arch dam is said to be highest and most important examples of its type to be built; it is 228 ft. from lowest foundation level to roadway level along top, and has series of 17 reinforced-concrete arches.

DIE CASTING

MACHINES, ALLOYS, AND DIES. Die Casting, N. C. Barnard. Mech. Eng., vol. 46, no. 11, Nov. 1924, pp. 661-669, 23 figs. Types of die-casting machines, representative alloys for use in die casting; die construction; casting problems; advantages gained by use of inserts.

DIESEL ENGINES

EXHAUST TEMPERATURE. The Significance of Exhaust Temperature, P. H. Smith. Engineering, vol. 118, no. 3068, Oct. 17, 1924, pp. 544-547. Gives results of experiments carried out on Carels-type Diesel engine. Paper read before Diesel Engine Users Assn.

OPERATION. Modern Diesel Engine Installation, F. Veitenheimer. Military Engr., vol. 16, no. 88, July-Aug. 1924, pp. 311-315, 5 figs. Discusses operation and operating cost of Diesel engine. Describes a stationary Diesel engine plant installed by U. S. Engr. Dept. in Hawaiian Islands; main equipment consists of three 135-hp. 4-cycle single-acting vertical type 6-cylinder Diesel engines, each directly connected to a 90-kw. 125-volt d. c. generator.

DISKS

ROTATING, THEORY OF. The Rotating Disk, E. L. Thearle. Mech. Eng., vol. 46, no. 11, Nov. 1924, pp. 670-674, 9 figs. In Foppl's classical theory of eccentric rotating disk, center of gravity is assumed to lie always in plane of deflected shaft, and angular acceleration is neglected entirely; solution leads to critical speed, at which shaft deflection becomes infinite; since mechanism such as a De Laval turbine would become inoperative under such conditions, idea of "violent vibration" at critical speed is introduced; author attempts to develop more rational theory by writing down equations of motion of particles of disk in more general form and introducing idea of possible angular acceleration; maximum shaft deflection at critical speed is found to have finite value.

DRAWINGS

DRAFTING-ROOM METHODS. Better Methods in the Drafting Room, J. Flodin. Indus. Mgt. (N. Y.), vol. 68, no. 5, Nov. 1924, pp. 293-296. Problems of chief draftsman; taking care of file or reference prints; issuing and keeping proper account of prints; method of recording patterns and dies; etc.

DROP FORGING

COSTS, RELATION TO OPERATION. Relation of Drop Forge Costs to Percentages of Operation, R. T. Herdegen. Forging-Stamping—Heat Treating, vol. 10, no. 11, Nov. 1924, pp. 405-409, 1 fig. Data compiled from various forge shops. Paper presented at Am. Drop Forging Inst.

E

EDUCATION, ENGINEERING

CAMBRIDGE UNIVERSITY. Engineering Education at Cambridge University. Engineer, vol. 138, no. 3591, Oct. 24, 1924, pp. 464-464, 10 figs. partly on supp. plate. Connected account of rise and development of engineering teaching in University; describes accommodation and equipment of laboratories; results which have been striven for and, to large extent, gained.

GERMANY. Technical Travelling Exhibit of the V. D. I. (Die betriebstechnische Wanderausstellung des Vereines deutscher Ingenieure), Ph. Wisotzky. Sparwirtschaft, vol. 1, nos. 15-16, Aug. 1924, pp. 73-74. Particulars regarding travelling exhibit representing various engineering lines, including State Railways, prepared by V. D. I. and circulating among principal industrial towns in Germany and Austria.

EJECTORS

STEAM-JET VACUUM. The Steam Jet Vacuum Ejector. Mech. World, vol. 76, nos. 1973 and 1974, Oct. 24 and 31, 1924, pp. 264-265 and 277-278, 5 figs. Discusses principles underlying action of ejector and gives equations and methods whereby, with suitable coefficients, vacuum ejector may be designed.

ELASTICITY

MODULUS OF. The Variation of Young's Modulus at High Temperatures, C. H. Lees, J. P. Andrews and L. S. Shave. Physical Soc. Lond.—Proc., vol. 36, pt. 5, Aug. 15, 1924, pp. 405-416, 3 figs. Shows by experiments that for fused quartz modulus changes only slightly between 0 deg. and 800 deg. cent.; for platinum, nickel and aluminum wire decreases with rise of temperature, at low temperatures slowly, at high more rapidly.

ELECTRIC CIRCUITS

COUPLED, TRANSIENT PHENOMENA IN. A Problem in Transient Phenomena in Coupled Circuits, E. E. Witmer. Franklin Inst.—Jl., vol. 198, no. 2, Aug. 1924, pp. 217-229, 2 figs. Methods of integration and evaluation of one-parameter integral; approximations and interpretation of results; time lags; effect of obliquity and eccentricity of trajectory on curve of electromotive force.

COUPLING. Coupling Between Two Oscillatory Circuits, with Some Applications, L. S. Palmer and H. W. Forshaw. Instn. Elec. Engrs.—Jl., vol. 62, no. 334, Oct. 1924, pp. 895-900, 6 figs. Different methods of coupling two oscillatory circuits are classified as follows: (1) indirect coupling through field of force common to both oscillatory circuits, (2) direct coupling through impedance common to both circuits, (3) direct coupling through impedance not included in either oscillatory circuit; describes easy method of obtaining values of two resonant frequencies for each system.

ELECTRIC CONDUCTORS

HEATING. Heating of Large Steel-Cored Aluminum Conductors, R. J. C. Wood. Am. Inst. Elec. Engrs.—Jl., vol. 43, no. 11, Nov. 1924, pp. 1021-1024, 10 figs. Tests made to determine temperature rise, both in still air and in wind, of three sizes of cable.

ELECTRIC DRIVE

GROUP VS. INDIVIDUAL. Froup versus Individual Drives, C. H. S. Tupholme. Mech. World, vol. 76, no. 1973, Oct. 24, 1924, pp. 261-262. Author's impressions of field of application of both group and individual drives, and experiences of engineers in various engineering shops where author has made study of power-transmitting conditions.

IRRIGATION PUMPING. Electrical Applications to Irrigation Pumping, R. H. Cates. Am. Inst. Elec. Engrs.—Jl., vol. 43, no. 11, Nov. 1924, pp. 1042-1046, 4 figs. Application of electric drive to pumping equipment in California.

ELECTRIC FURNACES

HEAT-TREATING. Using Electric Heating Furnaces, A. E. White. Iron Trade Rev., vol. 75, no. 19, Nov. 6, 1924, pp. 1229-1231. Exhaustive survey of electric heat-treating installations provides data for recommended design of furnaces; use of electric heat for forging units and for cyaniding still is in experimental state.

INDUCTION. Horizontal Ring Induction Furnaces. J. A. Seede. Iron Age, vol. 114, no. 13, 1924, pp. 1281-1282, 3 figs. Comparison with electric arc furnaces for metals; attractive features of induction melting; results from 6-ton unit.

LOW-GRADE IRON AND SCRAP. Using the Electric Furnace, J. T. MacKenzie. Foundry, vol. 52, no. 21, Nov. 1, 1924, pp. 859-860. Company making cast-iron pipe installs electric melting unit to handle low-grades of iron and scrap; direct metal tried out; segregation of manganese sulphide causes trouble. (Abstract.) Paper read before Am. Foundrymen's Assn.

STEEL. The Care of the Electric Steel Furnace, D. D. MacGuffie. Metal Industry (Lond.), vol. 25, no. 18, Oct. 31, 1924, pp. 429-430. Discusses chief points requiring attention in case of electric steel furnaces; deals chiefly with Heroult basic furnace, giving particulars as to procedure for lining out furnace, making it ready for melting, charging, and points of concern in melting and finishing off metal.

ELECTRIC GENERATORS, A.C.

Self-Excitation. The Self-excitation of the Dynamo, H. J. S. Heather. World Power, vol. 2, no. 10, Oct. 1924, pp. 232-236, 6 figs. Deals with self-excitation in cast of series- and shunt-wound machines.

ELECTRIC LOCOMOTIVES

Developments. Recent Developments in Electric Locomotives. Mech. Eng., vol. 46, no. 11, Nov. 1924, pp. 696-698. Discussion of two papers by N. W. Storer and A. H. Armstrong, read at spring meeting of A.S.M.E.

Direct-Current. Electric Locomotives for the Detroit & Ironton, F. Allison, H. L. Maher and L. J. Hibbard. Ry. Age, vol. 77, no. 16, Oct. 18, 1924, pp. 685-686, 1 fig. D. c. driving motors will receive power from 22,000-volt a. c. trolley. See also Ry. Rev., vol. 75, no. 16, Oct. 18, 1924, pp. 578-580, 1 fig.

Dynamometer-Car Tests. Tests of Electric Locomotive, Norfolk & Western Ry., T. C. Wurts. Ry. Rev., vol. 75, no. 16, Oct. 18, 1924, pp. 581-583, 1 fig. Dynamometer car used to produce data on actual road performance of new type LC-2 motive power.

Motor-Generator. Motor-Generator Locomotives for the New Haven. Ry. Age, vol. 77, no. 16, Oct. 18, 1924, pp. 697-698, 2 figs. Alternating current from trolley converted to direct current for motors on locomotive.

Single-Phase. New Type Electric Locomotives for New York New Haven & Hartford R.R. Ry. Rev., vol. 75, no. 17, Oct. 25, 1924, pp. 623-634. Details of single-phase locomotives which do not have a. c. traction motors; each locomotive contains travelling substation and will be equipped with synchronous motor-generator set for converting 11,000-volt, 25-cycle single-phase supply to direct current.

ELECTRIC MOTORS, A.C.

Starting. A Novel Method of Starting Polyphase Synchronous Motors, E. V. Clark. Instn. Elec. Engrs.—Jl., vol. 62, no. 334, Oct. 1924, pp. 878-881. States that difficulty experienced in starting up polyphase synchronous motor simultaneously with alternator supplying circuit is greatly reduced if alternator is of synchronous type, and that with small laboratory plant this method of starting is extremely simple; outlines scheme for operating small synchronous motors with this method of starting and cites three fields where method may be of use, namely, testing shops of manufacturers, laboratories and emergency use.

ELECTRIC POWER

Generation from Coal Fields. Advantages of Generating and Distributing Electrical Energy Direct from Coal-Fields, J. B. Hamilton. Can. Inst. Min. & Metallurgy—Monthly Bul., no. 150, Oct. 1924, pp. 667-674. Shows advantages of central power plant.

ELECTRIC RAILWAYS

Co-ordination with Motor-Bus Transportation. Co-ordination of Other Forms of Transportation with the Electric Railway, P. Shoup. Elec. Ry. Jl., vol. 64, no. 15, Oct. 11, 1924, pp. 625-628. Points out that eventually buses will have to carry same obligations as traction companies; duplication of service impairs efficiency and results in higher fares. (Abstract.) Paper presented before Am. Elec. Ry. Assn.

Overhead Distribution and Contact Systems. Overhead Distribution and Contact Systems, R. E. Wade. Ry. Elec. Engr., vol. 15, no. 10, Oct. 1924, pp. 358-365, 18 figs. Factors in heavy electric-traction installations which make for economy and efficiency.

ELECTRICAL MACHINERY

Design. Dynamo and Motor Design, F. Creedy. Electrician, vol. 93, nos. 2415, 2416 and 2418, Aug. 29, Sept. 5 and 19, 1924, pp. 226-228, 252-253 and 312-313, 10 figs. Recent developments in electrical machinery.

Standardization. Electrical Machinery Committee. Am. Inst. Elec. Engrs.—Jl., vol. 43, no. 10, Oct. 1924, pp. 974-978. Committee consideration of standardization matters in their initial stages; service conditions; application recommendations.

Variable-Speed Transmissions. Practical Pointers on How Variable Speeds Can Be Obtained. Indus. Engr., vol. 82, no. 11, Nov. 1924, pp. 519-524 and 555, 19 figs. Describes types of equipment used for adjusting speeds to needs of a process or to work performed by machines singly or in a group.

ELECTRIC TRANSMISSION LINES

Calculation. The Hyperbolic Method of Transmission Line Solution, H. Waddicot. Wld. Power, vol. 2, nos. 8 and 9, Aug. and Sept. 1924, pp. 97-102 and 173-176, 7 figs. Aug.: Deals with mathematical solution for terminal conditions and included fundamental line equations, giving numerical examples of hyperbolic method of solution; graphical solution for various terminal conditions; comparison of localized admittance methods. Sept.: Electrical conditions at intermediate points.

Design. Power Transmission Lines: Aspects of their Design, Wm. T. Taylor. Elec. Rev., vol. 95, nos. 2444, 2445 and 2446, Sept. 26, Oct. 3 and 10, 1924, pp. 462-463, 515-517 and 551-552, 4 figs. Economic requirements of design; physical and construction data; loading data.

Short-Circuit Currents, Calculating. Equivalent Single-Phase Networks, R. A. Shetzline. Am. Inst. Elec. Engrs.—Jl., vol. 43, no. 11, Nov. 1924, pp. 1014-1020, 9 figs. For calculating short-circuit currents due to grounds on 3-phase star grounded systems.

220,000-Volt. Transmission at 220 Kv. on the Southern California Edison System. Am. Inst. Elec. Engrs.—Jl., vol. 43, nos. 10 and 11, Oct. and Nov. 1924, pp. 901-908 and 1025-1030, 20 figs. Symposium with following contributions: Description of System and Operating Experiences, H. Michener; Automatic Protection—Balanced Relays and Flashover Control, E. R. Stauffacher; Economic Studies of Transmission Line Design with Particular Reference to Mechanical Features, C. B. Carlson; Economic Studies of Transmission Line Design with Particular Reference to Electrical Features, W. D. Shaw; Vibration of Conductors and Overhead Ground Wires, J. M. Gaylord; Location and Right of Way, V. D. Elliott.

ELECTRIC WELDING

Aluminum. Electric Spot Welding Aluminum or Duralumin, J. W. Meadowcroft. Am. Welding Soc.—Jl., vol. 3, no. 9, Sept. 1924, pp. 10-11. Author finds that best results are obtained by using steel as resistance material and by interposing superposed pieces of aluminum or duralumin between sheets of steel.

ELECTRIC WELDING, RESISTANCE

Spot. Spot Welding, W. Remington. Am. Welding Soc.—Jl., vol. 3, no. 9, Sept. 1924, pp. 23-26. Report of the resistance welding committee of Am. Bur. Welding.

EMPLOYEES

Recording Worker's Personality. Recording the Worker's Personality, D. A. Laird. Indus. Mgt. (N. Y.), vol. 68, no. 5, Nov. 1924, pp. 307-314, 13 figs. Going beyond working record in promoting employees, that is, supplementing records of employee's work with records which will furnish key to his personality.

EMPLOYMENT MANAGEMENT

Service Department. Organizing Personnel Work in a Textile Mill, E. C. Gould. Indus. Mgt. (N. Y.), vol. 68, no. 5, Nov. 1924, pp. 280-282. Describes plan of service department of a Lowell textile mill, designed to give mill executives responsibility for initiating and carrying out ideals of satisfactory industrial relations.

EVAPORATORS

Low-Pressure. Low-Pressure Evaporators, E. Ellsberg. Am. Soc. Nav. Engrs.—Jl., vol. 36, no. 3, Aug. 1924, pp. 434-465, 5 figs. Deals with submerged-coil type. Based on author's experience as planning and drafting superintendent at Navy Yard, Boston, in design, installation and operation of low-pressure evaporators on several vessels of the Navy.

EXPLOSIVES

Liquid Oxygen. Liquid Oxygen as a Substitute for Dynamite, F. W. O'Neil. Contract Rec., vol. 38, no. 40, Oct. 1, 1924, pp. 968-972, 10 figs. At large-scale demonstration of use of this explosive, cost per ton of rock broken was 1.28 cents against estimated cost of 3 cents with dynamite.

F

FANS

Centrifugal. Experiments on the Distribution of Air in Centrifugal Fans and on Re-entry Phenomena, H. Briggs and Jas. N. Williamson. North of England Inst. Min. & Mech. Engrs.—Trans., vol. 74, part 3, Mar. 1924, pp. 79-89 and (discussion) 89-94, 21 figs. Experiments bearing upon manner in which centrifugal fan of drum-type deals with air it discharges. See also (discussion) in part 4, June 1924, pp. 99-103, 3 figs.

Mine. Some Features of Ventilating Fans at 164 Coal and Metal Mines, D. Harrington and M. W. von Bernewitz. U. S. Bur. Mines, Reports of Investigations, no. 2637, Sept. 1924, 5 pp. Discusses various features of fan installations at mines where disasters have been studied, and handling of air currents at time of and after disasters, and includes also loss of life and number of men injured.

FATIGUE

Industrial. Fatigue a Vital Consideration of Forge Shop Management, Jos. Thompson. Forging—Stamping—Heat Treating, vol. 10, no. 11, Nov. 1924, pp. 409-412. Consideration of well being of employes furnishes basis for co-operation; lack of sympathetic understanding cause of industrial unrest. Paper presented before Am. Drop. Forging Inst.

FELDSPAR

Mining. Feldspar's Many Uses, A. S. Taylor. Cement, Mill & Quarry, vol. 25, no. 7, Oct. 5, 1924, pp. 30-34, 15 figs. Mentions in a general way industrial uses of feldspar. Describes activities of Crown Point Spar Co. in mining feldspar which outcrops on crest of Breed mountain, about a mile to south of village of Crown Point, northern New York, and in preparing it for various market purposes.

FILTRATION PLANTS

Decatur, Ill. Effect of the New Impounding Reservoir on Filter Plant Operation at Decatur, W. E. Stanley and E. E. Ruthrauff. Am. Water Wks. Assn.—Jl., vol. 12, no. 1, Sept. 1924, pp. 110-126, 8 figs. Details of gravity type rapid mechanical filtration plant; process involves coagulation with alum, sedimentation, filtration, and sterilization with chlorine; operating records; capacity and loadings; character of river water.

Operation. "Tricks of the Trade" in Filter Plant Operation. Eng. & Contracting (Water Works), vol. 62, no. 4, Oct. 8, 1924, pp. 783-789, 3 figs. Some of the ordinary practice employed by filtration superintendents in Ohio in conduct of their plants.

Richmond, Va. Features of New Water Filtration Plant at Richmond, Va., W. Donaldson. Eng. News-Rec., vol. 93, no. 16, Oct. 16, 1924, p. 623, ? figs. Plant build in old coagulating basins provides for mixing and coagulation, mechanical filtration and aeration.

FLAMES

Jet. Jet Flames, W. Payman. Fuel, vol. 3, no. 11, Nov. 1924, pp. 403-406, 1 fig. Study of flames produced by gases issuing from jets without primary aeration.

Speed of, Nitrogen Dilution and. The Influence of Nitrogen Dilution on the Speed of Flame, C. Campbell and O. C. de C. Ellis. Chem. Soc.—Jl., vol. 125, Sept. 1924, pp. 1957-1963, 4 figs. Results of experiments.

FLOORS

Concrete Beams as Ceiling. Saving Money by Leaving Concrete Floorbeams as Ceiling, Rob. D. Snodgrass. Eng. News-Rec., vol. 93, no. 16, Oct. 16, 1924, pp. 630-631, 1 fig. Points out that economy and appearance may both be served in concrete buildings by discarding flat-ceiling idea.

FLOTATION

Ores. Notes on Flotation Test Work at Anyox on Granby Ores, A. C. Halferdahl. Can. Inst. Min. & Metallurgy—Monthly Bul., no. 150, Oct. 1924, pp. 711-713. Results of laboratory study and experimentation.

FLOW OF FLUIDS

Stream Lines. An Electrical Method for Tracing Stream Lines in the Two-Dimensional Motion of a Perfect Fluid, E. F. Relf. Lond., Edinburgh, & Dublin philosophical Mag. & Jl. Sci., vol. 48, no. 284, Sept. 1924, pp. 535-539, 4 figs. Describes apparatus designed and constructed for use in Aerodynamics Dept. of Nat. Physical Laboratory, for plotting rapidly and accurately stream lines round an obstacle.

FLOW OF GASES

Theory. The Flow of Compressible Fluids, Treated Diemensionally, W. N. Bond. Physical Soc. Lond.—Proc., vol. 36, pt. 5, Aug. 15, 1924, pp. 367-378, 5 figs. Theoretical and experimental investigation of variation of pressure, density, temperature and velocity of a gas moving at speeds comparable with that of sound in gas.

FLOW OF STEAM

Velocity. Flow of Steam and Condensation as Affected by High Pressure, Horizontal Offsets and Valves, L. Ebin and R. L. Lincoln. Am. Soc. Heating & Vent. Engrs.—Jl., vol. 30, no. 6, June 1924, pp. 475-490, 9 figs. Deals with effect of high pressure on maximum velocity, valves on maximum capacity, and of horizontal offsets on maximum velocity.

FLOW OF WATER

Return Lines. Determining Dry Return Proportions, R. V. Frost. Am. Soc. Heating & Vent. Engrs.—Jl., vol. 30, no. 5, May 1924, pp. 359-364, 2 figs. Analysis of factors governing flow of water and air in return lines, showing how they must be taken into account in properly proportioning dry-return capacities.

FLUORSPAR

MINING. How Fluorspar Is Produced, E. C. Reeder. Du Pont Mag., vol. 18, no. 10, Oct. 1924, pp. 2-4, 4 figs. Notes on deposits and mining methods. Almost all domestic production comes from southern Illinois and western Kentucky.

FORGINGS

SHOCK DETECTION DURING TREATMENT. The Clink Detector for Steel Ingots and Forgings. Engineering, vol. 118, no. 3071, Nov. 7, 1924, p. 658, 6 figs. Instrument, when attached to forging during heating and cooling processes, gives autographic record of any shocks or disturbances which may have taken place.

FOUNDATIONS

REINFORCEMENT AGAINST MINING SUBSIDENCE. The Reinforcement of Buildings and Their Foundations against Mining Subsidence, Jos. Eltringham. North of England Inst. Min. & Mech. Engrs.—Trans., vol. 74, part 2, Jan. 1924, pp 22-33, 11 figs. Methods of arresting subsidence and preventing damage; examples giving result of reinforced-concrete foundations. See also (discussion) in part 3, Mar. 1924, pp. 42-50, 6 figs.

SINKING IN WATER-BEARING MATERIAL. Small Open Caissons Used in Water-Bearing Material. Eng. News-Rec., vol. 93, no. 21, Nov. 20, 1924, pp. 826-827, 2 figs. Method used in sinking foundations of small apartment house in Boston, which involves modifications of method used for First National Bank Building of Boston; two types of caissons used; level of water table lowered by pumping; diver used to excavate sumps.

TEST LOADS. Foundation Test Loads as Affected by Scale, S. D. Carothers. Can. Engr., vol. 47, no. 17, Oct. 21, 1924, pp. 439-442. Narrower the strip the greater the unit resistance if stress on horizontal planes greater than on vertical planes; all widths of strip may give same unit resistance; relation if ground is invariable. From paper presented before Eng. Sec., Int. Mathematical Congress, Toronto.

FOUNDRIES

BUILDING DESIGN. Study of Foundry Building Design. Iron Age, vol. 114, no. 21, Nov. 20, 1924, pp. 1334-1337, 6 figs. Influence of site selection, building layout, material storage and methods of operation on better foundry practice.

COST RECORDING. A System of Foundry Organization and Cost Recording, M. Nicholls. Foundry Trade Jl., vol. 30, no. 426, Oct. 16, 1924, pp. 324-325. Details of successful organization; examples of forms used.

OVERHEAD CHARGES, ALLOCATION OF. Space-Factor Rate v. Hour Rate in the Allocation of Overhead Charges. Foundry Trade Jl., vol. 30, no. 427, Oct. 23, 1924, pp. 661-663. Suggestions for correct allocation of overhead charges.

FREQUENCY CHANGERS

PROBLEMS. Frequency Changers, K. Lubowsky. Electrician, vol. 93, nos. 2421 and 2422, Oct. 10 and 17, 1924, pp. 404-405 and 436-437, 4 figs. Oct. 10: Various systems employed; control problems; load distribution. Oct. 17: Methods of control; need for careful examination.

FUELS

PROBLEMS, CANADA. Report of Institute Fuel Committee. Eng. Jl., vol. 7, no. 11, Nov. 1924, pp. 678-682, 2 figs. Summary of conclusions, introduction, review of preliminary activities, submitted by Fuel Committee of Eng. Inst. Can.

SMOKELESS. Maclaurin Process for Making Smokeless Fuel, E. K. Scott. Power Engr., vol. 19, no. 223, Oct. 1924, pp. 389-390, 2 figs. Principles and details of process.

STORAGE HOUSES. Design Features of a Large Concrete Fuel House, E. L. Crowe. Eng. & Contracting (Buildings), vol. 62, no. 4, Oct. 22, 1924, pp. 929-933, 5 figs. A 750,000-cu. ft. structure for holding sawdust and wood refuse fuel for a 3,000-hp. border installation at mill of Crossett Lumber Co. at Crossett, Ark.

See also Coal; Oil Fuel; Pulverized Coal.

FURNACES, ENAMELING

ELECTRIC. Continuous Conveyor Type Electric Enameling Furnace. West. Machy. Wld., vol. 15, no. 10, Oct. 1924, pp. 351-352, 1 fig. Describes furnace developed by C. C. Armstrong of Armstrong Mfg. Co., Huntington, W.Va., for enameling comparatively flat pieces whereby opening and closing of charging doors is eliminated through medium of a conveyor which carries work through furnace from charging end and discharges it at opposite end. Heating chamber is 9 ft. 8 in. long, 30 in. tall and 32 in. in width.

FURNACES, INDUSTRIAL

COMBUSTION DEVICES. Combustion Devices for Powdered Coal, W. Trinks. Fuels & Furnaces, vol. 2, nos. 5, 6, 7, 8 and 9, May, June, July, Aug. and Sept. 1924, pp. 449-452, 553-556, 663-666, 783-786 and 951-952, 17 figs. May: Theory of powdered-coal burning. June: Feeding devices and feeders. July: Low- and high-pressure burners. Aug. and Sept.: Capacity of burners and method of regulation.

G

GARBAGE DISPOSAL

METHODS. The Disposal of Municipal Refuse, S. A. Greeley. Eng. & Contracting (Water Works), vol. 62, no. 4, Oct. 8, 1924, pp. 813-816. Reviews recent practice in dealing with garbage and rubbish, including how refuse is classified, garbage reduction, Cobwell process, hog feeding, disposal by incineration, Beccari process, and comparison of methods. Paper read at Int. Conference on Sanitary Eng., Lond.

GAS ANALYSIS

MICRO-ANALYSIS. A New Method of Micro-gas Analysis, L. Reeve. Chem. Soc.—Jl., vol. 125, Sept. 1924, pp. 1946-1956, 1 fig. Account of methods adopted for measurement and analysis of gas mixtures consisting of CO_2, CO, hydrogen, and formaldehyde; suggests method for direct analysis of any oxygen present.

GAS ENGINES

HEAT LOSS IN. Heat Loss in Gas Engines, W. T. David. Engineering, vol. 118, no. 3070, Oct. 31, 1924, pp. 629-630, 10 figs. Results of series of measurements of radiation loss and of conduction loss during explosion and subsequent cooling of inflammable mixtures of coal gas and air contained in closed vessel; results emphasize marked influence of temperature on heat loss from working fluid both by conduction and radiation, and that radiation loss per unit area of wall surface increases greatly with cylinder dimensions. (Abstract.) Paper read before Instn. Mech. Engrs.

MISSING PRESSURE IN. The Missing Pressure in Gas Engines, W. T. David. Engineering, vol. 118, no. 3070, Oct. 31, 194, pp. 623-624, 7 figs. Conclusion drawn from closed-vessel experiments in regard to causes responsible for missing pressure; estimated ideal pressures in closed vessel; application of results of closed-vessel experiments to gas engine; reason for low combustion factors realized in gas engines and effect of after-burning upon efficiency. (Abstract.) Paper read before Instn. Mech. Engrs.

GAS TURBINES

INTERNAL-COMBUSTION. The Internal-Combustion Turbine (La turbine à combustion interne), A. Stouvenot and P. Troy. Nature (Paris), no. 2634, Sept. 27, 1924, pp. 203-206, 1 fig. Design and operation of a 5,000-kw. Holzwarth turbine, with eight explosion chambers.

GASES

IGNITION. The Ignition of Gases. Chem. Soc.—Jl., vol. 125, Sept. 1924, pp. 1858-1875, 3 figs. 1st Article, by R. V. Wheeler: Ignition by Impulsive Electrical Discharge. Mixtures of Paraffins with Air. 2nd Article, by R. V. Wheeler and W. Mason: Ignition by a Heated Surface. Mixtures of the Paraffins with Air.

THERMAL QUALITY AND VALUE. Relations of Thermal Quality to Value of Fuel Gases, C. F. Carrier. Chem. & Met. Eng., vol. 31, no. 17, Oct. 27, 1924, pp. 656-657. When used in efficient appliances value per B.t.u. is practically independent of kind of gas burned.

GEAR CUTTING

HELICAL GEARS. A New Double Helical Gear Generator. Engineer, vol. 138, no. 3590, Oct. 17, 1924, pp. 445-447, 9 figs. Improved machine for cutting double helical gear wheels by generating process, designed and built by D. Brown & Sons.

PROJECTOR FOR CUTTER FORMING. Using an Optical Projector for Cutter Forming, R. Grant. Machy. (N. Y.), vol. 31, no. 3, Nov. 1924, pp. 200-201, 3 figs. Procedure followed in duplicating established tooth form with aid of projector.

GEARS

EPICYCLIC. Epicyclic Gears, F. W. and G. H. Lanchester. Instn. Mech. Engrs.—Proc., no. 4, July 1924, pp. 605-631, 17 figs. Notes on function of gear box; epicyclic gear as developed on Lanchester car; definite characteristics of gear boxes; actuating mechanism of epicyclic gear; permissible load carried by teeth and bearings.

Epicyclic Spur-Gear Trains, J. Cryer. Mech. Wld., vol. 76, no. 1969, Sept. 26, 1924, pp. 194-196, 12 figs. Résumé of principles and consideration of applications for ship propulsion and other purposes.

INVOLUTE. Limiting Cases in Involute Spur Gearing, A. B. Cox. Mech. Eng., vol. 46, no. 11, Nov. 1924, pp. 683-691 and (discussion) 691-692, 15 figs. Derives formulas by means of which it is possible to determine smallest number of teeth that involute spur gear can have and yet be a perfect gear; discusses three sets of limiting cases; presents new polar formula for involute which, it is believed, will serve as valuable tool for further analysis of gearing.

GOLD DEPOSITS

BRITISH COLUMBIA. Hillsbar Gold Claim, Yale District, B.C., C. E. Cairnes. Can. Dept. Mines, Geol. Survey, no. 2031, summary report, 1924, part A, pp. 81A-83A. There are eight claims in two parallel and adjoining rows of four claims each; rocks represented include slate, granodierite, and occasional porphyritic dykes.

QUEBEC, CANADA. The Goldfields of North-Western Quebec, S. Brunton. Min. Mag., vol. 31, no. 2, Aug. 1924, pp. 137-146, 7 figs. General account of a new gold region in Canada which is at present attracting much attention, including geology, properties developed, legislation, travel routes, health regulations and official surveys.

GOLD MINES

CANADA. The Rouyn Gold Area, W. M. Goodwin. Can. Min. Jl., vol. 45, no. 43, Oct. 24, 1924, pp. 1049-1052, 5 figs. In northwestern Quebec. Account of preparations for winter work, transportation facilities, administration of Quebec mining act and features that are an integral part of development of any mining district.

GOVERNORS

SPEED-RESPONSIVE, TEST CODE FOR. Test Code for Speed-Responsive Governors. Mech. Eng., vol. 46, no. 11, Nov. 1924, pp. 713-716, 1 fig. Preliminary draft of special supplementary code formulated by A.S.M.E. committee on power test codes.

GRAIN HANDLING

CAR DUMPER. Grain Elevator Operation with Automatic Box Car Unloader. Ry. Rev., vol. 75, no. 19, Nov. 8, 1924, pp. 732-737, 6 figs. Installation of new dumping device at Port Arthur, Can. Nat. Rys., effects large savings in costs of unloading grain from box cars.

RAILWAY TRANSPORTATION. Moving the Crop, Canadian Pacific Railway, E. D. Cottrell. Ry. Rev., vol. 75, no. 19, Nov. 8, 1924, pp. 697-700, 5 figs. Method of handling grain through Winnipeg and North Transcona during rush season.

GRAPHITE

GERMANY. Graphite (Graphit), E. Herm. Bergbau, vol. 37, no. 18, Sept. 4, 1924, pp. 514-517. Occurrence of graphite in various countries and Germany. Production and Uses of German graphite.

GRINDING

CENTERLESS. The New Centerless Method of Grinding, G. W. Binns. West. Machy. Wld., vol. 15, no. 10, Oct. 1924, pp. 335-336, 4 figs. Range and class of work being handled successfully on centerless grinders, an innovation within last few years which has revolutionized art of grinding cylindrical work.

GRINDING MACHINES

SWING-FRAME, PORTABLE AND HAND. Swing-Frame, Portable and Hand Grinding Machines. Am. Mach., vol. 61, no. 17, Oct. 23, 1924, pp. 645-648, 6 figs. Early swing frames; greater freedom of movement needed; electric motor and solid wheel aid in development.

H

HARDNESS

HERBERT PENDULUM TESTER. Comparison of Herbert Pendulum Hardness Tester with Other Hardness Testers, J. O. Keller. Mech. Eng., vol. 36, no. 11a, mid-Nov. issue, 1924, pp. 818-824, 21 figs. Results of tests; data on specimens tested; Herbert pendulum, its action and theory; interpretation of photomicrographs taken on sections.

HEAT

EQUIVALENT VALUES PRODUCED BY FUELS. Determination of Equivalent Value of Heat Produced by Electricity and by Coal (Ueber die Bestimmung des Aequivalentes der elektrisch erzeugten Wärme im Vergleich zu der durch Kohle erzeugten Wärme), F. Rutgers. Schweiz. Elektrotechnischer Verein Bul., vol. 15, no. 8, Aug. 1924, pp. 393-409, 8 figs. Discusses difficulties of determination and shows by a large number of examples how equivalents may be obtained and that they vary between wide limits.

HEAT TRANSMISSION

HEAT FLOW METER. Practical Applications of the Heat Flow Meter, P. Nicholls. Am. Soc. Heating & Vent. Engrs.—Jl., vol. 30, no. 6, June 1924, pp. 439-451, 8 figs. Results of application of heat flow meter for determining thermal constants of certain building structures.

WALLS. Heat Transmission Through Dwelling House Walls. Am. Architect, vol. 126, no. 2455, Sept. 24, 1924, pp. 299-306, 29 figs. Results of tests on various kinds of wall construction, made by Norwegian Government at Trondhjem, Norway.

HEAT TREATING

PRINCIPLES AND APPLICATIONS. Heat Treating—Its Principles and Applications, Chas. H. Fulton, H. M. Henton and Jas. H. Knapp. Iron Trade Rev., vol. 74, nos. 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24 and 26, and vol. 75, nos. 2, 4, 6, 8, 10, 11, 13, 15 and 17, Jan. 10, 24, Feb. 7, 21, Mar. 6, 20, Apr. 3, 17, May 1, 15, 29, June 12, 26, July 10, 24, Aug. 7, 21, 28, Sept. 11, 24, Oct. 9 and 23, 1924, pp. 168-172 and 178, 292-295 and 300, 411-413, 551-554, 671-673, 799-803, 916-920, 1049-1051, 1161-1164, 1434-1437, 1560-1562, 1687-1689, 105-107, 223-225, 355-358, 487-489, 595-598, 673-675, 807-909, 939-941, and 1087-1089, 92 figs. Jan. 10: Heat treating in general. Jan. 24, Feb. 7, 21, Mar. 6 and 20: Normalizing and annealing. Apr. 3, 17, May 1 and 15: Hardening and tempering. May 29, June 12, 26, July 10 and 24: Carburizing and case-hardening. Aug. 7, 21 and Sept. 4: Heat treatment of alloy steels. Sept. 11, 25, Oct. 9 and 23: Electric furnaces.

HEATING AND VENTILATION

FACTORIES. Factory Heating and Ventilation, A. G. King. Domestic Eng. (Chicago), vol. 108, nos. 3, 5, 9 and vol. 109, no. 4, July 19, Aug. 2, 30 and Oct. 25, 1924, pp. 20-23, 21-22 and 51-52, 31-35 and 29-33, 16 figs. For heating factory buildings three general methods are employed; direct heating by pipe coils or radiators, hot-blast heating using heater and fan, or by what is termed "unit eating".

HEAT FROM HUMAN BODY, EFFECT OF. Heat Given Up by the Human Body and its Effect on Heating and Ventilating Problems, C. P. Yagloglou. Am. Soc. Heating & Vent. Engrs.—Jl., vol. 30, no. 8, Aug. 1924, pp. 597-609, 5 figs. Analysis of existing data from technical viewpoint; influence of temperatures, humidity, and air movement upon heat loss; influence of mechanical work; effect of body heat on heating and ventilating problems.

PRACTICE. Some Comments on Present Day Heating and Ventilating Practice, W. S. Timmis. Am. Soc. Heating & Vent. Eng.—Jl., vol. 30, no. 5, May 1924, pp. 395-403, 2 figs. Outlines results of recent investigations in heating and ventilating research.

HEATING, ELECTRIC

COSTS. Costs of Electric Heating, E. F. Collins. Elec. World, vol. 84, no. 17, Oct. 25, 1924, pp. 885-886. Basis of comparison from cost standpoint.

WALL STACKS FOR GRAVITY SYSTEMS. Selecting Wall Stacks Scientifically for Gravity Warm Air Heating Systems, V. S. Day. Am. Soc. Heating & Vent. Eng.—Jl., vol. 30, no. 5, May 1924, 391-394, 2 figs. Presents curves showing heating effect obtainable at registers for variety of stack areas and register for air temperatures.

HEATING, STEAM

CENTRAL. Additional Steam Lines and Plant of the New York Steam Corporation. Power, vol. 60, no. 21, Nov. 18, 1924, pp. 807-808, 2 figs. Steam for both power and heat is distributed at 125-lb. gage, while generation will be at 200 lb., in proposed new steam station; steam in all cases is utilized directly from boilers without power production before entering distributing mains.

District Steam Heating Proves Economical, H. A. Woodworth. Power Plant Eng., vol. 28, no. 21, Nov. 1, 1924, pp. 1107-1110, 5 figs. System using high-pressure steam in St. Louis business district shows considerable saving over use of isolated plants.

HOT-WATER VS. Comparative Tests of Heating Systems. Power, vol. 60, no. 20, Nov. 11, 1924, pp. 783-784, 2 figs. Intermediate-type thermostats are said to be superior to positive; automatic control from central point; results of tests to determine practical disadvantages rather than quantitative savings; heating requirements for steam and hot-water systems in two hotels were compared. (Abstract.) Report of Heat Utilization Committee before Nat. District Heating Assn.

HELICOPTERS

AERODYNAMICS AND CONSTRUCTION. An Introduction to the Helicopter, A. Klemin. Mech. Eng., vol. 46, no. 11a, mid-Nov. issue, 1924, pp. 739-751, 15 figs. Review of aerodynamic and construction data thus far available, together with descriptions of number of modern helicopters; difficulties to be met; lines of development open; possible uses.

HYDRAULIC TURBINES

GOVERNORS. Automatic Speed Regulator for Hydraulic Turbines (Regolatore automatico di velocità per turbine idrauliche). Industria, vol. 38, no. 17, Sept. 15, 1924, pp. 476-479, 4 figs. Design and operation of Parenti regulator.

PROPELLER-TYPE. Propeller-Type Turbines of the Hydroelectric Plant at Wynau, Switzerland. Mech. Eng., vol. 46, no. 11, Nov. 1924, pp. 704-705, 2 figs. Describes use of high-speed propeller-type turbines and gives test data. Translated from Génie Civil, vol. 85, no. 7, Aug. 16.

HYDRO-ELECTRIC DEVELOPMENTS

IMPROVEMENTS. Recent Advances in Hydro-Electric Engineering Practice, L. F. Harza. West. Soc. Engrs.—Jl., vol. 29, no. 9, Sept. 1924, pp. 339-349. Brief history of development of principal parts of hydroelectric stations, and advances that have been made in past 20 years; higher speeds, improved draft tubes, better control apparatus and mechanical refinements are among improvements described.

POWER RATES. Power Rates in Hydro Development, Rob. F. Ewald. Elec. World, vol. 84, no. 19, Nov. 8, 1924, pp. 993-995, 1 fig. Economic limits of development of water power are fixed by maximum rates for various periods; computations by means of "energy drawn-down diagrams" explained.

HYDRO-ELECTRIC PLANTS

ICE TROUBLES. Combating Ice Trouble in Water Power Plants in Norway, A. Ruths. Eng. & Contracting (Water Works), vol. 62, no. 4, Oct. 8, 1924, pp. 805-809. Conditions encountered and methods employed. Paper presented at World Power Conference, Lond.

LOW-HEAD POWER SITES. Redevelopment Improves Output of Low-Head Power Sites, H. W. Taylor. Eng. News-Rec., vol. 93, no. 19, Nov. 6, 1924, pp. 754-756, 3 figs. Output, which was restricted by unregulated flow, was improved by combining head of two plants; installations based on flow studies; describes new power house on Housatonic River of Smith Paper Co., Lee, Mass.

NEWFOUNDLAND. The Humberarm Hydro-electric Development in Newfoundland. Engineer, vol. 138, no. 3593, Nov. 7, 1924, pp. 514-517, 17 figs. partly on p. 526. Scheme will provide a storage of 30,000,000,000 cu. ft. of water, representing theoretical effective horsepower of 113,000; details of arrangement of dam, intake, canals and pipe line, power house and equipment.

SAGUENAY RIVER, QUEBEC. Building an Hydro-Electric Plant on Saguenay River. Eng. News-Rec., vol. 93, nos. 16, 17 and 18, Oct. 16, 23 and 30, 1924, pp. 616-619, 662-665 and 702-705, 18 figs. Electrically driven construction equipment used entirely on 500,000-hp. operation in Northern Quebec; work lasts through three sub-arctic winters; 35-mi. service railway used. Oct. 16: developing access and habitation. Oct. 23: Installing plant and power. Oct. 30: Construction progress and methods.

STANDARD TESTS. Standard Tests for Hydraulic Power Plants. Instn. Mech. Engrs.—Proc., no. 4, July 1924, pp. 567-587, 1 fig. Discussion on draft standard test code for hydraulic power plants drawn up by joint committee of Instn. Civ. Engrs. and Instn. Mech. Engrs.

WINTER RECONSTRUCTION. Winter Reconstruction at the Spier Falls (N. Y. Power Plant, C. Voetsch. Eng. News-Rec., vol. 93, no. 20, Nov. 13, 1924, pp. 791-795, 6 figs. Old foundations adapted to suit larger units; unwatering part of tailrace is difficult problem; methods and results of winter concreting.

HYDROGRAPHY

INTERNATIONAL HYDROGRAPHIC BUREAU. The International Hydrographic Bureau, Geo. E. Brandt. U. S. Nav. Inst.—Proc., vol. 50, no. 260, Oct. 1924. pp. 1658-1664. Its character, organization and scope.

I

ICE PLANTS

DEVELOPMENT. Forty Years Development in Ice and Refrigerating Plants, H. P. Hill. Nat. Engr., vol. 28, no. 10, Oct. 1924, pp. 479-485, 4 figs. Early history of refrigeration and description of early type of machines. Recent progress in this field. Paper read at Nat. Assn. Stationary Engrs.

IGNITION

AUTOMOBILE ENGINES. Magnetos and Coils. Autocar, vol. 53, no. 1511, Oct. 3, 1924, pp. 629-631, 16 figs. Review of some of the ignition appliances likely to be widely used in 1925.

IMPACT TESTING

NOTCHED-BAR TESTS. Measuring Metal's Resistance to Shock, R. G. Waltenberg. Chem. & Met. Eng., vol. 31, no. 17, Oct. 27, 1924, pp. 657-658. Study of impact tests on monel metal and new methods of obtaining figures indicative of toughness of metal tested.

INDUSTRIAL MANAGEMENT

METHODS AND PRINCIPLES. Shop Management, Fred. W. Taylor. Mech. Eng., vol. 46, no. 11a, mid-Nov. issue, 1924, pp. 806-807. Summary of paper presented in June 1903, dealing with management; high wages and low labor costs; planning development; functional management and foremanship; objections to usual systems of wage payment; recommended wage system; time study; personnel relations and welfare work.

PRINTED FORMS. The Designing of Printed Forms, P. M. Atkins. Indus. Mgt. (N. Y.), vol. 68, no. 4, Oct. 1924, pp. 235-241, 7 figs. Discusses principal points to be considered in design of forms.

PRODUCTION INCREASE. No Safe Short Cut to High Production, H. H. Farquhar. Am. Mach., vol. 16, no. 19, Nov. 6, 1924, pp. 727-729. Effect of installing incentive-payment schemes without proper preparation; efforts to increase production must suit local conditions; responsibilities of management and its essential functions. Paper presented at Nat. Machine Tool Bldrs.' Assn.

PURCHASING AGENT. The Qualifications of a Purchasing Agent, C. T. Yates. Taylor Soc.—Bul., vol. 9, no. 5, Oct. 1924, pp. 230-232. How purchasing agent functions and what he contributes in scientifically managed plant.

STATISTICAL ANALYSES. Analyzing Statements of Operating Results, Geo. S. Cremer and Wm. R. Drachbar. Mgt. & Administration, vol. 8, no. 5, Nov. 1924, pp. 507-508, 3 figs. Gives some of the uses of deep-cutting statistical analyses.

INDUSTRIAL ORGANIZATION

COST REDUCTION. Organizing a Business for Cost Reduction, J. H. Van Deventer. Indus. Mgt. (N. Y.), vol. 68, no. 4, Oct. 1924, pp. 193-197. Discusses part that cost department should play in general program of company progress.

EXECUTIVE CONTROL. Organization for Successful Operation, B. A. Franklin. Mgt. & Administration, vol. 8, no. 5, Nov. 1924, pp. 513-516. Discusses important requirements to be met, and methods to be followed for upbuilding of smoothly operating and result-getting organization.

PLAN. Business Organization from a New Viewpoint, E. P. Hyde. Indus. Mgt. (N. Y.), vol. 68, no. 5, Nov. 1924, pp. 273-280. Plan of organization is suggested for large business engaged in both manufacture and sale of technical commodity, maintaining technical departments for manufacturing and sales development, and conducting other activities auxiliary to business.

INSPECTION

METHODS. Inspection Methods Symposium. Soc. Automotive Engrs.—Jl., vol. 15, no. 5, Nov. 1924, pp. 437-439 and 466. Gives abstracts of three papers, by A. H. Frauenthal, C. S. Stark, and C. J. Jones, respectively, followed by discussion.

INSULATING MATERIALS, ELECTRIC

EVALUATION. Evaluation of Insulating Materials, L. E. Barringer. Elec. World, vol. 84, no. 18, Nov. 1, 1924, pp. 950-952, 10 figs. Difficulty encountered in formulation of tables of properties that can be used for comparisons; uniform testing methods being used that will standardize practice.

INSULATORS, ELECTRIC

HIGH-TENSION. High Voltage Insulators, A. Collins. Electrician, vol. 93, no. 2422, Oct. 17, 1924, pp. 438-439, 3 figs. Draws attention to bearing of time-voltage characteristic upon factor of safety of insulation of electric plant and describes method employed by Micanite & Insulators Co. in carrying out commercial tests on high-voltage insulators.

MANUFACTURE. Manufacture of High-Voltage Insulators, M. H. Hunt. Chem. & Met. Eng., vol. 31, no. 19, Nov. 10, 1924, pp. 728-733, 10 figs. Brief exposition on raw material and processes of insulator manufacture, with particular reference to operations at Westinghouse company's plant at Emergyville, Cal.

INTERNAL-COMBUSTION ENGINES

GAS DISTRIBUTION. Determination of Gas Distribution in Internal-Combustion Engines by Gas Analysis, G. W. Jones, W. P. Yant and L. B. Berger. U. S. Bur. Mines—Reports of Investigations, no. 2631, Aug. 1924, 6 pp., 4 figs. on supp. plates. Describes simple portable apparatus for making determination; tests showing results obtained from engine having good distribution, and tests made under road conditions on engine giving poor distribution.

SYNCHRO-BALANCE. The Synchro-Balance Internal-Combustion Engine: Empire Exhibition. Engineering, vol. 118, no. 3069, Oct. 24, 1924, p. 593, 4 figs. Describes mechanism employed for transforming reciprocating motion of pistons into rotary motion of crankshaft.

See also Airplane Engines; Automobile Engines; Diesel Engines; Gas Engines; Gas Turbines; Oil Engines.

IRON ALLOYS

GRAY-IRON. The Analysis of Grey Iron Foundry Alloys. Foundry Trade Jl., vol. 30, nos. 415, 416, 418, 421, 422, 423, and 424, July 31, Aug. 7, 21, Sept. 11, 18, 25 and Oct. 2, 1924, pp. 89-91, 118-119, 165-166, 221-222, 268-269 and 290-291, 10 figs. Methods for analysis of pig-iron, cast iron (castings), ferro-silicon, speigel, silico-speigel, and ferro-manganese, which are, in author's opinion, most applicable to gray iron foundry practice.

IRON AND STEEL

INDUSTRIAL POSSIBILITIES, BRITISH COLUMBIA. Possibilities for an Iron and Steel Industry in British Columbia, C. P. W. Schwengers. Can. Inst. Min. & Metallurgy—Monthly Bul., no. 149, Sept. 1924, pp. 589-593. Subject is approached from view points of business man rather than from that of technologist.

IRON CASTINGS

CONTRACTION AND WARPING. Contraction and Warping in Castings, J. Gray. Foundry Trade Jl., vol. 30, no. 427, Oct. 23, 1924, p. 348. Report of paper read to Inst. Brit. Foundrymen.

SULPHUR AS HARDENING AGENT. Sulphur as a Hardening Agent, R. H. Palmer. Foundry, vol. 52, no. 22, Nov. 15, 1924, pp. 894-896, 8 figs. Series of experiments carried out to determine relative hardening value of varying amounts of sulphur added to iron which later was poured into chill molds.

IRON, PIG

CHARACTERISTICS. Characteristics that Chemical Analysis Fails to Disclose in Pig-Iron and Castings, W. E. Jominy. Foundry Trade Jl., vol. 30, no. 428, Oct. 30, 1924, pp. 371-376, 16 figs. Results of author's examination of pig-iron samples over period of four months from five different blast furnaces; gives comparative strengths of irons produced from coke furnaces and those from charcoal furnaces. (Abstract.) Paper read before Am. Foundrymen's Assn. See also Metal Industry (Lond.), vol. 25, no. 18, Oct. 31, 1924, p. 432, 2 figs.

IRRIGATION

LEGISLATION, U.S. Irrigation and Drainage Laws Critically Reviewed. Eng. News-Rec., vol. 93, no. 20, Nov. 13, 1924, pp. 788-790, 1 fig. U.S. Dept. of Agriculture reports on land-reclamation policies; subsidies and failure; excess reclamation; future of reclamation.

RECOVERY OF RETURN AND SEEPAGE WATERS. Recovery of Return and Seepage Waters in California, T. R. Simpson. Eng. News-Rec., vol. 93, no. 19, Nov. 6, 1924, pp. 751-754, 6 figs. Applications for right to divert return flow are frequent; area irrigated with such water is rapidly increasing.

L

LABORATORIES

METALLURGICAL, FOR TESTING MATERIALS. Testing Materials in the Laboratory. Machy. (N. Y.), vol. 31, no. 3, Nov. 1924, pp. 184-186, 7 figs. How metallurgical laboratory maintained by Bullard Machine Tool Co. controls quality of materials used in building machines in shop.

LATHES

INSPECTION. Checking Lathes for Accuracy. Machy. (N. Y.), vol. 31, no. 3, Nov. 1924, pp. 195-199, 12 figs. Methods employed at plant of Am. Tool Works Co., Cincinnati, in inspecting various parts of lathes and assembled machines.

LEVELING

PRECISE. Precise Leveling in New England, E. B. Roberts. Boston Soc. Civ. Engrs.—Jl., vol. 10, no. 10, Oct. 1924, pp. 283-313, 5 figs. Account of work by U. S. Coast and Geodetic Survey in establishing line of precise levels from Providence, R.I., to Portland, Me.; descriptions and elevations of permanent bench marks.

LIGHTING

OFFICE AND PLANT BUILDING. High-Intensity Illumination. Elec. World, vol. 84, no. 18, Nov. 1, 1924, pp. 943-949, 23 figs. Describes lighting equipment installed in offices and plant of McGraw-Hill Co. in New York City; problems encountered and types of equipment required.

PROGRESS 1923-1924. The Year's Progress in Illumination, 1923-1924. Illuminating Eng. Soc.—Trans., vol. 19, no. 8, Oct. 1924, pp. 711-800, 1924 report of Committee on Progress. Deals with gas; incandescent electric, and arc and vapor tube lamps; lamps for projection purposes; street lighting and other exterior illumination; interior illumination; luminaires; photometry; physics; physiology; illuminating engineering. Bibliography.

LIQUIDS

BOILING-POINT CORRECTION CHART. A Boiling Point Correction Chart for Normal Liquids, W. H. Bahlke and Rob. E. Wilson. Indus. & Eng. Chem., vol. 16, no. 11, Nov. 1924, pp. 1131-1132, 3 figs. With special application to petroleum products; chart may be used with reasonable accuracy for any of so-called non-associated liquids.

VISCOUS, MOTION OF. An Apparatus for Investigating Certain Types of Fluid Motion, E. N. da C. Andrade and J. W. Lewis. Sci. Instruments—Jl., vol. 1, no. 12, Sept. 1924, pp. 373-377, 3 figs. Designed to exhibit types of motion of viscous liquid between two rotating cylinders.

LOCOMOTIVES

BOOSTERS. Locomotive Boosters and Their Effect on Locomotive Design and Train Operation. Ry. & Locomotive Eng., vol. 37, no. 10, Oct. 1924, pp. 299-300. Consideration of limitations and functions; what booster is capable of doing in passenger and freight service. Committee report before Travelling Engrs. Assn.

DECAPOD. Decapod Tests Show Well Defined Fuel Economy. Ry. Mech. Engr., vol. 98, no. 11, Nov. 1924, pp. 662-666, 12 figs. Addition of feedwater heater results in 14 per cent coal saving over previous Ils Pennsylvania locomotives.

FEEDWATER TREATMENT. Water Treatment on the Chicago & Alton R. R., L. O. Gunderson. Ry. Rev., vol. 75, no. 16, Oct. 18, 1924, pp. 571-575, 3 figs. Results of systematic soda-ash treatment for locomotive-boiler waters of exceptionally undesirable quality.

HIGH-PRESSURE SYSTEM. Locomotive Evolution, J. Riekie. Ry. Engr., vol. 45, no. 538, Nov. 1924, pp. 373-375, 2 figs. Advocates use of very high pressures on compound principle, in conjunction with boiler of flash type.

OIL-BURNING. How to Improve Oil Burning on Locomotives. Ry. & Locomotive Eng., vol. 37, no. 10, Oct. 1924, pp. 302-308. Design and location of oil burners; air openings; dampers; furnace design; refractories. Committee report before Travelling Engrs.' Assn.

RUNNING REPAIRS. Union Pacific Systematizes Running Repairs. Ry. Mech. Engr., vol. 98, no. 11, Nov. 1924, pp. 694-696, 5 figs. Periodical detentions reduce locomotive maintenance costs 10 per cent with increased service.

STEAM-TURBINE. A New Turbo-Locomotive for the German State Railways. Ry. Gaz., vol. 41, no. 16, Oct. 17, 1924, p. 513-516, 9 figs. Designed and built at Krupp Works, Essen, and since subjected to experimental runs for testing purposes.

Zoelly Turbine Locomotive. Engineer, vol. 138, no. 3593, Nov. 7, 1924, pp. 530-532, 4 figs. Features of new Swiss locomotive which has had remarkably successful trial trips.

SWITCHING. Powerful Six-Wheel Switcher for the Monon. Ry. Mech. Engr., vol. 98, no. 11, Nov. 1924, pp. 660-661, 1 fig. Details of 0-6-0 switching locomotives which develop 42,000 lb. tractive force with 57-in. drivers and have total weight of 191,000 lb.

TESTING WITH ELECTRIC LOCOMOTIVE. Unusual Method of Testing Steam Locomotives. Ry. Age, vol. 77, no. 17, Oct. 25, 1924, pp. 733-734, 2 figs. Describes use of regenerative braking feature of electric locomotive for determining drawbar pull of 3-cylinder Mikado locomotive. See also Ry. Rev., vol. 75, no. 17, Oct. 25, 1924, pp. 611-615, 10 figs.

WELDING PRACTICE. Standardizing Welding Practice in Locomotive Shops, J. S. Heaton. Boiler Maker, vol. 23, no. 16, Oct. 1924, pp. 295-297. Suggestions for good welding practice, which have proven their merit in shops of Wabash System, Decatur, Ill. Discusses methods of maintaining records of welding, arrangement of a welding shop, system of carrying out firebox repairs with the process, flue welding and care of equipment.

LUBRICATING OILS

DETERIORATION. Causes of Change in Lubricating and Insulating Oils in Use (Beobachtungen über die Ursachen der Veränderung der Schmier- und Isolieröle im Gebrauch), F. Frank. Petroleum, vol. 20, no. 29, Oct. 10, 1924, pp. 1488-1493. Discusses effects of oxygen on oil and formation of acids, formation of metal compounds by acids and bearing metal; treating transformer oils with ethyl alcohol. See also Braunkohle, vol. 23, no. 29, Oct. 18, 1924, pp. 537-542.

M

MACHINE SHOPS

COST REDUCTION. Reducing Shop Cost in the Engineering Department, J. A. Davis. Am. Mach., vol. 61, no. 20, Nov. 13, 1924, pp. 761-763, 8 figs. Reducing quantity and variety of tools and fixtures; modifying design without detriment to product; avoiding close tolerances where they are unnecessary.

SIGNALING SYSTEM. Signals in the Shop to Speed Production, C. J. Priebe. Am. Mach., vol. 61, no. 19, Nov. 6, 1924, pp. 731-734, 6 figs. How workman calls foreman, inspector or dispatcher; plan is part of production-control system, and is said to save time and keep materials moving properly.

MACHINE TOOLS

AUTOMOBILE SHOPS. High-Production Machines in the Automobile Shops. Am. Mach., vol. 61, nos. 5 and 7, July 31 and Aug. 14, 1924, pp. 191-194 and 277-279, 16 figs. July 31: "Simplimatic" lathe. Aug. 14: M.-G. production unit made by Meldrum-Gabrielson Corp., Syracuse, N.Y.

DEVELOPMENTS. Fourth New Haven Machine-Tool Exhibition. Mech. Eng., vol. 46, no. 11, Nov. 1924, pp. 698-700. Review of papers and discussion in connection with exhibition conducted under auspices of A.S.M.E. New Haven Section, Yale University, and New Haven Chamber of Commerce.

MACHINING METHODS

BLUEPRINTS, ELIMINATION OF. Eliminating Blue Prints in Machining. Iron Age, vol. 114, no. 21, Nov. 20, 1924, pp. 1327-1328, 4 figs. Jigs registering from machined surface are used for tool setting; "greased air" employed in deep-hole drilling; practice at Snow-Holley Works, Buffalo, of Worthington Pump & Machy. Corp.

MARINE STEAM TURBINES

PLYMAX. A New Steel Coated Material, F. W. Cook. Can. Machy., vol. 32, no. 17, Oct. 23, 1924, p. 23, 8 figs. Notes on a material known as "Plymax", made by Venesta Ltd., of Lond., Eng., consisting of a plywood core, to which light-galvanized iron or lead-coated sheet is rigidly fixed. Claimed to be 80 times as stiff as steel plate and twice as stiff as ordinary plywood, weight for weight.

MATERIALS HANDLING

HAND LIFT TRUCKS. Multiplied Manpower and Simplified Handling, M. W. Potts. Indus. Mgt. (N. Y.), vol. 68, no. 4, Oct. 1924, pp. 221-228, 12 figs. Deals with hand lift truck and skid system.

RAILWAY SHOPS. Identification of Material Handling Costs Develops Unusual Possibilities. Ry. Rev., vol. 75, no. 19, Nov. 8, 1924, pp. 706-714, 7 figs. Materials-handling system established in Angus shops of C. P. railway makes possible correct cost finding and permits control of production costs.

MEASURING INSTRUMENTS

BIBLIOGRAPHY. Bibliography for Measuring Instruments with Special Reference to Instruments and Methods of Meteorology Used in Mechanical Engineering, F. J. Schlink. Optical Soc. Am.—Jl., vol. 9, no. 3, Sept. 1924, pp. 309-321. Covers general material on physical and mechanical instruments, measurement and production of small linear and angular displacements and distances, vibrations, speeds and time intervals, hysteresis and their relation to instrument design and testing, dynamometers, temperature and humidity, weighing scales, pressure gages, engine indicators, properties and design of springs, etc.

MEASURING MACHINES

END, LINE STANDARDS FOR. Ruling Line Standards, H. B. Lewis and C. G. Peters. Mech. Eng., vol. 46, no. 11a, mid-Nov. issue, 1924, pp. 796-798, 7 figs. Method of producing line standards free from measurable error by application of light interference and end measuring machine upon which they are used.

METALS

ENDURANCE. The Evidence for the Existence of an Endurance or "Fatigue" Limit in Metals and its Determination, H. F. Moore and T. M. Jasper. Engineering, vol. 118, nos. 3069 and 3071, Oct. 24 and Nov. 7, 1924, pp. 580-582 and 658-660, 12 figs. S-N diagram and endurance limit; elastic limit and its limitations; mechanism of fatigue breakdown of metal; tests for endurance limit and fatigue strength; summary of machines and test methods used in investigation at Univ. of Ill. Paper read before Brit. Assn. at Toronto.

INTERNAL STRUCTURE. The Relationship between Mechanical Treatment and Internal Structure of Metals, F. Johnson. Birmingham Met. Soc.—Jl., vol. 8, no. 11, July 1924, pp. 479-496, 14 figs. Constitution of atoms; inter-atomic forces; plastic deformation; twinning in metals; slip-interference theory of hardening of metals; relation between grain size and strength; critical range of deformation; hardness of solid solutions; alloys of duplex structure.

SPECIFIC HEAT. An Improved Method of Measuring the Specific Heats of Metals at High Temperatures, K. K. Smith and L. I. Bockstahler. Nat. Acad. Sciences—Proc., vol. 10, no. 9, Sept. 1924, pp. 386-388. Determination of specific heat of tungsten at temperatures between 2375 deg. K. and 2475 deg. K.

X-RAY EXAMINATION. X-Ray Examination of Metals at the Watertown Arsenal, Watertown, Mass., T. C. Dickson. Mech. Eng., vol. 46, no. 11a, mid-Nov. issue, 1924, p. 773. Operation of 280,000-volt X-ray equipment and results obtained.

MICROSCOPES

METALLOGRAPHIC WORK. Microscopes for Metallographic Work. Engineering, vol. 118, no. 3067, Oct. 10, 1924, pp. 514-515, 6 figs. Describes high-powered microscope for use in research laboratory, and microphotographic apparatus for use in industrial plants; microphotographs produced with these instruments.

MINE LOCOMOTIVES

STORAGE-BATTERY. Notes on the Use of Storage-Battery Locomotives and Storage-Batteries Underground, J. Shanks. Can. Inst. Min. & Metallurgy—Monthly Bul., no. 150, Oct. 1924, pp. 654-666, 12 figs. Author's gives his experience in operating different types or designs of locomotives, and draws attention to drawbacks of some designs, and to improvements made in more recent storage-battery locomotives put on market, as regards efficiency, upkeep and safety.

MINERAL RESOURCES

BRITISH COLUMBIA. Reconnaissanee of Silver Creek, Skagit and Similkameen Rivers, Yale District, B.C., C. E. Cairnes. Can. Dept. Mines, Geol. Survey, no. 2031, summary report, 1924, part A, pp. 46A-80A, 8 figs. partly on supp. plates. General and economic geology.

CANADA. Arnprior-Quyon and Maniwaki Areas, Ontario and Quebec, M. E. Wilson. Can. Dept. Mines, Geol. Survey—Memoir 136, geol. series no. 117, 1924, 152 pp., 41 figs. partly on supp. plates. Location, area and accessibility; physiography; general geology; mineral deposits. Bibliography.

GASPE PENINSULA, CANADA. The Mineral Deposits of Gaspé, F. J. Alcock. Can. Min. Jl., vol. 45, no. 41, Oct. 10, 1924, pp. 1000-1003, 4 figs. History, geology and structure; zinc and lead, copper, petroleum, chromite and asbestos deposits.

MINING

BRITISH COLUMBIA. Conditions Affecting Mining in British Columbia, R. W. Brock. Can. Inst. Min. & Metallurgy—Monthly Bul., no. 149, Sept. 1924, pp. 597-607. Deals with physical geological and artificial conditions.

MINING LAWS

BRITISH COLUMBIA. Mining Laws of British Columbia and Some Notes on Blue Sky Legislation, A. M. Whiteside. Can. Inst. Min. & Metallurgy—Monthly Bul., no. 149, Sept. 1924, pp. 574-585. Discussion of laws bearings upon economics of mining in British Columbia.

MOLDING

DRY-SAND AND LOAM. Dry Sand and Loam Moulding, A. Sutcliffe. Foundry Trade Jl., vol. 29, nos. 402, 405 and 418, May 1, 22 and Aug. 21, 1924, pp. 341-343, 417-419 and 153-155, 15 figs. Typical jobs recently made, which might have been produced by either dry sand or loam method. Treated from a jobbing-foundry point of view.

MOLECULES

ATTRACTION AND COMBINATION. Molecular Attraction and Molecular Combination, O. Maass. Franklin Inst.—Jl., vol. 198, no. 2, Aug. 1924, pp. 145-159, 1 fig. Author makes preliminary observations with regard to nature and distribution of molecular forces in molecule, and then discuss esthree series of investigations concerning physical properties, molecular compound formation, and velocities of chemical reactions.

PRODUCER-GAS. Producer-Gas Trucks (Les camions à gaz pauvre), E. Weiss. Nature, no. 2635, Oct. 4, 1924, pp. 214-221, 13 figs. Design and construction of various types, including Vierzon, Etia, G. P. A., Lion, Renault, Berliet, etc.

TIPPING GEARS. The Latest Three-Way Tipping Development. Motor Transport (Lond.), vol. 39, no. 1024, Oct. 13, 1924, pp. 443-444, 5 figs. Particulars of a modification of hand-operated three-way tipping mechanism of F. Waters & Co., Rugby, Eng., incorporating a new device for universal movement of lifting screw.

MUNITIONS

MANUFACTURING, INDUSTRIAL MOBILIZATION FOR. The Role of the Engineer in Industrial Mobilization Planning, E. E. MacMorland. Mech. Eng., vol. 46, no. 11, Nov. 1924, pp. 693-695 and (discussion) 695-696. Author shows how engineering societies can aid Government materially in its program of industrial mobilization in event of war, by providing reserve officers, giving advice on technical problems and assisting in development of new weapons, etc.

N

NICKEL

DETERMINATION IN ORES AND ALLOYS. Determination of Nickel in Ores and Alloys by Means of Dimethylglyoxime (Het bepalen van nikkel met dimethylglyoxim in ertsen en legeeringen), J. G. Weeldenburg. Chemisch Weekblad, vol. 21, no. 30, July 26, 1924, pp. 358-362. Influence of common metals was examined; material is dissolved in *aqua regia*, and lead and alkaline-earth metals are removed as sulphates; filtrate is treated with hydrogen sulphide, and nickel determined in filtrate after addition of tartaric acid and ammonium chloride; if iron and cobalt are present together, former must be reduced before precipitation.

NICKEL DEPOSITS

ALASKA. Alaskan Nickel Minerals, A. F. Buddington. Economic Geology, vol. 19, no. 6, Sept.-Oct. 1924, pp. 521-541, 4 figs. Study of specimens collected from outcrops of several recently discovered nickeliferous pyrrhotite deposits in southeastern Alaska; investigation was made with aid of metallographic microscope.

NITROGEN

FIXATION. Fixed Nitrogen—A National Economic Problem, H. A. Curtis. Chem. & Met. Eng., vol. 30, nos. 17, 18, 19 and 20, Apr. 28, May 5, 12 and 19, 1924, pp. 667-670, 703-706, 749-752 and 788-790, 6 figs. Apr. 28 and May 5: Essential facts of nitrogen situation as it exists in United States. Place that Chilean nitrate holds in supplying nitrogen needs of nation. Nitrogen consumption, domestic sources of nitrogen supply. Agricultural phase of nitrogen problem. Estimate of fixed nitrogen balance sheet in America. May 12: How much ammonia will be produced from coal and what it will sell for. May 19: Economic phases of importation of Chilean nitrate are bases for price of nitrogen ingredients of fertilizer. Explains decreasing importance of organic nitrogen.

O

OIL ENGINES

HEAVY-OIL. Gardner Heavy-Oil Engines. Engineering, vol. 118, no. 3069, Oct. 24, 1924, pp. 595-598, 37 figs. Details of engines of hot-bulb type exhibited at British Empire Exhibition.

300 B. H. P. Heavy Oil Engine. Engineering, vol. 118, no. 3071, Nov. 7, 1924, pp. 638-640, 8 figs. Describes horizontal cold-starting oil engine exhibited by Blackstone & Co. at British Empire Exhibition.

OIL FUEL

BURNING. Hazards of Industrial Oil Burning, H. E. Newell. Mech. Eng., vol. 46, no. 11a, mid-Nov. issue, 1924, pp. 765-768. Discussion of flash point; heating of oil in storage tank; storage methods; fire hazard; features of design; installation and operation; cause of oil fires.

Oil Burning in Industrial-Plant and Central-Station Service, N. E. Lewis. Mech. Eng., vol. 46, no. 11a, mid-Nov. issue, 1924, pp. 849-851, 1 fig. Steam atomizing vs. mechanical atomizing oil burners; oil heaters; furnace volume; introducing air for combustion; firebrick problems due to high furnace temperatures.

STORAGE AND HANDLING. The Storage and Handling of Fuel Oil in Industrial Plants, C. G. Sheffield and H. H. Fleming. Mech. Eng., vol. 46, no. 11a, mid-Nov. issue, 1924, pp. 771-773, 1 table. Storing and handling of fuel oil for land oil-burning installations; deals with location, foundations, construction of steel tanks themselves, handling and heating.

OIL SHALES

NEW BRUNSWICK, CAN. Bituminous Shales of New Brunswick, M. Lodge. Can. Min. Jl., vol. 45, no. 40, Oct. 3, 1924, pp. 972-975, 4 figs. Some estimates of quantities in New Brunswick field.

REFINING. The Refining of Oil-Shale, E. M. Bailey. Instn. Petroleum Technologists—Jl., vol. 10, no. 44, July 1924, pp. 527-553 and (discussion) 553-559, 8 figs. Production of crude oil and sulphate of ammonia; distillation of crude oil; treatment or washing of distillates; extraction of solid paraffin; refining of crude solid paraffin. Paper read before Empire Min. & Met. Congress.

OIL WELLS

DRILLING. The Evolution of Oil-Well Drilling Method, A. B. Thompson. Instn. Petroleum Technologists—Jl., vol. 10, no. 44, July 1924, pp. 432-451 and (discussion) 451-458, 8 figs. General classification of systems in use; process of evolution.

OPEN-HEARTH FURNACES

ACID. Importance of Temperature in Acid Open-Hearth Practice, E. G. Smith. Foundry Trade Jl., vol. 30, no. 426, Oct. 16, 1924, p. 341. Advantages of hot working are summarized.

PRODUCER-GAS-FIRED. Recent Developments in Open-Hearth Furnace Practice. Fuels & Furnaces, vol. 2, no. 10, Oct. 1924, pp. 1057-1058, 2 figs. Use of jets of compressed air or steam to increase rate of combustion in producer-gas-fired furnaces.

ORE DRESSING

BALL- AND TUBE-MILL LINERS. Ball- and Tube-mill Liners, Wm. T. W. Miller. Eng. & Min. Jl.-Press, vol. 118, no. 16, Oct. 18, 1924, pp. 613-617, 29 figs. Recent development has brought out many designs which help to increase grinding efficiency and prolong effective life of steel.

OXY-ACETYLENE WELDING

METHODS. Cutting Manufacturing Costs by Means of the Oxy-Acetylene Blowpipe, Geo. E. Hagemann. Mgt. & Administration, vol. 8, no. 5, Nov. 1924, pp. 509-512, 10 figs. Examples of work, based on data and photographs furnished by Linde Air Products Co.

MANGANESE STEEL. Welding Manganese Steel by the Oxy-Acetylene Process, B. K. Smith. Eng. & Contracting (Railways), vol. 62, no. 4, Oct. 15, 1924, pp. 882-884, 3 figs. Repairing of worn or broken special work. From Transmitter-Jl.

P

PAINTS

ALUMINUM. Some Observations on Aluminum Paints, P. H. Walker and E. F. Hickson. Chem. & Met. Eng., vol. 31, no. 18, Nov. 3, 1924, pp. 693-696, 12 figs. Tests showing how and when aluminum paints can be used most satisfactorily.

COLLOIDAL LEAD SUSPENSION. A New Lead Paint, R. Ditmar. Chem. & Met. Eng., vol. 31, no. 20, Nov. 17, 1924, p. 775. Colloidal suspension of metallic lead in linseed oil forms effective protective coating; material is being marketed in Europe under name of Subox; when applied to iron, metals, wood, cardboard, cement, etc., it is claimed that firmly adhering film of metallic lead is obtained on coated material after suspension agent has become dry.

PIPE

HAMMER-WELDED. Making Large Size Hammer-welded Pipe, Geo. F. Tegan. Iron Age, vol. 114, no. 20, Nov. 13, 1924, pp. 1263-1268, 11 figs. Practice of Nat. Tube Co., McKeesport, Pa., in manufacture of penstocks, tanks, stills, digesters and receivers; methods of forming and welding; finishing to size.

PIPE, WROUGHT IRON

MANUFACTURE. The Manufacture of Wrought Iron Pipe. Universal Engr., vol. 40, no. 4, Oct. 1924, pp. 34-40, 16 figs. Chemical and physical characterisrics.

PISTON RINGS

DESIGN. The Design of Piston Rings. Machy. (Lond.), vol. 25, no. 632, Nov. 6, 1924, pp. 171-173, 5 figs. Remarks and data applying to Ramsbottom type of ring; formula for radial pressure; normal stress on cross section of ring.

PISTONS

PINS. Some Notes on Carburized Piston Pins, R. S. Archer. Am. Soc. Steel Treating—Trans., vol. 6, no. 5, Nov. 1924, pp. 615-618. Discusses manufacture and heat treatment of piston pins used in Liberty aircraft engines which were produced in large quantities during World War; types of steels used, their heat treatment and methods of testing.

PLATES

ANNULAR. The Elastic Stability of an Annular Plate, W. R. Dean. Roy. Soc.—Proc., vol. 106, no. A-737, Sept. 1, 1924, pp. 268-284, 3 figs. Deals with elastic stability of a circular annular plate under uniform shearing forces applied at its edges.

PLATINUM

CANADA. Platinum Situation in Canada. Can. Min. Jl., vol. 45, no. 39, Sept. 26, 1924, pp. 953-954. Résumé of conditions.

DEPOSITS. Platiniferous Rocks from Tulameen Map-Area, Yale District, British Columbia, and Ural Mountains, Russia, E. Poitevin. Can. Dept. Mines, Geol. Survey, no. 2031, summary report, 1924, part A, pp. 84A-101A, 8 figs. partly on supp. plates. Chemical composition of platinum; primary deposits; placer deposits; petrographic and mineralogical comparison of platinum-bearing rocks of Ural mountains, Russia, and of Tulameen map area, B.C.

POWER FACTOR

CORRECTION. Power Factor Correction, R. A. Neal. Iron & Steel Engr., vol. 1, no. 10, Oct. 1924, pp. 564-565, 1 fig. States typical case covering application of a static or synchronous condenser; shows savings effected by use of static condenser.

PRESSURE VESSELS

UNFIRED, MOUTHPIECE RINGS FOR. Calculating the Stress in Mouthpiece Rings for Unfired Pressure Vessels. Boiler Maker, vol. 23, no. 16, Oct. 1924, pp. 287-291. Discusses internal stresses, distribution of circumferential stresses, and other forces acting on ring. Reprinted from Locomotive.

PROJECTILES

SPINNING, DRIFT OF. On the Drift of Spinning Projectiles, J. W. Campbell. Roy. Soc.—Proc., vol. 106, no. A-737, Sept. 1, 1924, pp. 222-232, 1 fig. Discusses case of drift of spinning projectiles where yaw and inclination of axis of projectile to plane of fire do not become too great.

PROSPECTING

RADIO, BY. Prospecting by Radio, W. C. Riley. Eng. & Min. Jl.-Press, vol. 118, no. 19, Nov. 8, 1924, pp. 733-734, 2 figs. Development and possibilities of electrical investigations by this method.

PULVERIZED COAL

BOILER FIRING. Economic Interest of Use of Pulverized Coal in Boilers (Intérêt économique de l'emploi du charbon pulvérisé dans les foyers de chaudières), M. de Vathaire. Revue de l'Industrie Minérale, no. 91, Oct. 1, 1924, pp. 469-480. Fineness of pulverization; efficiency of pulverized coal; boiler tests; comparison with other kinds of firing.

Notes on Pulverized Coal as a Fuel in Practice, A. E. Val Davies. S. African Inst. Elec. Engrs.—Trans., vol. 15, part 7, July 1924, pp. 429-433. Reply to discussion.

SYSTEMS, HAZARDS OF. The Hazards of Pulverized-Fuel Systems, H. E. Newell and Rob. Palm. Mech. Eng., vol. 46, no. 11a, mid-Nov. issue, 1924, pp. 783-784 Principal features underlying proper installations; types of systems; driers of indirect type; safety requirements.

PUMPING STATIONS

CENTRAL. No Unnecessary Pipe Fittings in this Pump Station, J. H. Edwards. Coal Age, vol. 26, no. 19, Nov. 6, 1924, pp. 651-654, 7 figs. New central pump station of Keystone Coal & Coke Co., Greensburg, Pa.; single-stage centrifugal pumps are connected in series; units rated 400 hp., 4200 gal. per min., 285-ft. head; brick-lined duct connects pump house with 60-acre sump.

FRANCE. The Loire Pumping Station at Pertuiset (Station de pompage dans la Loire au Pertuiset (Loire), G. J. Laferrière. Génie Civil, vol. 85, no. 17, Oct. 25, 1924, pp. 357-360, 10 figs. Details of water intake, feed pumps, reservoirs, sand filters, and main pumping plant of a station on Loire river, having capacity of 5000 m3 per 22 hours, for industrial purposes.

PUMPS, CENTRIFUGAL

HIGH-LIFT. Centrifugal Pumps at the British Empire Exhibition. Engineering, vol. 118, no. 3070, Oct. 31, 1924, pp. 625-627, 10 figs. High-lift turbine pumps exhibited by Brit. Elec. Plant Co.

TURBINE-DRIVEN. Port of London Authority Rotary Hydraulic Pumping Plant. Power Engr., vol. 19, no. 223, Oct. 1924, pp. 378-382, 6 figs. Describes two turbine pumping plants for furnishing high-pressure water at London docks.

R

RAILWAY CONSTRUCTION

CANADA. A Larger Program of Railroad Building, C. S. Gzowski. Ry. Rev., vol. 75, no. 19, Nov. 9, 1924, pp. 693-690, 14 figs. Construction of lines which now make up Canadian national railways system in Western Canada.

RAILWAY ELECTRIFICATION

CHILE. Electrification of the Lines Valparaiso-Santiago and Vegas-Andes (La Electrificación de la 1 Zona de los F. F. C. C. del Estado; Líneas de Valparaíso a Santiago y de las Vegas a Los Andes), R. S. Puga. Instituto de Ingenieros de Chile—Anales, vol. 24, nos. 1 and 2, Jan. and Feb. 1924, pp. 18-33 and 71-94, 4 figs. Details of system adopted and its characteristics, power production and distribution, substations, locomotives for passenger and freight traffic. Advantages of electrification.

FINANCIAL ASPECTS. The Financial Aspects of Main Line Electrification, Phil. Dawson. World Power, vol. 2, no. 11, Nov. 1924, pp. 274-278. Author seeks to disprove idea that only where water power is available, or in case of mountain lines, can complete electrification of railway system be justified.

FRANCE. Some Views on Railway Electrification in France (Quelques aperçus sur l'électrification des chemins de fer en France), L. Barbillion. Industrie Electrique, vol. 33, no. 776, Oct. 25, 1924, pp. 421-425. Discusses power consumption; three-phase, single-phase, and d. c. traction; etc.

SWITZERLAND. Main Line Railway Electrification, S. Parker Smith and Phil. Dawson. Engineer, vol. 137, nos. 3571, 3572 and 3573, June 6, 13, and 20, 1924, pp. 633-636, 653-654 and 684-685, 27 figs. June 6: Electrification of Swiss railways; reasons for electrification; choice of system; tabular data on electric rolling stock; present state of electrification; Berne-Loetschberg-Simplon railway; tabular data on supp. plate of different lines. June 13: Rhaetian railway; Swiss federal railways; single-phase lines. June 20: Simplon tunnel and Brique-Sitten 3-phase lines; Freiburg-Murten-Ins railway; Burgdorf-Thun railway.

RAILWAY MANAGEMENT

STORES DEPARTMENT. The Building of a Stores Department. Ry. Rev., vol. 75, no. 17, Oct. 25, 1924, pp. 619-623, 13 figs. In order to stimulate interest of employees in reorganization plan of Erie R. R., cash prizes were offered for best division storehouse and best individual storehouse during 1923; installation of best established practices instrumental in effecting substantial savings in stores department.

RAILWAY MOTOR CARS

GASOLINE-ELECTRIC. Application of Internal-Combustion Engines to Rail Traction (Applicazione dei motori a combustione interna alla trazione su rotaie), M. Mellini and M. Maggiorelli. Rivista Tecnica delle Ferrovie Italiane, vol. 26, nos. 1-2 and 3, July 15-Aug. 15 and Sept. 15, 1924, pp. 1-17 and 68-83, 22 figs. Discusses substitution of gasoline-electric for steam and its problems, and gives details of design and construction of principal types of railway motor cars, including A. E. G., Berliet, Deutsche Werke, Fiat, Renault, Scemia, Crochat, Sulzer-Brown-Boveri, etc.; also Diesel-steam equipment.

RAILWAY SIGNALING

CONTROLLED MANUAL BLOCK. Controlled Manual Block with Train Control. Ry. Age, vol. 77, no. 19, Nov. 8, 1924, pp. 843-847, 9 figs. Missouri Pacific eliminates train orders by directing train movements with signal indications. See also Ry. Signaling, vol. 17, no. 11, Nov. 1924, pp. 423-428, 12 figs.

HALL SYSTEM. Transmission by Wire for Long Distances or Under Difficulties and Use of Electric Signals (Note sur les transmissions par fils à longue distance ou difficiles et l'emploi de signaux à moteur). Revue Universelle des Transports, vol. 1, no. 11, Aug. 1, 1924, pp. 171-172, 2 figs. Details of Hall system of working railway signals by means of an electric storage-battery motor.

POINT OPERATION, LONG-DISTANCE. A New Method for the Long-Distance Operation of Points. Ry. Engr., vol. 45, no. 538, Nov. 1924, pp. 386-388, 4 figs. At Charleville, on Great Southern & Western of Ireland, some facing points are being operated at over a mile from their lever; power is obtained through hand-operated generator, and this is first instance of such means being employed for point and signal operation. See also Ry. Gaz., vol. 41, no. 15, Oct. 10, 1924, pp. 476-478, 4 figs.

RAILWAY TRACK

WEED BURNERS. Illinois Central Improves Equipment for Burning Weeds with Oil, C. R. Knowles. Ry. Eng. & Maintenance, vol. 20, no. 11, Nov. 1924, pp. 433-435, 5 figs. Economy and effectiveness of process augmented by atomizing oil with steam.

RAILWAYS

REORGANIZATION, GERMANY. Reorganization of the German Railways, Wm. Acworth. Ry. Age, vol. 77, no. 18, Nov. 1, 1924, pp. 799-802. Government management abandoned under Dawes plan to make efficient and profitable operation possible; details of new organization.

TRAIN RESISTANCE TO MOTION. The Resistance of Express Trains, C. F. D. Marshall. Ry. Engr., vol. 45, nos. 528-529, 530, 531, 532, 533, 534, 535, 536, 537 and 538, Jan., Feb., Mar., Apr., May, June, July, Aug., Sept., Oct. and Nov., 1924, pp. 13-18, 45-49 and 71, 86-90, 133-137, 174-178, 210-214, 246-250, 286-291, 319-325, 355-358 and 396-399, 44 figs. partly on supp. plate. Jan.: Critical discussion of present state of theory and practice of subject, and suggestions for development of former and improvement of latter. Feb.: Atmospheric resistance in a calm; resistance constants for carriages; effect of acceleration. Mar.: Effect of gradients; speeds on gradients; effect of curves. Apr.: Natural wind; effect of direct wind; effect of wind gusts on frontal pressures; limiting speeds. May: Resultant wind; angle of resultant for various wind angles; effect of speed on resultant wind; ratios of speed of resultant to that of travel. June: Effect of oblique winds; consideration of flange friction; lines of flow round train. July: Oblique winds and air resistance; effect for different kinds of train; effect of gusts on resultant wind; resistance of engines. Aug.: Consideration of tests conducted on Great Western and late Lond. & North Western Rys.; use of speedometers and engine indicators. Sept.: Resistance of electric cars; results of tests on Berlin-Zossen line. Oct.: Question of shape; improvements to shape of smokebox and chimney; importance of reducing air resistance of outside details. Nov.: Extreme speeds; French treatise; summary of principal formulas.

REACTORS

CURRENT-LIMITING. Current-Limiting Reactors, W. M. Dann. Am. Inst. Elec. Engrs.—Jl., vol. 43, no. 11, Nov. 1924, pp. 1050-1054, 6 figs. Considerations of factors affecting reliability; early weaknesses and means taken to eliminate them.

REDUCTION GEARS

CALCULATIONS. Reduction Gearing, M. Delaporte. Mar. Engr., vol. 47, no. 565, Oct. 1924, pp. 371-373, 6 figs. Some interesting opinions on the subject. Abstract translation of paper read before Association Technique Maritime et Aéronautique.

STEAM-TURBINE. Turbine Reduction Gearing and Its Production, R. J. McLeod. Instn. Mech. Engrs.—Proc., no. 4, July 1924, pp. 633-659, 22 figs. Discusses general questions governing design and methods of production, from manufacturer's standpoint.

STRESSES. Speed Reduction Gears (Considérations sur les réducteurs de vitesse à engrenages), M. Delaporte. Bul. Technique du Bureau Veritas, vol. 6, no. 9, Sept. 1924, pp. 176-179, 7 figs. Discusses calculation of stresses, and shape of teeth, and describes an elastic transmission to overcome torsional deformation.

REFRACTORIES

HIGH-TEMPERATURE, BONDING. Bonding High-Temperature Refractories, R. C. Gosreau. Chem. & Met. Eng., vol. 31, no. 18, Nov. 3, 1924, pp. 696-698. Results of practical study designed particularly to aid electric-furnace operator in selecting satisfactory bonding materials for use in patching, fettling and making monolithic linings.

REFRIGERATING MACHINES

BRITISH EMPIRE EXHIBITION. Refrigerating Machines at the British Empire Exhibition. Engineering, vol. 118, nos. 3068 and 3069, Oct. 17 and 24, 1924, pp. 559-563 and 594, 26 figs. Details of various types.

REFRIGERATING PLANTS

PRESSURES AND TEMPERATURES. Pressures and Temperatures in the Refrigerating Plant, G. Grow. Power, vol. 60, no. 20, Nov. 11, 1924, pp. 768-769, 2 figs. Shows influence of suction pressure on power required by compressor; points out that influence of superheat in suction is often ignored; discharge pressure is dependent upon temperature of cooling water.

REFRIGERATION

FRANCE. Some Recent Progress in the Refrigerating Industry in France (Sur quelques progrès récents de l'industrie frigorifique en France), L. Marchis. Technique Moderne, vol. 16, nos. 17 and 18, Sept. 1 and 15, 1924, pp. 565-577 and 604-615, 25 figs. Discusses compressors, including horizontal and vertical, single- and double-effect, rotary, multiple-stage, compressors for low-power refrigerators, high-power ammonia compressors, etc.; liquefiers and evaporators; flooded system, and liquid separators; insulators; transportation equipment used for importing and exporting cold-storage products; experiences on application of refrigeration to conservation of fish; Ottesen meat-freezing method; etc.

FRUITS AND VEGETABLES, PRECOOLING OF. Precooling of Fruits and Vegetables, J. W. Andrews. Refrig. Eng., vol. 11, no. 4, Oct. 1924, pp. 143-146 and 150, 1 fig. Reviews some of the more important points developed to date along precooling lines.

REFUSE DISPOSAL

COLLECTION SYSTEM. The Pagefield System of Refuse Collection. Engineering, vol. 118, no. 3071, Nov. 7, 1924, pp. 655-656, 8 figs. partly on p. 646. Essential feature is combined use of horse and motor transport; motor vehicle does long trips from point to point and horses can be employed for slow house-to-house delivery or collection.

ENGLISH PRACTICE. Modern Methods of Refuse Collection, J. A. Priestley. Contract Rec., vol. 38, nos. 42 and 44, Oct. 15 and 29, 1924, pp. 1024-1025 and 1082. Describes English practice, including types of receptacles, frequency of collection, dust prevention, etc. Paper presented at Int. Conference on Sanitary Eng., Lond.

RESERVOIRS

CIRCULAR. Design of Reinforced Concrete Circular Reservoirs. Ferro-Concrete, vol. 16, nos. 1 and 3, July and Sept. 1924, pp. 9-12 and 61-64, 1 fig. Discusses new and more precise method of calculation. Translated from Constructeur de Ciment Armé.

CONSTRUCTION METHODS. Modern Methods in Reservoir Building. Pub. Works, vol. 55, no. 9, Sept. 1924, pp. 289-292, 7 figs. Belt conveyors used for moving earth, aggregate, cement and concrete, over any distance and elevation desired; removing thin topsoil at minimum cost at Wanaque dam.

RESEARCH

ENGLAND. The Failure of Intensified Research Work in England, J. G. A. Rhodin. Engineer, vol. 138, no. 3590, Oct. 17, 1924, pp. 430-431 and 433. Author attempts to outline defects most apparent in research work, and its difficulties.

ROAD CONSTRUCTION

EARTHWORK. The Effect of Haul on the Cost of Earthwork, J. L. Harrison. Pub. Roads, vol. 5, no. 7, Sept. 1924, pp. 14-17, 4 figs. Study conducted by Bur. Pub. Roads, and results.

ROADS

GRADE CHANGES CALCULATION. Easy Method of Calculating Highway Grade Changes, W. E. Jones. Eng. & Contracting (Roads & Streets), vol. 62, no. 4, Oct. 1, 1924, pp. 723-724, 5 figs. Easily applied plan which "eliminates" all "guess" work, used on road design department of Iowa State Highway Commission.

OILED. Oiled Earth Roads on Long Island, A. T. Goldbeck. Pub. Roads, vol. 5, no. 7, Sept. 1924, pp. 21-22, 3 figs. Method of treatment; nature of road surface.

ROADS, CONCRETE

DAM TOP, FOR. Design of Paved Road for Dam Top Dayton Flood Works, C. S. Bennett. Eng. News-Rec., vol. 93, no. 17, Oct. 23, 1924, pp. 660-661, 1 fig. Concrete road with gutter to control runoff crowns hydraulic fill at Huffman dam; cured with calcium chloride.

FRICTION TEST. Friction Test of Concrete on Various Subbases, A. T. Goldbeck. Good Roads, vol. 67, no. 3, Sept. 1924, pp. 79-81. Description of specimens and method of tests; shows that frictional resistance is lowered by wet subbase; lowering frictional resistance should reduce frequency of transverse cracks.

ROADS, EARTH

BITUMINIZED. Experimental Bituminized Earth Road in Alberta. Eng. & Contracting (Roads & Streets), vol. 62, no. 4, Oct. 1, 1924, pp. 731-734, 2 figs. Describes an attempt to work out a serviceable type of prairie rural road. From 4th annual report of Research Council of Alberta.

ROADS, GRAVEL

CORRUGATIONS. Rhythmic Corrugations in Gravel Roads, Geo. E. Ladd. Pub. Roads, vol. 5, no. 7, Sept. 1924, pp. 18-20 and 22, 2 figs. Study of nature of "chatter bumps" and their relation to traffic.

The Prevention of Corrugations in Gravel Roads Carrying Heavy Traffic, A. H. Hinkle. Good Roads, vol. 67, no. 3, Sept. 1924, pp. 77-78. How corrugations are formed; necessity of maintenance; methods of reducing or preventing corrugations.

ROLLING MILLS

STRIP MILLS. New Sheet Bar and Hot Strip Mills, F. L. Prentiss. Iron Age, vol. 114, no. 18, Oct. 30, 1924, pp. 1141-1146, 9 figs. Otis strip mill continuous from furnace to coilers, without use of hot bed; electric drive throughout.

ROLLS

BEARINGS FOR. Roll Bearings for Cold Rolling Mills, C. E. Davies. Engineering, vol. 118, nos. 3069, 3070 and 3071, Oct. 24, 31 and Nov. 7, 1924, pp. 569-571, 601 and 636-637, 23 figs. Reviews and compares various designs, materials and lubrication systems for cold-roll bearings in general use in England and abroad.

ROOFS

ASPHALTIC ROOFING, MANUFACTURE. Economic Factors in Roofing Manufacture, J. L. McK. Yardley. Chem. & Met. Eng., vol. 31, no. 17, Oct. 27, 1924, pp. 559-663, 3 figs. Making granulated slate; how asphalt is obtained; roofing-mill operating costs.

S

SAND, MOLDING

BRASS-FOUNDRY, RECLAIMING. Reclaiming Brass Foundry Sands, F. L. Wolf and A. A. Grubb. Metal Industry (N. Y.), vol. 22, no. 11, Nov. 1924, pp. 438-441, 5 figs. Molding-sand reclamation and control experiments. Paper presented before Am. Foundrymen's Assn.

SEMI-STEEL

CHARACTERISTICS. Semi-Steel. Metal Industry (Lond.), vol. 25, no. 18, Oct. 24, 1924, pp. 403-405. Points out that semi-steel is nothing more than a good cast iron; influence of steel on grain structure; advantages of semi-steel and difficulties of its manufacture; cost considerations; "sluggishness" and risk of imhomogeneity; hematite semi-steel mixtures and influence of phosphorus; influence of sulphur.

MANUFACTURE OF CASTINGS. Semi-Steel, G. W. Gilderman. Purdue Univ.—Bul., vol. 8, no. 6, 1924, pp. 23-25. General idea of methods used in actual practice.

SEWAGE DISPOSAL

ACTIVATED SLUDGE. Tests of Air Pressure Losses in Activated-Sludge Plants, R. J. Bushee and S. I. Jack. Eng. News-Rec., vol. 93, no. 21, Nov. 20, 1924, pp. 823-824, 4 figs. Observations on cast-iron pipe, venturi air meters, check valve and three different makes of aeration plates.

ACTIVATED SLUDGE AS FERTILIZER. Activated Sludge as Fertilizer, V. H. Kadosh. Eng. & Contracting (Water Works), vol. 62, no. 4, Oct. 8, 1924, pp. 817-820. Investigations of Sewerage Commission of Milwaukee, Wis. Paper read at Int. Conference of Sanitary Engrs., Lond.

INDUSTRIAL WASTES. Disposal of Industrial Wastes in U. S., H. P. Eddy. Can. Engr., vol. 47, no. 15, Oct. 7, 1924, pp. 395-397. Effect of animal, vegetable and mineral wastes and methods of treatment commonly used. From paper presented at Int. Conference on Sanitary Eng., Lond.

Experimental Work on the Purification of Trade Waste Waters, H. Kessener. Surveyor & Mun. & County Engr., vol. 66, no. 1705, Sept. 19, 1924, pp. 233-234. Notes on experiments carried out in Holland in connection with dairy, sugar-factory, strawboard, and potato-flour wastes. Extracts from paper presented at Int. Conference on Sanitary Eng., Lond.

SCANDINAVIA. Treatment of Sewage in Scandinavia, G. P. Harvey. Can. Engr., vol. 47, no. 15, Oct. 7, 1924, pp. 399-402. Progress in disposal of sewage in Norway, Sweden, Finland and Denmark. Methods employed in dealing with trade wastes, particularly from yeast factories. From paper read at Int. Conference on Sanitary Eng.

TRICKLING-FILTER DISTRIBUTORS. Trickling Filter Distributors at British Sewage-Works, T. Chalkley Hatton. Eng. News-Rec., vol. 93, no. 16, Oct. 16, 1924, pp. 624-626, 4 figs. Notes taken recently at sewage works of Birmingham, Bradford and Leeds show that travelling distributors rather than fixed nozzles are main reliance.

SILVER METALLURGY

ORE TREATMENT. Montesinos on Silver Metallurgy, R. E. Carr. Min. Mag., vol. 31, no. 2, Aug. 1924, pp. 82-87. Account of an old Peruvian treatise by Fernando Montesinos, on occurrence, description, and treatment of silver ores.

SILVER DEPOSITS

YUKON, CAN. Silver Lead Deposits of Beaver River Area, Yukon, W. E. Cockfield. Can. Dept. Mines, Geol. Survey, no. 2031, summary report, 1923, part A, pp. 22A-28A, 2 figs. Topography; general geology; ore deposits.

SLAG

CEMENT MORTARS AND CONCRETES, USE IN. Comparative Tests of Slag With Pittsburgh Sand and Gravel, C. K. Whitehead. Pit & Quarry, vol. 9, no. 2, Oct. 15, 1924, pp. 95-101. Describes tests made of fine and coarse aggregate for cement mortars and concretes, also similar tests made simultaneously with local sands and gravel.

SPRINGS

A.S.M.E. PROGRESS REPORT. Preliminary Progress Report of the A.S.M.E. Special Research Committee on Metal Springs. Mech. Eng., vol. 46, no. 11a, mid-Nov. issue, 1924, pp. 793-795. Deals with present status of spring technique; definitions and historical notes; theoretical aspects; uses and materials of various types of springs; outline of future progress reports.

HELICAL. Design of Helical Springs, J. W. Rockefeller, Jr. Machy. (N. Y.), vol. 31, no. 3, Nov. 1924, pp. 205-206, 3 figs. Deflection; how to calculate spring of varying coil diameter; determining maximum fiber stress.

STANDARDIZATION

ADVANTAGES TO INDUSTRY. Advantages of Standardization to Industry, F. J. Schlink. Mgt. & Administration, vol. 8, no. 5, Nov. 1924, p. 496. Statement of advantages which accrue to industry by adoption of standards, compiled by Am. Eng. Standards Committee.

STEAM

"CRITICAL," GENERATION OF. Experiments on the Generation of "Critical" Steam, J. F. Overwyn. Power, vol. 60, no. 18, Oct. 28, 1924, pp. 693-694, 2 figs. Experiments made in attempt to develop extremely light steam power plant for use in airplanes and other vehicles.

STEAM ENGINES

BLEEDING TYPE. Engines in Combined Power and Process Steam Plants, J. Cassidy. Power, vol. 60, no. 19, Nov. 4, 1924, pp. 724-725, 1 fig. Describes bleeding-type tandem steam engine developed in England.

STEAM METERS

ELECTRIC FLOWMETER. Installing the Electric Steam-Flow Meter, J. M. Spitzglass. Power, vol. 60, no. 19, Nov. 4, 1924, pp. 746-747, 2 figs. How velocity pressure is obtained; differentiation between close tap and far tap; limitations imposed by bends and elbows; guarding against leaks. (Abstract.) Paper read before Nat. Assn. Stationary Engrs.

STEAM POWER PLANTS

COMBINED HEATING AND GENERATING. Small Industrial Plant Generates Current at Low Cost. Power, vol. 60, no. 19, Nov. 4, 1924, pp. 754-756, 3 figs. Cincinnati factory of Am. Can Co. used combined heating and generating plant; uniflow engines produce current for less than 1 cent per kw-hr.; labor reduced to minimum.

DEVELOPMENT. Two Score Years in Power Development, F. R. Low. Nat. Engr., vol. 28, no. 10, Oct. 1924, pp. 473-478, 5 figs. Review of developments in power-plant engineering since Nat. Assn. Stationary Engrs. was organized. Paper read at Nat. Assn. Stationary Engrs.

EQUIPMENT, BRITISH EMPIRE EXHIBITION. Power Plant Exhibits at Wembley, J. B. C. Kershaw. Power, vol. 60, nos. 3 and 4, July 15 and 22, 1924, pp. 82-86 and 131-134, 17 figs. Describes boilers, economizers, air preheaters, dust collectors, deaerators, steam turbines, etc.

REFUSE AS FUEL. Domestic Refuse as Source of Thermal Energy (Les ordures ménagères, source d'énergie thermique), E. Bruet. Chaleur et Industrie, vol. 5, no. 53, Sept. 1924, pp. 448-450, 3 figs. Details regarding plants at St.-Ouen, Toronto and Paris-Plage, firing refuse for steam production.

THERMAL VS. COMMERCIAL EFFICIENCY. Thermal Versus Commercial Efficiency, W. G. Diman. Power, vol. 60, no. 20, Nov. 11, 1924, pp. 764-765. Points out that solutions of troubles do not lie with super-power, nor in all cases with isolated plant; rather, a combination of two with proper consideration given to both power and heating, as well as use of steam for industrial purposes. (Abstract.) Paper read before Nat. Assn. Stationary Engrs.

STEAM TURBINES

CROSS-COMPOUND PARSONS. 50,000 Kw. Compound Parsons Turbine for the Crawford Avenue Station, Chas. Parsons. Power, vol. 60, no. 19, Nov. 4, 1924, pp. 728-730, 3 figs. Unit, recently completed in England and shipped to Chicago, contains three turbine elements and three generators; thermal efficiency of 27.8 per cent from coal to steam is expected. (Abstract.) Paper presented at World Power Conference.

DE LAVAL. Blading Effects in a De Laval Turbine, D. S. Anderson. Instn. Mech. Engrs.—Proc., no. 4, July 1924, pp. 687-702, 8 figs. Results of nozzle tests to determine efficiency; preliminary survey of tests; tests to determine relative angle of outlet; final analysis of steam tests.

IMPULSE. Stage Efficiencies of Impulse Turbines, L. J. Levit. Power, vol. 60, no. 21, Nov. 18, 1924, pp. 908-810, 4 figs. Manner of plotting condition curve so that pressures to be expected in impulse turbine might be roughly determined.

JET ACTION IN BLADING. A Note on Jet Action in Turbine Blading, Wm. Kerr. Instn. Mech. Engrs.—Proc., no. 4, July 1924, pp. 673-686, 6 figs. Deals only with special aspect of problem, arising out of certain peculiar results obtained in investigation on outlet jet directions from blading of single-row wheel while stationary and using different kinds of nozzles.

MARINE. *See Marine Steam Turbines.*

STEEL

ALLOY, DEVELOPMENT OF. Modern Alloy Steel, Rob. Hadfield. Mech. Wld., vol. 76, no. 1968, Sept. 19, 1924, pp. 189-190. Deals with heat-resisting non-scaling steels. (Abstract.) Paper read before Iron & Steel Section of Empire Min. & Met. Congress.

FATIGUE TESTS. Recent English Endurance Tests of Steel and Other Metals. Eng. News-Rec., vol. 93, no. 18, Oct. 30, 1924, pp. 709-710. Comparison of endurance limit and static strength; effect of temperature and viscosity of material. Tests carried out at Nat. Physical Laboratory, London.

HOT ROLLING, EFFECT OF. Rolling Refines Grain Structure, W. J. Crook. Iron Trade Rev., vol. 75, no. 21, Nov. 20, 1924, pp. 1365-1369, 12 figs. Hot rolling reduces grain size of low-carbon steel; further refinement is afforded by annealing; experiments contradict theory that no change in size occurs below transformation point.

OXYGEN AND RED SHORTNESS. Oxygen and the Red Shortness of Steel, H. Monden. Iron Age, vol. 114, no. 21, Nov. 20, 1924, pp. 1338-1350, 3 figs. German investigation of effect of gases on rolling qualities; low-carbon basic open-hearth practice in Germany. Translated from Stahl u. Eisen, 1923, June 7 and 14. See reference to original article in Eng. Index 1923, p. 486.

PROPERTIES AT HIGHEST TEMPERATURES. Steel at Highest Working Temperatures, P. Eyermann. Iron Age, vol. 114, no. 20, Nov. 13, 1924, pp. 1270-1273, 8 fihs. Changes in strength and other properties of carbon and alloy steels at 500 to 1200 deg.; range of "reduced malleability" in hot working; results of tensile tests on eight steels.

Stainless. Stainless Steels and their Practical Manipulation. Metal Industry (Lond.), vol. 25, no. 16, Oct. 17, 1924, pp. 379-381. Discusses many misconceptions that exist in regard to stainless steels, and advises correct method of working so as to obtain best results.

X-Ray Examination. Examination of Steel by X-Ray, L. C. Breed. Blast Furnace & Steel Plant, vol. 12, no. 11, Nov. 1924, pp. 517-518. Report on spectrometer equipment at government arsenal, Watertown, Mass.

STEEL CASTINGS

Manufacture. The Manufacture of Steel Castings, Wm. Woodhall. Purdue Univ.—Bul., vol. 8, no. 6, 1924, pp. 12-23. Deals chiefly with manufacture of steel castings by acid open-hearth-steel-furnace method.

X-Ray Tests. Using X-Rays to Detect Hidden Dangers in Plant Equipment, H. H. Lester, E. C. Herthel, Wm. Mendius and Wm. V. Ischie. Chem. & Met. Eng., vol. 31, no. 16, Oct. 20, 1924, pp. 619-622, 13 figs. Points out that defects in castings used in high-pressure stills, overlooked in inspection by usual method, are easily seen in radiograph.

X-Ray Tests Applied to the Problems of the Steel Industry, H. H. Lester. Am. Soc. Steel Treating—Trans., vol. 6, no. 5, Nov. 1924, pp. 575-603 and (discussion) 603-605, 28 figs.

STEEL, HEAT TREATMENT OF

Carbon and High-Speed Tools. Heat Treatment of Carbon and High-Speed Steel Tools, Jos. K. Wood. Am. Mach., vol. 61, no. 21, Nov. 20, 1924, pp. 791-793. Determining factors in development of metal-cutting tools; heat treatment for carbon-steel tools; compositions and heat treatment for high-speed steel tools.

Die Blocks. Heat-treatment of Steel with Special Reference to Production, U. W. Urquhart. Machy. (Lond.), vol. 24, nos. 621 and 623, Aug. 21 and Sept. 4, 1924, pp. 649-652 and 709-712, Aug. 21: Treatment of die blocks; carburizing; hardening of mild steel dies. Sept. 4: Composite steel dyes; best hardening procedure; rehardening.

Practice. Heat-treated Steel, J. W. Urquhart. Mech. Wld., vol. 74, nos. 1925, vol. 75, nos. 1931, 1936, 1938, 1944, 1950, 1955, vol. 76, nos. 1960, 1963, 1972 and 1973, Nov. 23, 1923, Jan. 4, Feb. 8, 22, Apr. 4, May 16, June 20, July 25, Aug. 15, Oct. 17 and 24, 1924, pp. 321-323, 5-7, 81-82, 117-118, 212-214, 311-312, 385-386, 57-58, 105-106, 252 and 267-268, 10 figs.

Temperature Distribution. Temperature Distribution in Steel Bodies Heated at a Constant Heat Potential, E. J. Janitzky. Am. Soc. Steel Treating—Trans., vol. 6, no. 5, Nov. 1924, pp. 619-622, 1 fig. Contentions set forth in previous article, entitled Characteristics of Heating Curves (published in Feb. 1924, issue of Trans.), are extended to temperature distribution in steel bodies heated at constant heat potential.

Theories. The Heat Treatment of Steel, F. B. Foley. Fuels & Furnaces, vol. 2, no. 9, Sept. 1924, pp. 889-920 and 925-936, 20 figs. A treatise presenting latest theories for changes occurring in steel during its heat treatment. Discusses crystal structure of steel, hardening, hot working, annealing of hot-worked steel, drawing, case-hardening, heat treatment of case-carburized parts quenching media, furnaces, and pyrometry.

Turbine Blading. Heat Treatment of Nickel Steel Turbine Blading, Carlos Bean. Am. Soc. Nav. Engrs.—Jl., vol. 36, no. 3, Aug. 1924, pp. 494-512, 6 figs. Determination of critical temperature of nickel steel; electric furnace; forms of test specimens; results of various forms of heat treatment; method of forging blades.

STEEL WORKS

Electric Drive. Electrification of Tata Iron Works at Jamshedpur, India, S. Ghosh. Iron & Steel Engr., vol. 1, no. 10, Oct. 1924, pp. 545-552, 30 figs. Details of electrical machinery and equipment installed.

STREET CLEANING

Motor Vehicles for. Phases of Modern Gulley Emptying. Motor Transport (Lond.), vol. 39, no. 1023, Oct. 6, 1924, pp. 413-415, 8 figs. Particulars of new Laffly gully emptier which can also be used for street watering. Tank and its equipment is mounted on a 4-ton chassis of standard design.

STREET LIGHTING

Types. The Columbus Street Lighting Demonstration, F. C. Caldwell. Illuminating Eng. Soc.—Trans., vol. 19, no. 7, Sept. 1924, pp. 675-678. Discusses various types of street lighting exhibited on streets of Columbus, O.

STREET RAILWAYS

Motor-Bus Transportation, vs. The Electric Tramcar and the Petrol Bus, W. T. Wardale. World Power, vol. 2, no. 11, Nov. 1924, pp. 285-288. Comparison of economic advantages and safety.

SUBSTATIONS

Design. Substation Design to Meet Space Limits, J. C. Gaylord. Elec. World, vol. 84, no. 19, Nov. 8, 1924, pp. 989-992, 5 figs. Unusual conditions on Southern Cal. Edison system lead to innovations in plans; transformer cooling coils are placed on roof of building; special arrangement of equipment necessary.

60,000-Kva. Features of 60,000-Kva. Substation, J. E. Goodale. Elec. World, vol. 84, no. 17, Oct. 25, 1924, pp. 881-884, 5 figs. Underground feeders at 13,200 volts and 26,400 volts supply Metropolitan substation of N.Y. & Queens Elec. Light & Power Co. at Maspeth; multiple-voltage transformer banks used; details of switch and bus structures.

SUPERHEATED STEAM

Heat Content, Measurement of. Direct Measurement of the Heat Content of Superheated Steam, N. S. Osborne. Mech. Eng., vol. 46, no. 11a, mid-Nov. issue, 1924, pp. 808-809. Calorimetric method of surveying behavior of superheated steam by employing isothermal throttling in saturated-steam calorimeter.

SUPERPOWER

Interconnection of Systems, Southeast. The Interconnected Power Systems of the Southeast, Chas. G. Adsit. Am. Soc. Civ. Engrs.—Proc., vol. 50, no. 8, Oct. 1924, pp. 1286-1302, 2 figs. Describes system of Georgia Railway and Power Company, which is said to be typical of other companies connected with interconnected transmission systems of Southeast.

SURVEYING

Transits. Transits Without Stadia Wires, E. S. M. Lovelace. Can. Engr., vol. 47, no. 13, Sept. 23, 1924, pp. 365-366. Method of using a transit not fitted with stadia wires but having a vertical arc. Main requirements of proposed new instruments.

T

TANKS

Horizontal Storage. How to Find the Contents of Horizontal Storage Tanks, Jos. B. Reynolds, and Sam. Cottrell. Chem. & Met. Eng., vol. 31, no. 17, Oct. 27, 1924, pp. 665-667, 1 fig. Table and explanation that simplified calculation for one type of tank and can be easily applied to other types.

TERMINAL, LOCOMOTIVE

Moncton, N.B. Canadian National Railways Engine Terminal at Moncton, N.B. Ry. Rev., vol. 75, no. 20, Nov. 15, 1924, pp. 785-795, 18 figs. Facilities provided for turning engines and making heavy running repairs.

THERMOMETERS

Kata-Thermometers. Value of the Kata Thermometer in Effective Temperature Studies. M. Ingels. Am. Soc. Heating & Vent. Engrs.—Jl., vol. 30, no. 6, June 1924, pp. 453-456, 1 fig. Deals with work of adapting this instrument for measuring effective temperatures.

TOOLS

Salvage. Too' Salvage, L. A. Churgay. Soc. Automotive Engrs.—Jl., vol. 15, no. 5, Nov. 1924, pp. 456-460, 7 figs. Points out that all worn, broken and obsolete tools should be kept in separate containers; standard forms of purchase and inter-department requisitions are described and their usage specified.

TRANSPORTATION

Railway. Some Problems of Railroad Transportation, H. W. Thornton. Ry. Age, vol. 77, no. 18, Nov. 1, 1924, pp. 779-782. Discusses reasons for state ownership; difficulties at large terminals; situation in Canada; points out that consolidations may make systems too large; fundamental principles essential to existence of railway as private enterprise. (Abstract.) Address before Inst. Am. Meat Packers and Univ. of Chicago.

TUBES

Brass, Manufacture of. The Manufacture of Brass and Copper Tubes, G. Evans. Metal Industry (Lond.), vol. 25, no. 18, Oct. 24, 1924, pp. 395-396, 1 fig. Coremaking for brass tube castings.

TUNNELING

Moffat Tunnel, Colo. Work on Moffat Tunnel Now in Full Progress. Ry. Age, vol. 77, no. 20, Nov. 15, 1924, pp. 889-894, 11 figs. Completion of headings for nearly one-third of its total length of 6.1 mi.; how east headings are being driven; power equipment for mucking; problems presented by headings at west end.

Wet-Rock Tunnel. Driving a Long Small-Section Wet Rock Tunnel. Eng. News-Rec., vol. 93, no. 19, Nov. 6, 1924, pp. 744-747, 7 figs. Use of mucking machine enabled two 8-hour drilling shifts to be worked each day; Diesel-engine power for tunneling operations.

TUNNELS

Concrete Lining. Concrete Lining Methods in the Skagit Tunnel. Eng. News-Rec., vol. 93, no. 18, Oct. 30, 1924, pp. 700-701, 4 figs. Air gun built on job places 300 cu. yd. of concrete in 24 hours; traveller for trimming and setting forms.

TURBO-GENERATORS

Large. Large Steam Turbine Generators, W. J. Foster, E. H. Freiburghouse and M. A. Savage. Am. Inst. Elec. Engrs.—Jl., vol. 43, no. 10, Oct. 1924, pp. 923-931, 13 figs. Discusses manufacturing, touching on what is considered best practices of present day; describes 62,500-kva. 60-cycle generator and gives test data; losses and ventilation problems; probable sizes at given speeds which may be expected in future.

V

VACUUM TUBES

Thermionic Valves. Marconi-Osram Thermionic Valves. Elec. Rev., vol. 95, no. 2445, Oct. 3, 1924, pp. 498-499, 5 figs. Methods of manufacture. See also description in Elecn., vol. 93, no. 2419, Sept. 26, 1924, pp. 350-351, 5 figs.

Transmitting and Rectifying Valves. High-Tension Rectifying and Transmitting Valves. Engineering, vol. 118, no. 3066, Oct. 3, 1924, pp. 492-494, 8 figs. Deals with latest developments in application of thermionic valve as transmitting valve and high-tension rectifying valve.

VENTILATION

Industrial, Effective Temperature Applied to. Effective Temperature Applied to Industrial Ventilation Problems, C. P. Yagloglou and W. E. Miller. Am. Soc. Heating & Vent. Engrs.—Jl., vol. 30, no. 7, July 1924, pp. 515-539, 8 figs. Concise report of investigation of effective temperature with moving air as conducted by Society's Research Laboratory in co-operation with Bur. of Mines. Industrial applications of experimental facts for improving working conditions.

Standards of. Modern Trend in the Science of Ventilation, Perry West. Am. Soc. Heating & Vent. Engrs.—Jl., vol. 30, no. 6, June 1924, pp .421-438, 2 figs. 20 years of evolution in ventilation; theoretical standards of ventilation; practical standards.

VIBRATION

Machinery. The Vibration Problem in Engineering, C. R. Soderberg. Elec. Jl., vol. 21, nos. 4, 6 and 7, Apr., June and July, 1924, pp. 160-165, 295-299 and 330-334, 18 figs. Apr.: Theoretical considerations and practical arrangement of vibration absorbers. June and July: Discussion of most important phases of analytical work which should be applied to every design of high-speed rotating machinery with a view of eliminating vibrations.

VISCOSITY

Kinetic Theory. Some Notes on the Kinetic Theory of Viscosity, Conduction and Diffusion, S. Chapman and W. Hainsworth. Lond., Edinburgh, & Dublin Philosophical Mag. & Jl. Sci., vol. 48, no. 284, Sept. 1924, pp. 593-607. Theory of viscosity and thermal conduction in gases possessed of rotatory as well as translatory energy; definition of temperature in non-steady state of a polyatomic gas; formula for coefficient of diffusion appropriate to a polyatomic gas; etc.

W

WAGES

Cost of Living and. Wages and the Cost of Living, Rob. J. Andersen. Indus. Mgt. (N. Y.), vol. 68, no. 5, Nov. 1924, pp. 260-265. Author states that any industry that either willingly or unwillingly allows its wage scale to be based upon cost of living is proceeding upon an economically unsound principle.

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For Alphabetical List of Advertisers see page 48

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In many cases we have not on our records the official positions of our members and it is hoped that all members will return the slip, filled in, at the earliest possible date.

FRASER S. KEITH, Secretary.

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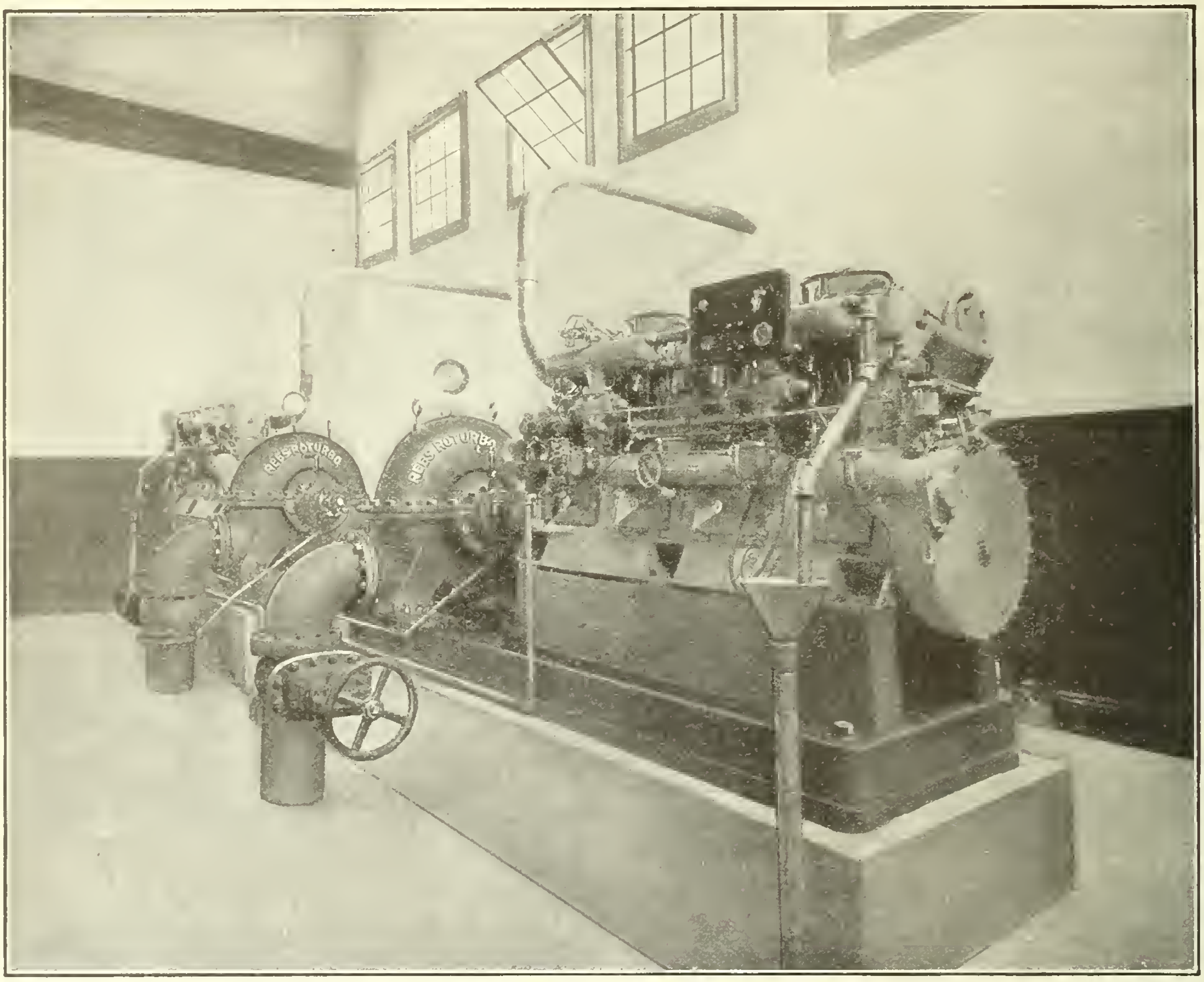

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"TO FACILITATE THE ACQUIREMENT AND INTERCHANGE OF PROFESSIONAL KNOWLEDGE AMONG ITS MEMBERS, TO PROMOTE THEIR PROFESSIONAL INTERESTS, TO ENCOURAGE ORIGINAL RESEARCH, TO DEVELOP AND MAINTAIN HIGH STANDARDS IN THE ENGINEERING PROFESSION AND TO ENHANCE THE USEFULNESS OF THE PROFESSION TO THE PUBLIC"

THE ENGINEERING INSTITUTE OF CANADA FOUNDED 1887

FEBRUARY 1925

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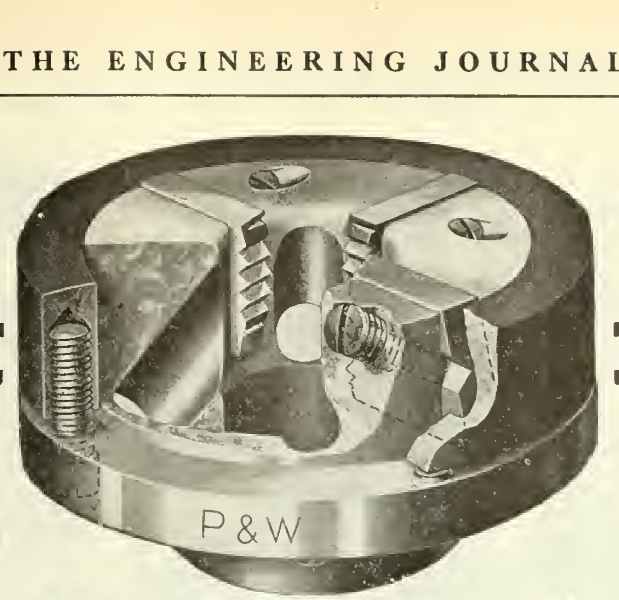
AT 176 MANSFIELD STREET, MONTREAL

Vol. VIII No. 2



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For Clean, Accurate Threads

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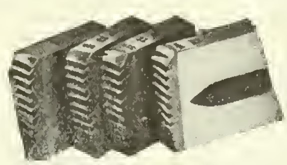
The Holding Ring
Note the taper adjusting slots for the chasers. Threaded for pulling screws.



The Chasers
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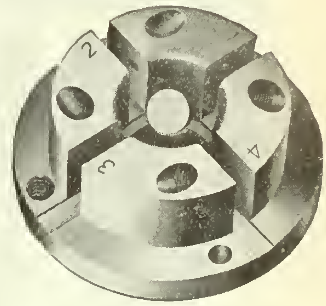

The Collet
Market slots for chasers. Clearance holes for chips. Center hole bored to correct diameter for true alignment. Slot for locking in the die stock. Counter-bored for pulling screws, threaded for pushing screws and tapped on an angle for chaser locking screws.

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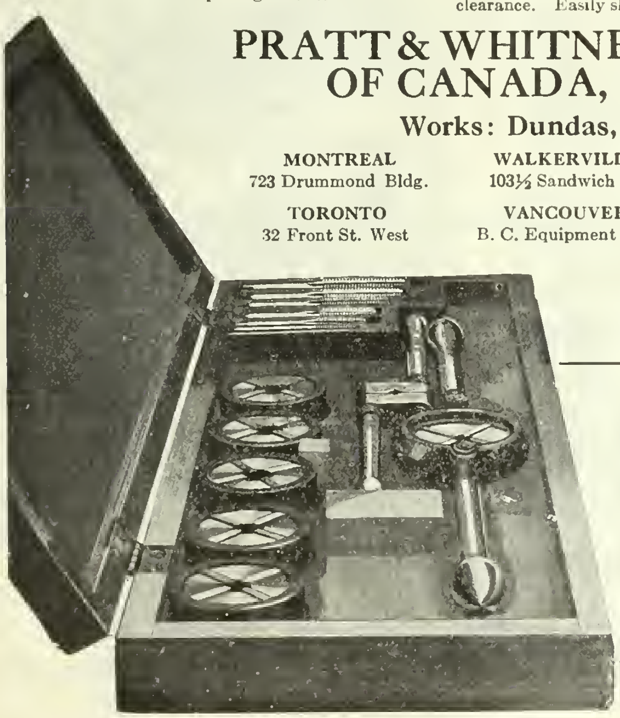

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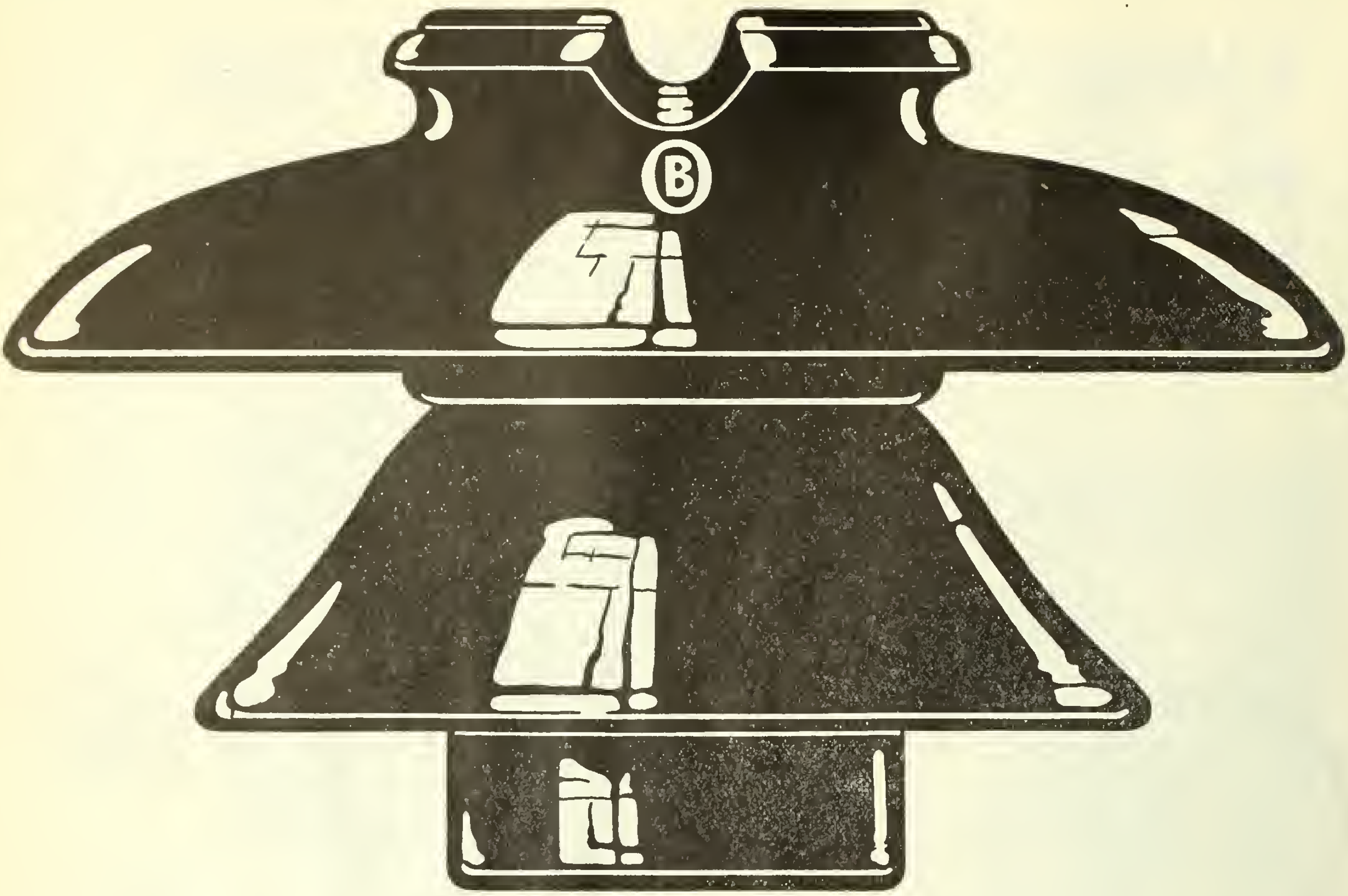

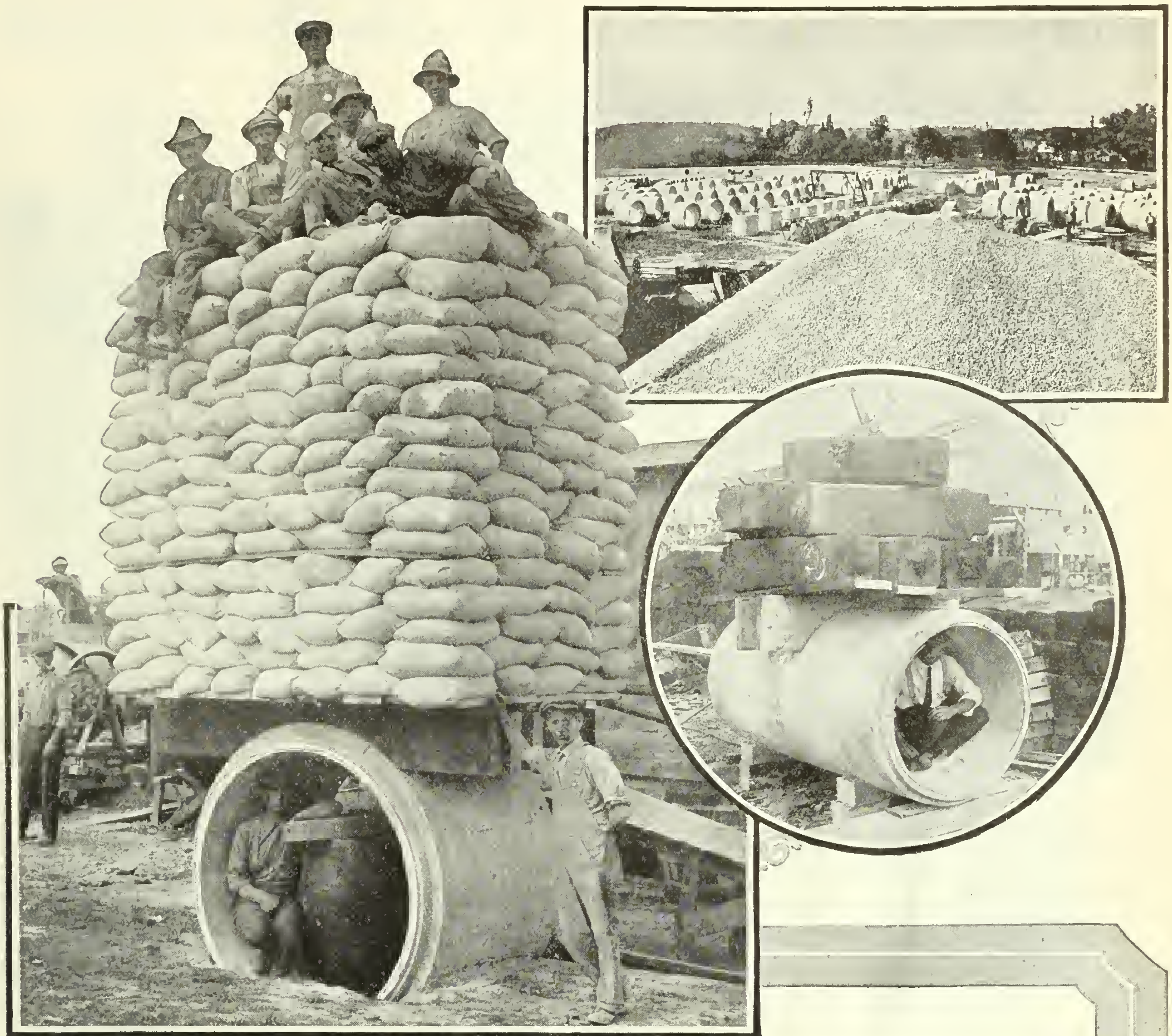

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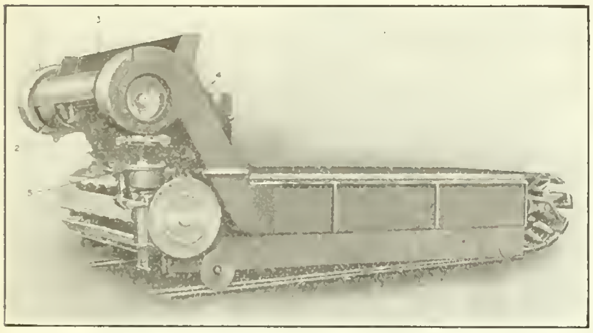

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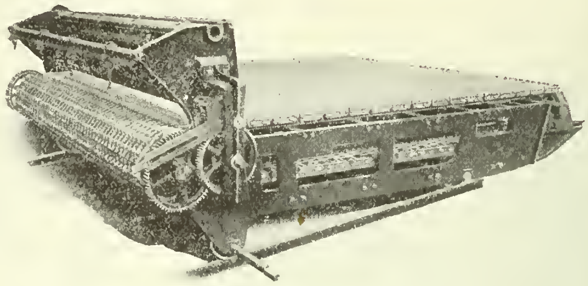
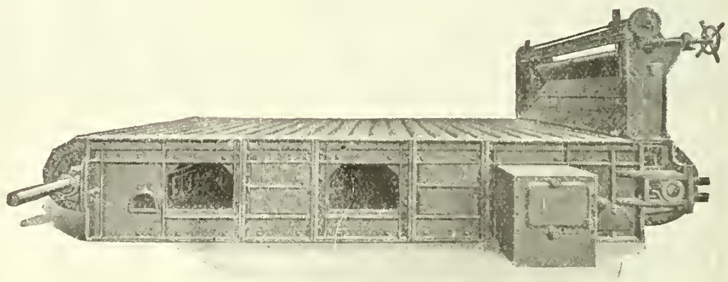
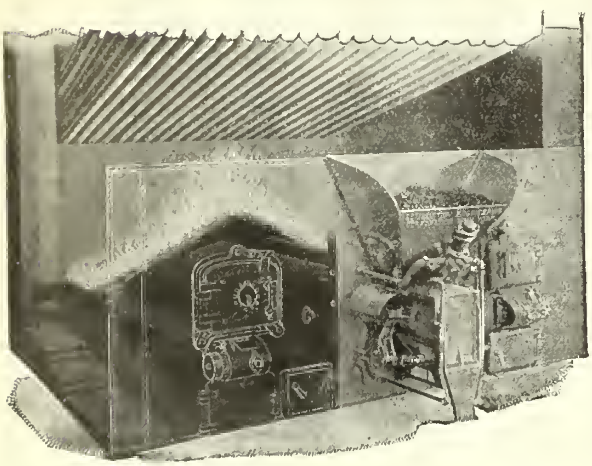


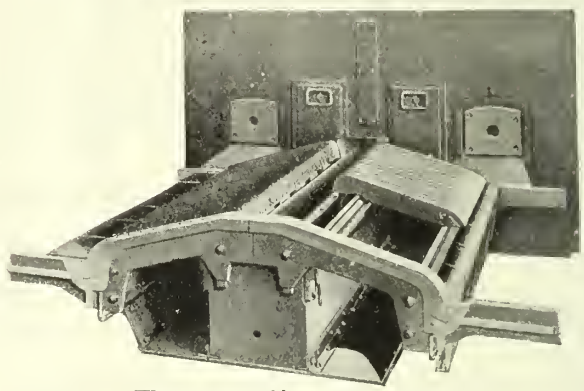
Coxe Travelling Grate
(3/4 front view)



Coxe Travelling Grate (side view)



Type "E"
(Phantom view showing the fire)



Type "E" (rear view)

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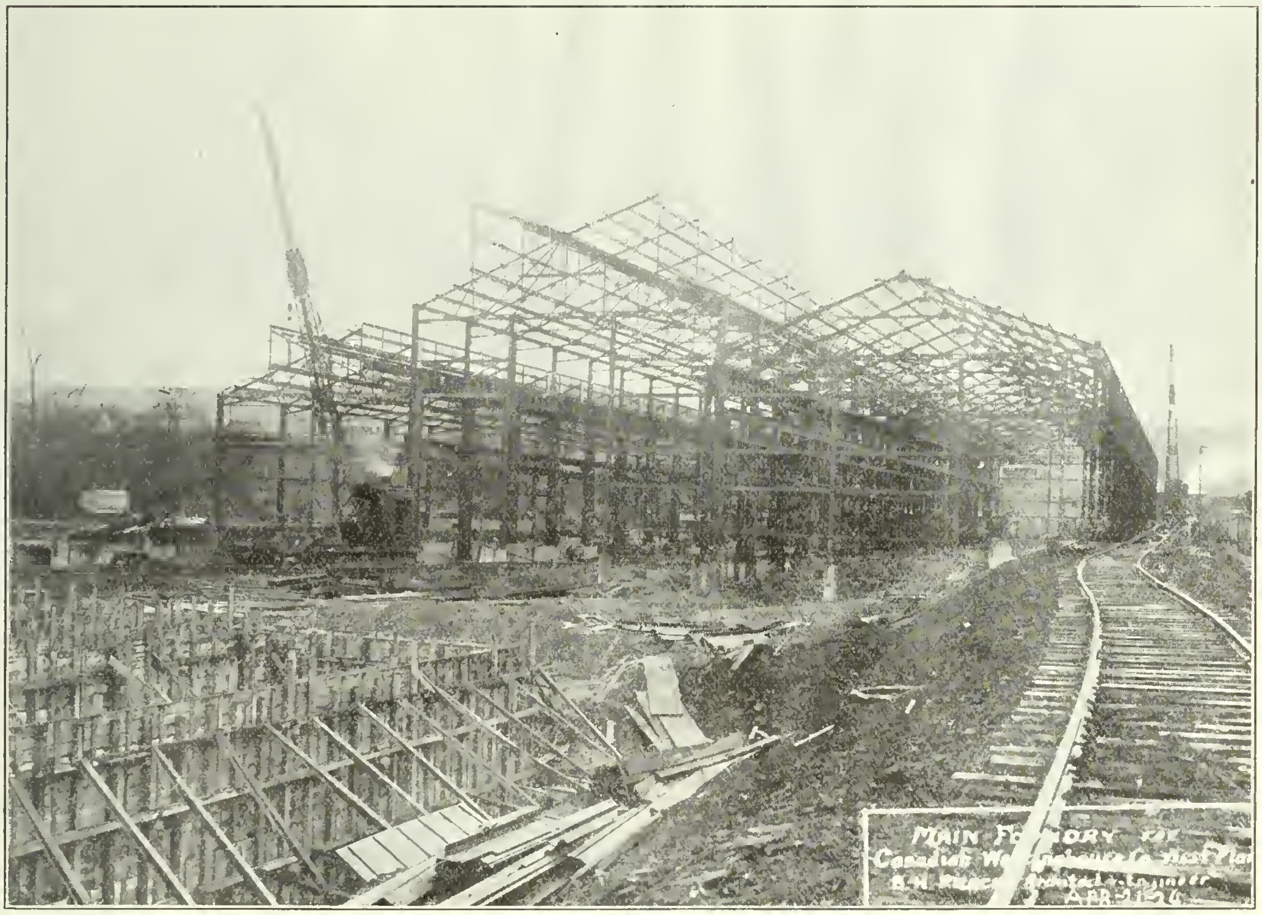

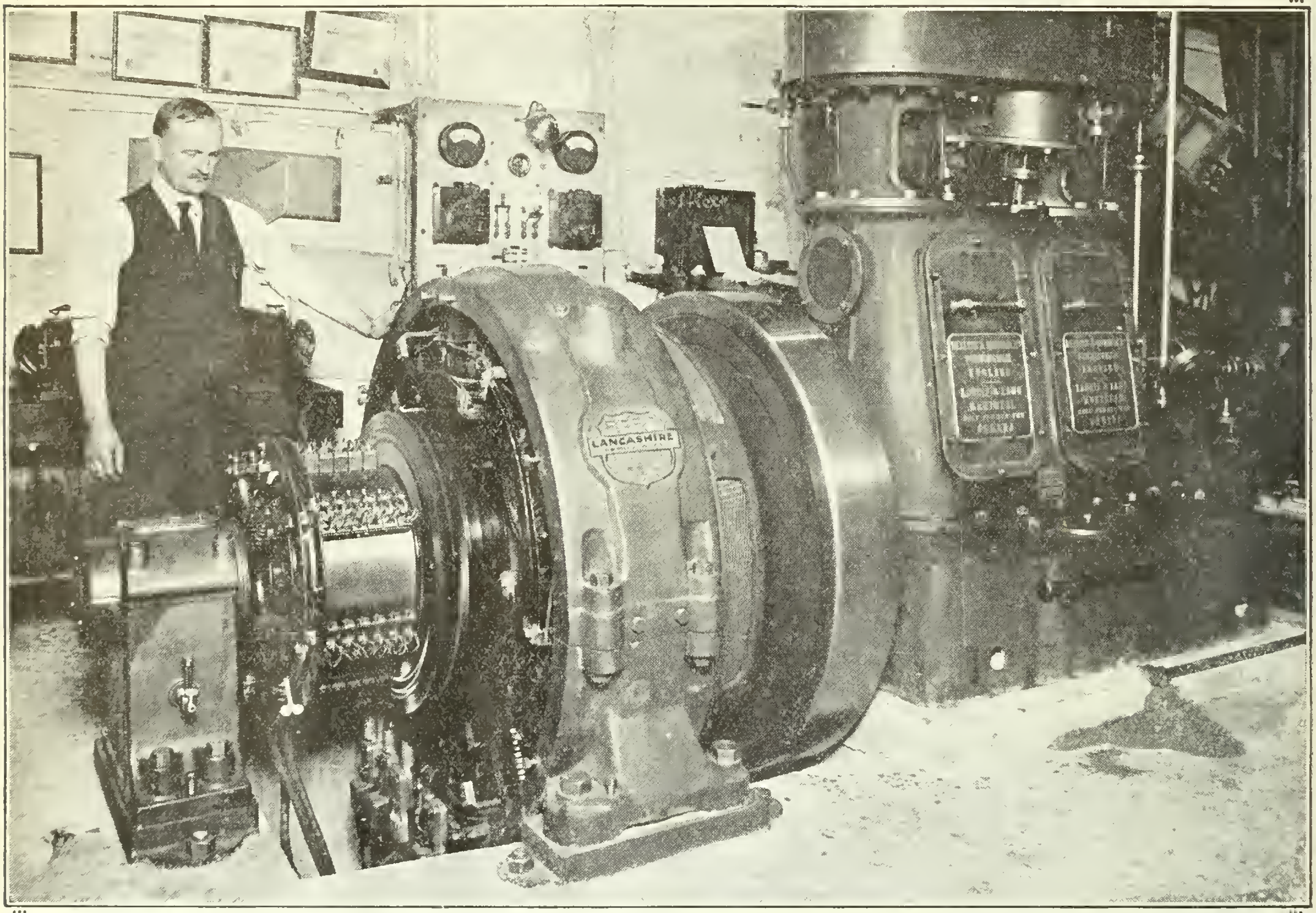
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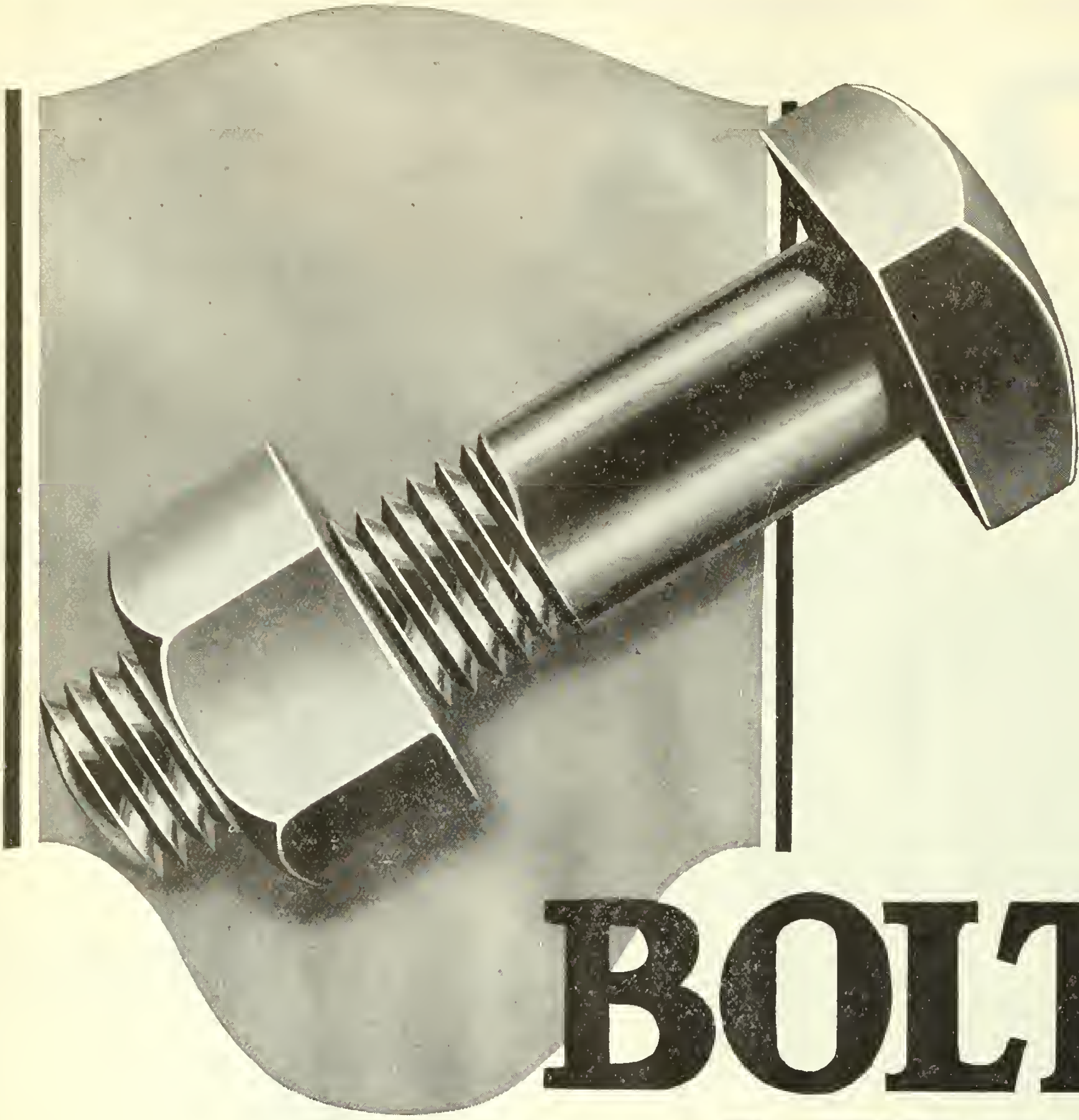

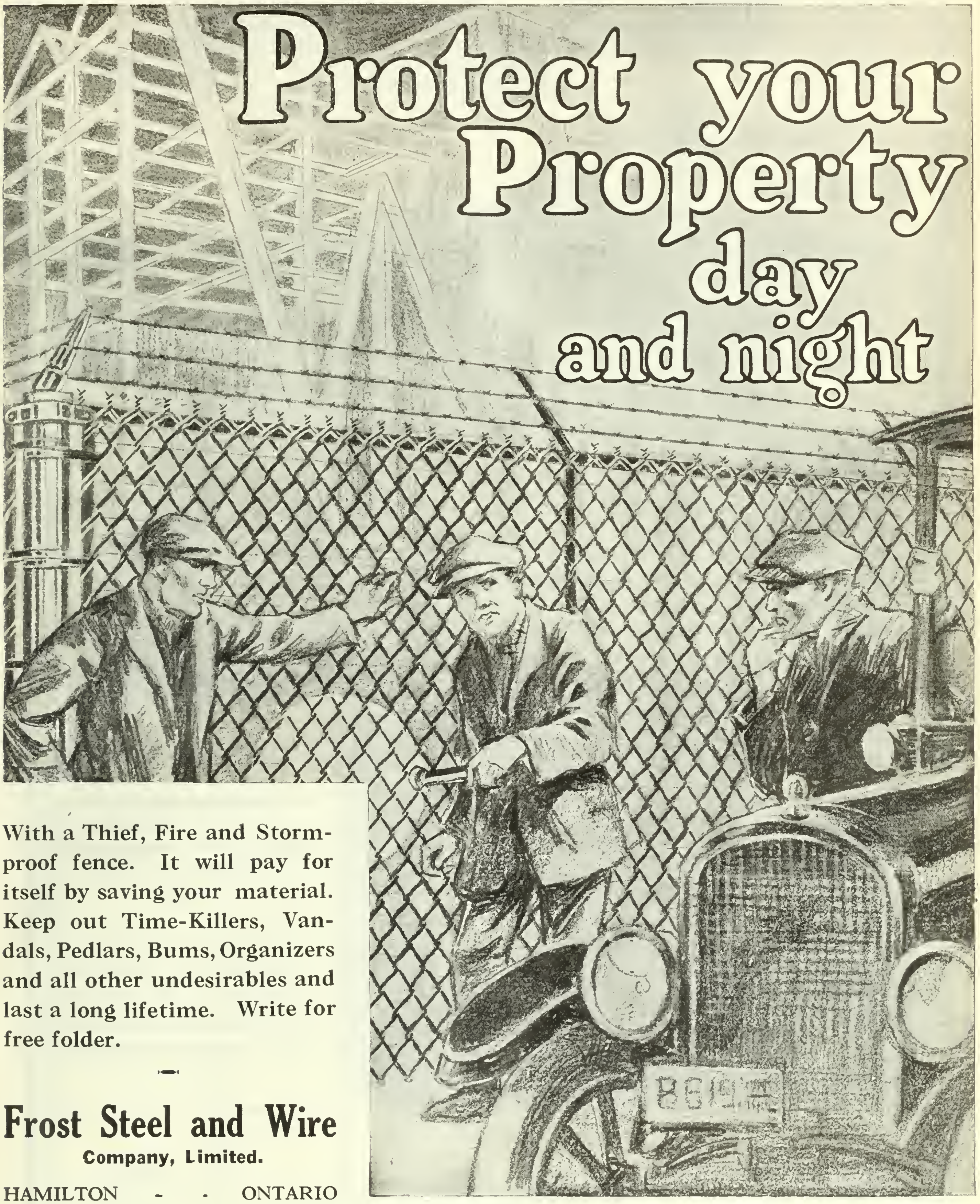
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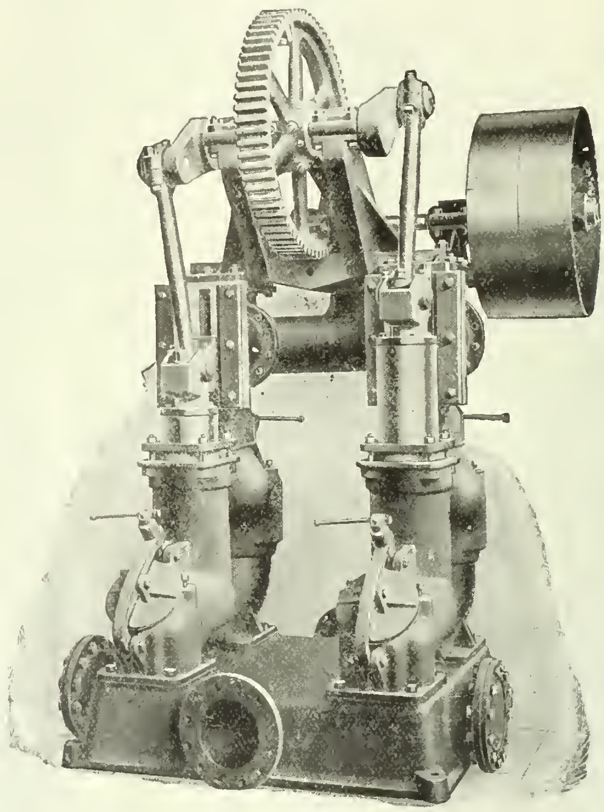

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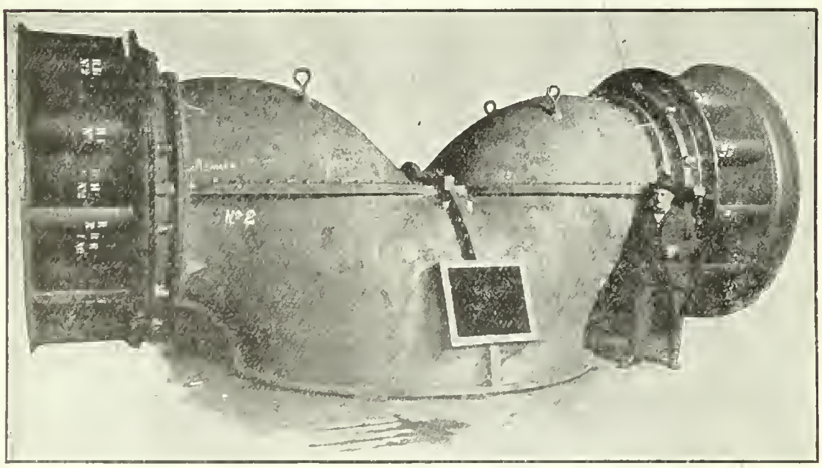

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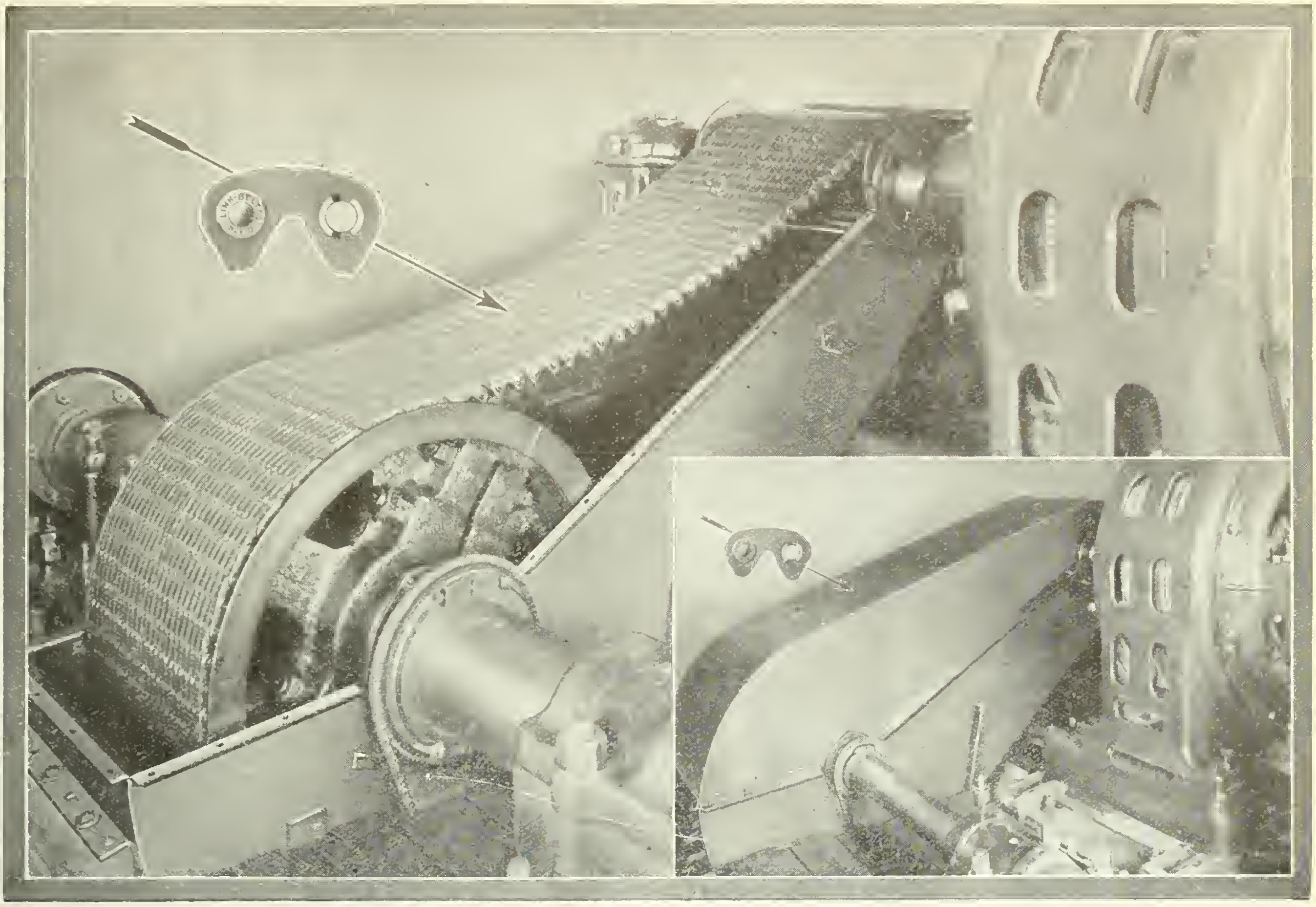

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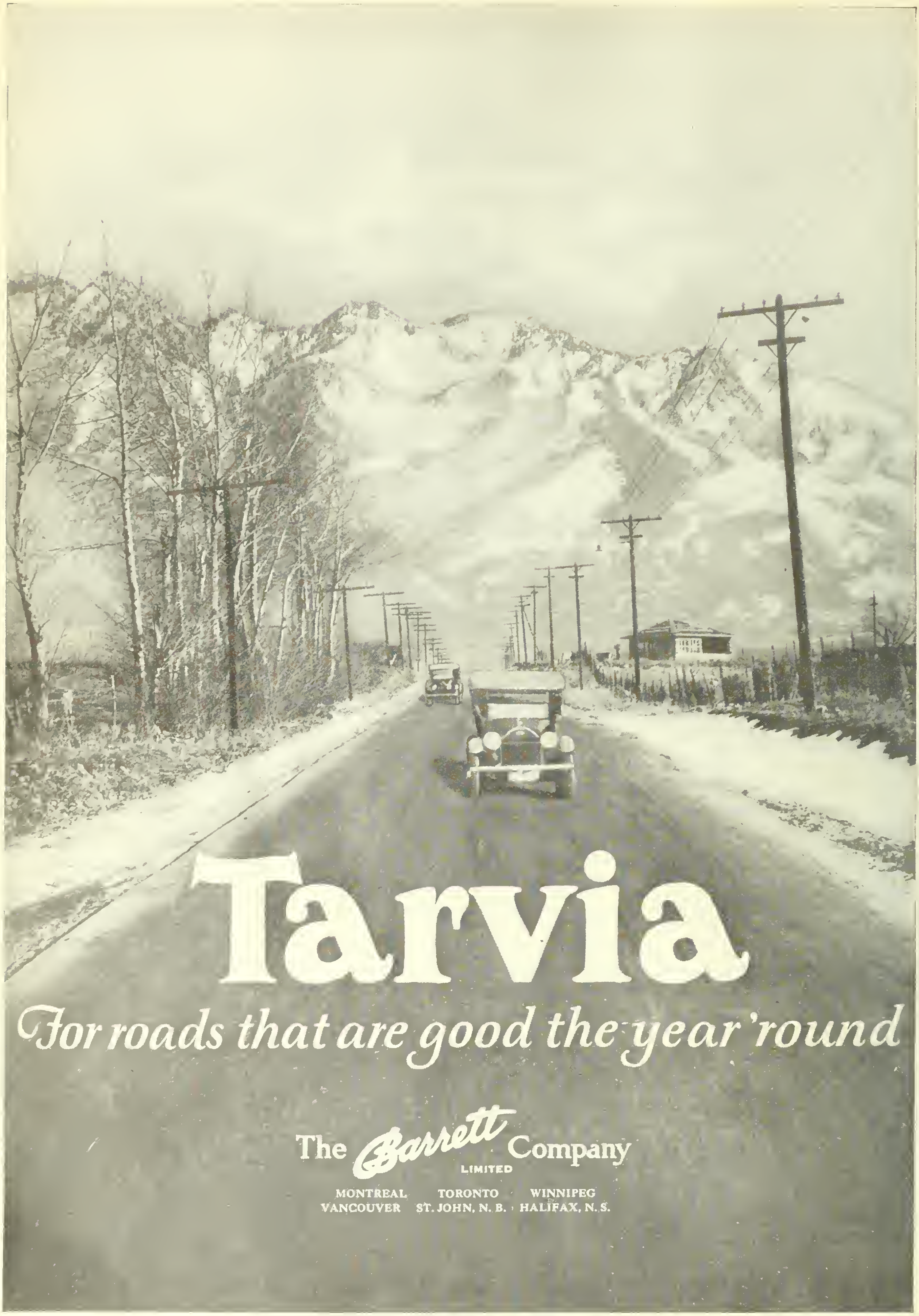
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ENGINEERING JOURNAL

THE JOURNAL OF
THE ENGINEERING INSTITUTE
OF CANADA

FEBRUARY, 1925 Volume VIII, No. 2

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THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

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VOLUME VIII MONTREAL, FEBRUARY 1925 NUMBER 2

Report of Council for the Year 1924

While the year just passed was not one of outstanding importance a number of events in connection with *The Institute's* history are recorded which have an important bearing upon our future.

It is with sincere regret that we record the death of our President, Walter J. Francis, which occurred on the evening of March sixth, the anniversary of the death of President St. Laurent. In the death of Mr. Francis *The Institute* was deprived of one of its most loyal, ardent and active supporters, and the profession one of the most promising of its members.

As a matter of historic record branch charters were prepared, framed, and forwarded to the branches, in most cases their presentation having been made. These charters are illustrated in the January *Journal.*

After considering the matter for some years a Code of Ethics was submitted to the members and adopted almost unanimously, together with a method of procedure. A strong Committee on Professional Conduct has been established to report on all cases of alleged unprofessional conduct brought to its attention.

The Committee on War Memorials has been active to the end that suitable records might be established in honour of the dead, and to record the names of all who served in the Great War. It is hoped that the committee may complete its work during the coming year.

The Library and House Committee has rendered splendid service towards having the library recatalogued and put in shape to be of more universal use to the members.

The Institute was well represented at the World Power Conference during the past year, fifteen of our members in all being in London at the time. Advantage was taken of the occasion to form closer contacts with the engineering societies in Great Britain and France.

The final report of the Fuel Committee was made during the year and the recommendations made by the committee, as published in *The Journal*, were approved. This committee is deserving of particular mention in view of its activities, as is also the Committee on the Deterioration of Concrete in Alkali Soils, which is continuing its work in a most satisfactory manner.

Meetings

The thirty-eighth annual general meeting of *The Institute* was held at headquarters in Montreal on Tuesday, January twenty-second, nineteen twenty-four, and after the reading of the minutes of the previous annual meeting and the appointment of scrutineers to report the result of the officers ballot, and auditors for the ensuing year, the meeting was adjourned to be reconvened at the Chateau Laurier, Ottawa, the following day.

The business of the adjourned meeting was resumed at the morning session in Ottawa, when the report of Council and the various committee and branch reports were presented. The announcement of the result of the ballot for the election of officers, the installation of the newly-elected president, and the reading of messages received concluded the business of the meeting which was then adjourned.

Following the adjournment of the annual meeting, the general professional meeting, held under the auspices of the Ottawa Branch, was opened with a luncheon in the Chateau Laurier. At this meeting the following papers were presented:—

"**Progress in Aviation**," by Sir Sefton Brancker, K.C.B., etc.

"**The Fuel Problem**," by Dr. Charles Camsell, M.E.I.C.

"**The St. Lawrence Deep Waterways Problem**," by D. W. McLachlan, M.E.I.C.

In addition to the technical sessions there were the following functions: — On Wednesday, January 23rd, the annual banquet at the Chateau Laurier, at which the newly-elected president presented his address and the smoker the same evening, following the banquet. On Thursday, January 24th, the morning technical session was followed by a luncheon at the Chateau Laurier and visits to points of interest in the afternoon, the meeting concluding that night with the annual ball of the Ottawa Branch at the Chateau Laurier.

Roll of The Institute

The election of new members has added two hundred and seventy-one names to the roll of *The Institute*, during the year nineteen twenty-four. These are divided into the following grades: — Twenty Members; seventy-eight Associate Members; twenty-two Juniors; one hundred and forty-seven Students; and four Affiliates.

Transfers from one grade to another in *The Institute* were as follows: — Associate Member to Member, twelve; Junior to Associate Member, twenty-four; Student to Associate Member, eight; Student to Junior, thirty-three; Affiliate to Associate Member, one.

A summary of these elections and transfers is given below. The names of those elected or transferred are published each month in *The Journal*, immediately following election, and are added to the official membership roll as acceptances are received.

Elections

	Members	Associate Members	Juniors	Students	Affiliates
January	2	8	4	..	1
February	..	..	..	22	..
March	..	..	..	11	..
April	6	21	7	30	..
May	..	..	..	3	..
June	6	16	3	..	3
July	..	..	..	..	..
August	..	..	..	8	..
September	4	15	4	9	..
October	2	2	2	10	..
November	..	16	2	28	..
December	..	..	..	26	..
	20	78	22	147	4

Transfers

	A.M. to M.	Jr to A.M.	S to A.M.	S to Jr.	Aff. to A.M.
January	..	4	..	3	..
February	..	..	..	..	..
March	..	..	..	..	..
April	2	5	1	5	1
May	..	..	..	1	..
June	3	11	..	13	..
July	..	..	..	..	..
August	..	..	..	..	..
September	6	1	3	6	..
October	..	..	4	4	..
November	1	3	..	1	..
December	..	..	..	..	..
	12	24	8	33	1

Removals from the Roll

There have been removed from the membership roll during the year nineteen twenty-four, by resignation, non-payment of dues, and the not-reported soldiers list: — fifteen Members, eighty-three Associate Members, fifty-three Juniors, one hundred and seven Students, and one Affiliate. The removals under the heading of "Not Reported Soldiers List", includes the names of those members of *The Institute* who served overseas, but from whom no word has been received since the period of their service, although information regarding these members has been sought from time to time. A detailed list of the resignations accepted is as follows:—

Members

Grant, Donald Ernest, O.B.E.
Johnston, Harry Linwood
Kandall, Geo. P.
Lambert, Walter
Moore, Robert H.
Parsons, J. L. R.

Associate Members

Bordessa, B. C.
Boulet, L. N.
Chase, Albert V.
Cooper, Howard Scott
Cumberford, James
Cummings, John
Devereux, Francis A.
Garroni, Meliton C.
Garvie, Robert Andrew
Goodwin, George
Greenwood, Jos. H.
Habben, Lawrence E.
Kingston, J. S.
Jennings, Frank P.
Laflamme, Jos. K.
Lamarque, Ernest C. W.
MacDermot, Edward C.
McCuaig, Peter John
Paquet, Donat
Porter, John Henry, Jr.
Read, Hiram E.
Ridout, Geo. L.
Russel, Robert K.
Sedgwick, Arthur
Slater, Nicholas J.
Smith, R. Stephenson
Sword, Arthur D.
Villeneuve, Ths. Ls.
Young, E. J.

Juniors

Clary, Arthur Reeser
Giguire, Eudore
Greatrex, Wm. K.
Holmgren, E. L.
Long, Arthur
Patterson, Jas. F.
Stewart, Alan D.
Sutherland, Archibald Jos.
Wilcock, Wm. S.

Students

Anderson, Robert Beresford
Baker, Ackland James
Churchill, T. C. D.
Cromwell, H. Roy.
Cunningham, Fred. J.
Eckert, Fred. Russell
Elliott, Frank Wallace
Farncomb, Hugh F.
Foster, A. R.
Hayman, Harold G.
Jordan, John N.
MacGregor, R. A.
Moore, Arthur J.
O'Brien, Frederick Gordon
Paget, J. Alan
Perrault, R. B.
Robitaille, Henri J.
Rundle, Wilmot L.
Shapter, Carl
Steacie, E. W. R.
Strudley, Donald B.
Tempest, Wm. F.
Tennyson, Alfred L.
Walden, J. G. Loftin
Willis, I. D.
Wingfield, Alex. H.

Affiliate

Labrie, Charles C.

Deceased Members

During the year nineteen twenty-four, the deaths of forty of *The Institute's* members have been reported.

Honorary Member

Deville, E., LL.D., D.L.S., F.R.S.C.

Members

Anderson, George G.
Barry, Aug. Burges
Bowden, William A.
Caddy, John St. Vincent
Carroll, Cyrus
Crossley, Frederick
Davidson, William A.
Désy, Louis A.
Fitzmaurice, Lt.-Col. Sir Maurice
Francis, Walter J.
Gronau, William Fred.
Hayward, Robert Francis
Hunter, Robert E.
Miller, Fred. Fraser
Mills, Nathaniel Child
Odell, Charles M.
Rhéaume, Louis N.
Steckel, L. J. R.
Way, Wm. C.
Young, Frank Moses

Associate Members

Begg, W. A.
Bruce, Henry William
Campbell, William Fred
Côté, Hon. J. L.
Dunlop, Thos. T.
Dry, Reginald D.
Gray, Edwin Roy
Greene, N. Hanson
Henry, Gabriel
Hodgins, Lt.-Col. F. Owen, D.S.O.
Lindsay, Jas. Gray
Riddell, Andrew J.
Symes, John A.
Wildridge, Chas. H.

Juniors

MacMillan, M. J.

Affiliates

Gosselin, Jos., Jr.
Meriwether, Coleman
Taylor, Wilson

Student

*Dawson, Lieut. John Kenneth

*Killed in Action, authentic information of which has been received during the year.

Total Membership

The membership of *The Institute* at present totals five thousand, one hundred and twenty-five, while there are one hundred and one applications which have been favourably received, the addition of the names of these applicants to the roll being delayed pending the receipt of their formal acceptance of election. The annual report for the year nineteen twenty-three showed two hundred and thirty-eight elections, acceptances of which were pending. During the year there were removed from this number one hundred and twelve applications which had lapsed through time. The membership according to grades is shown in the accompanying table:—

Honorary Members	10
Members	1,139
Associate Members	2,451
Juniors	421
Students	1,061
Affiliates	43
	5,125
Elections—acceptances pending	101
	5,226

Respectfully submitted on behalf of the Council,

ARTHUR SURVEYER, M.E.I.C., *President.*
FRASER S. KEITH, M.E.I.C., *Secretary.*

Library and House Committee

The President and Council,

The year has been an important one in the affairs of the Library and House Committee. Acting under the authority of Council arrangements were made for recataloguing the library under the Dewey decimal system, similar to that in vogue in the Engineering Societies Library, New York. *The Institute* is indebted to the director of the Engineering Societies Library for the fact that we were able to make arrangements to have the services of the expert technical cataloguer of the library, who spent six weeks on the work and who is to return during the coming year in order that it may be completed. It has been decided to have the card catalogue in the main office with one of the staff in charge as librarian. With the recataloguing and re-arranging of the books, and greater staff service, it is hoped that the library will be made much more useful to the members.

We are again indebted to a number of individuals and organizations for the presentation of books and reports, all of which are acknowledged herewith.

There was expended on the library during the year, one thousand and seventeen dollars and one cent.

New books added to the library and contributions received during the past year, have been listed each month in *The Engineering Journal* and may be found on pages 43, 217, 316, 586, 658 and 748 of volume VII. These are gratefully acknowledged as are also the following special donations which have been received during the year:—

Presented by the Library of McGill University.

Miscellaneous duplicate volumes of the following engineering publications:—

Transactions and reports of the Canadian Society of Civil Engineers; Transactions of the American Society of Mechanical Engineers; Professional papers of the Corps of Royal Engineers; Proceedings of the Association of Railway Superintendents of Bridges and Buildings; Proceedings of the Engineers Club of Philadelphia; Transactions of the Society of Engineers; Proceedings of the South Wales Institute of Engineers; Proceedings of the Institution of Mechanical Engineers; Proceedings of the American Waterworks Association; Transactions of the Liverpool Engineering Society; Electrical Review; Engineering Magazine; Engineering News; Engineering Index; Engineering; The Engineer; Electrical Engineer.

Presented by the Estate of the late D. S. Barton, M.E.I.C.

Transactions of the Canadian Society of Civil Engineers 1899-1919
Reports of Meetings Canadian Society of Civil Engineers 1899-1918
Journal and List of Members of the Institution of Electrical Engineers, 1886 to 1919.

Publications of the Commission of Conservation; Preliminary Report respecting Water Powers by A. V. White; Review of Work, 1917, by Sir Clifford Sifton; Electrification of Railways — Dodd; Power Possibilities on the St. Lawrence River — A. V. White; The Niagara Power Shortage — A. V. White; National Conference on Game and Wild Life Conservation; Mine Rescue Work in Canada; Civic Improvement League for Canada; Tenth Annual Report, 1919; Rural Planning and Development — Adams; First Annual Report, 1910.

Publications of the Department of Lands and Forests, Quebec.

Miscellaneous publications of the Department of the Interior, Canada.

Miscellaneous publications of the following departments and commissions; Hydro-Electric Power Commission of Ontario; Quebec Streams' Commission; Department of Mines Canada; Department of the Naval Service Canada; Commission of Highways, Ontario; Department of Colonization, mines and fisheries, Quebec; Ontario Bureau of Mines.

History of the French Revolution and the Subsequent Wars.

Presented by W. Bell Dawson, M.E.I.C.

Instructions to Engineers by Sir Sanford Fleming, 1875.

Presented by L. H. Cole, M.E.I.C.

Mineral Resources of the United States.

Presented by A. G. Jeffreys, A.M.E.I.C.

Dictionary of Applied Physics by Sir Richard Glazebrook.

Presented by Doctor Alexander Russell, President of the Institution of Electrical Engineers.

Lord Kelvin, His Life and Work.

A detailed list of publications which are regularly placed in the reading room was published in last year's report of the Library and House Committee, and appears on page fifty-three of the February nineteen twenty-four *Journal.* The year-books and other publications of universities and societies have been regularly received, as have also those of governmental departments and special reports on engineering matters.

Of particular interest is an old woodcut of the original Victoria Bridge at Montreal, which was presented by Mr. W. G. A. Hemming.

Respectfully submitted,

ARTHUR SURVEYER, M.E.I.C., *Chairman.*

Legislation and By-laws Committee

The President and Council,

Following the recommendations of your committee last year the members voted on the suggested changes to the by-laws, all of which were carried practically unanimously. These related to the term of office of vice-presidents and councillors, the establishment of an engineering sections committee, consideration of applications for admission and transfer, and the detail in handling the officers' ballot.

Plans are under way to give further consideration to the question of harmonizing branch by-laws. It is realized that branch by-laws cannot be standardized but that certain freedom of action must be given. A separate committee has been appointed by the Council for this purpose whose report will no doubt be submitted to next year's Legislation and By-laws Committee.

Respectfully submitted,

J. A. DUCHASTEL, M.E.I.C., *Chairman.*

Board of Examiners and Education Committee

The President and Council,

On behalf of the Board of Examiners and Education I beg to present the following report for the year 1924.

Examinations were held in May and November. The following table gives the number of candidates who were examined and also the numbers of those who passed and failed.

Schedule	Number examined	Passed	Failed
B	4	2	2
C mechanical engineering	1	0	1
C electrical engineering	2	2	0
C railway engineering	1	1	0
C structural engineering	1	0	1
Total examinations	9	5	4

Respectfully submitted,

H. M. MACKAY, M.E.I.C., *Chairman.*

Finance Committee

The President and Council,

In accordance with a recently established custom your committee prepared a budget at the beginning of the year which showed a slight surplus on operations for the year, and we are again thankful to be able to report a favourable balance.

It might be pointed out that the arrears of fees collected was fifteen hundred dollars less than last year and about twenty-four hundred dollars less than a year ago. Current fees, which were estimated at twenty-seven thousand dollars, showed a decrease of one thousand dollars on that amount. Last year entrance fees were thirty-two hundred and fifteen dollars, being estimated for the current year at three thousand dollars, and show a total of twenty-six hundred dollars received, thus our current revenue has been considerably less than anticipated.

It should also be called to the attention of the members that current revenue from the dues of members is not sufficient to maintain the organization, and that the question of increased dues will have to be considered in the near future.

Rebates to branches amounted to over sixty-one hundred dollars, and the branches received for branch news and commissions the sum of nine hundred and twenty-two dollars and twenty-three cents.

As far as current expenses were concerned the budget was adhered to throughout the year, showing that this system is one that should be maintained.

Respectfully submitted,

F. P. Shearwood, M.E.I.C., *Chairman.*
Alex. Bertram, M.E.I.C., *Treasurer.*

STATEMENT OF ASSETS AND LIABILITIES AS AT 31st, DECEMBER 1924

Assets

Property		$ 89,041.64
Furniture		
Balance at 1st January 1924	$ 3,644.91	
Additions during year	143.65	
	3,788.56	
Less 10% depreciation	378.85	
		3,409.71
Library:		
Estimated value of books	4,614.57	
Less 10% depreciation	461.45	
		4,153.12
Stationery on hand, as per inventory		325.39
Gold medal		45.00
Investments:		
Canada Permanent Mortgage Corporation stock, 20 shares par value $10.00 each	215.00	
Montreal Light, Heat & Power Consolidated stock, 6 shares par value $100.00 each	120.50	
		335.50
Accounts Receivable:		
Journal	3,702.61	
Advances to branches	400.00	
Sundry	104.50	
	4,207.11	
Less reserved for bad and doubtful accounts	500.00	
		3,707.11
Journal, copies sold not yet delivered		1,500.00
Arrears of fees, estimated		2,500.00
Year Book, prepaid expense for 1925		150.00
Cash:		
Canadian Bank of Commerce,—		
Current account	1,894.58	
Savings accounts	1,978.47	
Petty cash on hand	100.00	
		3,973.05
Unexpired Insurance		164.11
Special Funds:		
Investments	19,138.85	
Cash in savings bank accounts	1,104.56	20,243.41
		$129,548.04

Liabilities

Mortgage on property:		
Royal Institute for the Advancement of Learning	$ 20,000.00	
Interest accrued to date	233.33	$ 20,233.33
Accounts payable:		
Sundry	449.03	
Advances to branches	640.93	
		1,089.96
Special funds		20,243.41
Student Apprenticeship Prize		25.00
Surplus account:		
Balance at 1st January 1924	86,071.34	
Add surplus for year	1,915.00	
	87,986.34	
Deduct allowance on 1923 accounts receivable	30.00	
		87,956.34
		$129,548.04

Montreal, 10th January, 1925.
Verified as per our report of this date.
(Signed) Riddell, Stead, Graham & Hutchison, C.A.
Auditors.

STATEMENT OF REVENUE AND EXPENDITURE FOR THE YEAR ENDED 31st DECEMBER 1924

Revenue

Membership fees:		
Arrears	$ 3,035.17	
Current	26,062.11	
Advance	504.71	
Entrance	2,610.00	
		$ 32,211.99
Interest:		
On overdue fees	257.60	
On Victory bonds	660.00	
On savings bank account	20.66	
		938.26
Dividends:		
Canada Permanent Mortgage Corporation stock	24.00	
Montreal Light, Heat & Power Company stock	42.00	
		66.00
Journal:		
Revenue		46,276.28
Rent of hall		660.00
Certificates		217.60
Badges		68.32
Bad debts recovered		13.22
		$ 80,451.67

Expenditure

Building expense:		
Interest on mortgage	$ 1,400.00	
Taxes	1,494.11	
Water rates	203.70	
Fuel	470.74	
Insurance	147.24	
Light and gas	285.39	
Caretaker — wages and service	1,352.59	
Repairs and expense	769.59	
		$ 6,123.36
Office expense:		
Salaries, secretary and office staff	14,599.69	
Office supplies and stationery	1,556.09	
Postage and telegrams	1,849.97	
Auditors' fees	200.00	
Telephone	239.11	
Messengers and express	86.40	
Miscellaneous expense	251.79	
Legal expense	17.80	
		18,800.85
Publications:		
Transactions	207.42	
Journal	40,390.78	
		40,598.20
General expense:		
Annual and professional meetings expense	999.16	
Travelling expense, secretary	1,334.00	
Branch stationery	315.62	
Students' prizes	100.00	
Library expenses and magazines	1,017.01	
10% written off furniture	378.85	
10% written off books	461.45	
Bank exchange and discounts	132.65	
Committee expenses	648.04	
Bad debts written off	692.55	
Examination expense	87.50	
Branch charters	700.55	
		6,867.38
Rebates to branches		6,146.88
Balance — Excess of revenue over expenditure for the year ended 31st, December 1924		1,915.00
		$ 80,451.67

Montreal, 14th January 1925.
Verified:
(Signed) Riddell, Stead, Graham & Hutchison, C.A.
Auditors.

Schedule No. 1—Special Funds

Mortgage Fund

Balance			$12,269.51
Represented by:			
Victory bonds, par value	$12,000.00		
cost price	12,269.51		

Leonard Medal

Balance at 1st January 1924		$ 527.08	
Paid for medal		26.50	
		500.58	
Add Bond interest		27.50	
Bank interest		.97	
			$ 529.05
Represented by: Victory bond	$500.00		
Balance in bank	29.05		
	$529.05		

Plummer Medal

Balance at 1st January 1924		$ 526.42	
Add Bond interest		27.50	
Bank interest		.99	
			$ 554.91
Represented by: Victory bond	$500.00		
Balance in bank	54.91		
	$554.91		

Prize Fund

Balance at 1st January 1924		$ 512.10	
Add bank interest		15.46	
			$ 527.56
Represented by: balance in bank	$527.56		

Fund for Relief of Members' Families

Balance at 1st January 1924		$ 1,641.23	
Less paid out for relief		285.00	
		$ 1,356.23	

Add Bond interest		77.00	
Bank interest		6.44	
			$ 1,439.67
Represented by: Victory bonds	$1,400.00		
Bank balance	39.67		
	$1,439.67		

Past President's Fund

Balance at 1st January 1924		$ 2,525.07	
Add donation		100.00	
Bond interest		62.50	
Bank interest		9.74	
			$ 2,697.31
Represented by:			
Dom. of Canada C.N.R. 5% 1954		$ 2,489.55	
Bank balance		207.76	
		$ 2,697.31	

War Memorial Fund

Total subscriptions to date		$ 2,541.99	
Less collection expenses		227.99	
		2,314.00	
Less Prize awarded for best design for memorial		150.50	
		2,163.50	
Add Bond interest		50.00	
Bank interest		11.90	
			$ 2,225.40
Represented by:			
C.P.R. Coll. Trust 1934 bonds		$ 1,979.79	
Balance in bank		245.61	
		$ 2,225.40	
			$20,243.41

Code of Ethics Committee

The President and Council,

Your committee does not at present favour any revision in the code as recommended in the December, 1923, *Journal.* It is hoped that this code will be closely followed where possible, or at least taken as a guide by those associations which are forming codes for the provincial legislatures, for your committee feels that it would be an advantage to have little or no variation in the ethical standards in the several provincial associations throughout the Dominion.

Respectfully submitted,

FREDERICK B. BROWN, M.E.I.C.
F. P. SHEARWOOD, M.E.I.C.

Students' Activities Committee

The President and Council,

It was realized when the recommendations of this committee were made a year ago in suggesting that all branches at university centres take steps to interest the students in the profession that it would take considerable time to have this policy fully established and in working order. A number of branches have taken up the suggestion enthusiastically and are carrying out this work to good effect. Your committee reports that it is in touch with the situation in the various branches and considers this policy should be adhered to during the coming year, at the end of which it is expected to be able to report definite and very substantial results.

Respectfully submitted,

GEO. R. MACLEOD, M.E.I.C., *Chairman.*

Nominating Committee — 1925

The following nominations to the Nominating Committee for the year 1925 have been made by the various branches, have been noted by Council, and are herewith presented to be announced at the annual meeting in accordance with the by-laws.

Halifax Branch	K. H. Smith, M.E.I.C.
Cape Breton Branch	James Purves, M.E.I.C.
St. John Branch	C. C. Kirby, M.E.I.C.
Moncton Branch	A. F. Stewart, M.E.I.C.
Saguenay Branch	C. N. Shanly, M.E.I.C.
Quebec Branch	A. E. Doucet, M.E.I.C.
Montreal Branch	W. C. Adams, M.E.I.C.
Ottawa Branch	L. Sherwood, M.E.I.C.
Peterborough Branch	B. L. Barns, A.M.E.I.C.
Kingston Branch	LeR. F. Grant, A.M.E.I.C.
Toronto Branch	N. D. Wilson, A.M.E.I.C.
Hamilton Branch	H. A. Lumsden, M.E.I.C.
London Branch	E. A. Gray, A.M.E.I.C.
Niagara Peninsula Branch	Alex. Milne, A.M.E.I.C.
Border Cities Branch	G. V. Davies, A.M.E.I.C.
Sault Ste Marie Branch	J. W. LeB. Ross, M.E.I.C.
Lakehead Branch	F. Y. Harcourt, M.E.I.C.
Winnipeg Branch	J. N. Finlayson, M.E.I.C.
Saskatchewan Branch	C. J. Mackenzie, M.E.I.C.
Lethbridge Branch	N. H. Bradley, A.M.E.I.C.
Edmonton Branch	R. S. L. Wilson, A.M.E.I.C.
Calgary Branch	J. H. Ross, A.M.E.I.C.
Vancouver Branch	Wm. Smaill, M.E.I.C.
Victoria Branch	J. N. Anderson, A.M.E.I.C.

Gzowski Medal Committee

The President and Council,

Your committee, appointed to judge the papers eligible for the Gzowski Medal for the year ending June 30th, 1924, recommends that this medal be awarded to Mr. D. W. McLachlan, M.E.I.C., for his paper on "The St. Lawrence River Problem", which was published in the March, 1924, issue of *The Journal.*

Respectfully submitted,

FREDERICK B. BROWN, M.E.I.C., *Chairman.*

Leonard Medal Award

The majority of the Leonard Medal Committee reported in favour of awarding the Leonard Medal to Doctor Charles Camsell, M.E.I.C., for his papers "The Mineral Industries, their present place in the Commercial Development of Canada", C.I.M.M. Bulletin, March 1924, and "The Fuel Problem", *Engineering Journal,* April 1924. Doctor Camsell, who is chairman of the committee, reported that he did not consider his papers eligible for the Leonard Medal as they were not his own efforts, having compiled them from information received from other sources. He recommended the award of the medal to W. L. Uglow, for his paper "The Undiscovered Mines of British Columbia", C.I.M.M. Bulletin, October 1923, this being the alternative recommendation of the other members of this committee. The matter was referred to Council who, after deliberations, decided to make the award to W. L. Uglow.

Plummer Medal Committee

The President and Council,

In reply to your letter of June 16th, addressed to the members of this Committee, I have pleasure in stating that the Committee has considered the matter very carefully and has decided unanimously to recommend that the Plummer Medal for this year be awarded to Mr. Gordon Sproule, M.Sc., A.M.E.I.C., for his paper on "Metals in Engineering Service" which was published in the December 1923 number of *The Engineering Journal.*

For the committee:

ALFRED STANSFIELD, D.Sc., M.E.I.C., *Chairman.*
CHARLES CAMSELL, LL.D., M.E.I.C.
G. D. MACDOUGALL, M.E.I.C.
JOHN F. ROBERTSON, M.E.I.C.
J. COLIN KEMP, M.E.I.C.

Students' Prizes Committee

The President and Council,

Your committee has examined all the papers submitted by Student members of *The Institute* for consideration in connection with the award of the Students' prizes and takes pleasure in recommending the award of a prize to each of the following:

F. E. Hawker, S.E.I.C., for his paper on "Underground Electrical Conduits";

E. Gray-Donald, S.E.I.C., for his paper on "Hydro-Electric Power Distribution";

H. Greenberg, S.E.I.C., for his paper on "Low Temperature Carbonization and Its Products";

H. M. Thompson, Jr.E.I.C., for his paper on "Mechanical Equipment used in Road Construction and Maintenance".

In arriving at the above decision, Mr. Hawker's paper was classified in the general or civil section; Mr. Gray-Donald's in the electrical section; Mr. Greenberg's in the chemical section, and Mr. Thompson's in the mechanical section.

In general the standard of the papers submitted for consideration is not as high as might be desired, and it is the hope of your committee that greater attention will be given to the preparation of papers by students for future competitions.

Respectfully submitted,

FREDERICK B. BROWN, M.E.I.C., *Chairman.*

Honour Roll and War Trophies Committee

The President and Council,

During the year your committee has made preliminary arrangements for the erection at headquarters of a fitting Memorial to the members of *The Institute* who gave their lives in the Great War, and a record in bronze to those members who served. An appeal to the members for funds has resulted in the sum of **Two thousand five hundred and forty-one dollars and ninety-nine cents ($2,541.99)** being received up to date for that purpose. Competitive designs were requested for the memorial and record, and a prize was offered — $150.00 for the former and $100.00 for the latter. The result of the competition has shown that there is considerable artistic talent available in *The Institute*. The award was made, following its approval by Council, to Major Fred. G. Cross, A.M.E.I.C., of Brooks, Alta., in both competitions.

As the bronzes are estimated to cost approximately $4,000.00, another opportunity will be presented to the members of subscribing the amount needed, notice of which is being sent with the statement of annual dues. When a sufficient amount has been received, work will be commenced in the hope that the memorial and record in bronze will be ready and in place during the coming summer.

Respectfully submitted,

C. J. ARMSTRONG, BRIG. GEN., *Chairman.*

Montreal, P.Q.
12th January 1925

Committee on International Co-operation

The President and Council,

The members of the committee have taken advantage of the unique opportunities afforded by the World Power Conference in London and the subsequent official tours to various European countries to establish direct and friendly relations for *The Engineering Institute of Canada* with organized engineering bodies of Great Britain, France, Italy, Switzerland, Germany and the Scandinavian countries. With the Institutions of Engineers of Great Britain particularly, there have been established, with the personal assistance of the General Secretary, the most cordial connections.

The consistent policy of *The Institute* to maintain and, wherever possible, to foster the friendliest co-operation with the Founder Societies of the United States has also been consistently fostered by individual members of the Committee. It is hoped within a reasonable time to have evolved a well defined and generally acceptable arrangement that will permit of a suitable exchange of privileges between Founder Societies of the United States on the one hand and *The Engineering Institute* on the other.

As a result of the year's activities, *The Engineering Institute* is more generally and favourably known abroad than ever in its history. The work of this Committee is of a character that cannot be referred to in detail, and its results can only be reported in a general way. It can confidently be stated, however, that the interests of *The Institute* have been constructively advanced and greatly extended during the past year.

Respectfully submitted,

J. B. CHALLIES, M.E.I.C., *Chairman.*

Committee on Apprenticeship and Training of Engineers

The President and Council,

1. We have the honour to submit the following report and recommendations for the consideration of the Council of *The Engineering Institute of Canada* on the question of practical training of engineers.

2. We wish to place on record at the outset our indebtedness to the Institution of Civil Engineers and to Mr. A. E. Berriman, honorary organizer in England of the Engineering Training Organization, for much valuable information in regard to what has been done in recent years in Great Britain in connection with the best methods of education and training for all classes of engineers. A great deal of discussion and inquiry into this subject has been carried on intermittently in Great Britain by the various engineering institutions since the year 1868. More particularly in 1903, as showing the importance that is attached to this question, the following engineering societies nominated representatives to serve on a special committee to advise on this subject:—

The Institution of Civil Engineers,
The Institution of Mechanical Engineers,
The Institution of Naval Architects,
The Iron and Steel Institute,
The Institution of Electrical Engineers,
The Institution of Gas Engineers,
The Institution of Engineers and Shipbuilders in Scotland,
The Institution of Mining Engineers,
The North-East Coast Institution of Engineers and Shipbuilders

3. As we propose confining our remarks to the practical training of engineers, we have not considered the question of preparatory education, as presumably the universities are better fitted to advise on this subject.

4. In regard to practical training, the committee are unanimously of opinion that some system of training, either during the last two years of the education of the young engineer, or sometime of pupil-age or training for probably a minimum of two years immediately after the student has left the college would be of great value, not only to the young engineer himself, but to the profession in general.

5. In our opinion it is most important that the young civil engineer should be instructed in the principles governing the economic execution of earth work, the design and erection of steel work, the building of masonry and the design and construction of mass and reinforced concrete. Accuracy in the setting out of works under construction is a most important matter. Architecture as a mechanical art in distinction from architecture as a fine art would be a most useful acquisition. While engineering structures no doubt are built to be useful and their character on most occasions should be simple, still there is no reason why their utility should not be made beautiful. A knowledge of modern languages is most desirable, and in the new examinations for entrance to the Institution of Civil Engineers fluency in one foreign language is essential. Unquestionably in Canada French would be found to be the most useful.

6. The Rt. Hon. Lord Justice Fletcher Moulton has said, "The profession of engineering involves much more than mere engineering knowledge, or even executive skill. In a large proportion of the matters in which he is consulted, the engineer has the responsibility of giving advice, and that advice often relates to acts in which the rights of three parties are directly or indirectly involved. This consideration alone would make it desirable that he should have a sound knowledge of such branches of the law as bear upon the question he is to resolve, but his need of clear legal conceptions does not depend upon this alone. He has not only to administer but often to frame contracts of a character which beyond doubt renders them the most complicated of any that have to be interpreted and pronounced upon by our courts, and their nature is such that he can only pass on the responsibility to professional lawyers to a small extent. The rest deals with matters so technical that it must remain in his hands".

7. It appears to your committee that the period between the ages of 20 and 25, or thereabouts, is the most

important for the professional future of the young man, as during this period he certainly learns more and is more influenced than at any other time of his career. We are unanimously of opinion that during these early years the young engineer who hopes to rise to the higher ranks should be content, within reasonable limits as to salary, to sacrifice everything possible for the sake of gaining experience, as the use of this particular time, good or bad, will determine the success or failure of the engineer for the future.

8. Apprenticeships may be of two types. First,—that given to a man after he has had a complete science course at a college; second, —that taken by a youth with a good high school education. The first is that recommended by the Institution of Civil Engineers.

9. To quote from one of the most eminent and successful engineers of this century who took a great interest in the training of young engineers, "Practical knowledge is at least as necessary as theory, and, while advocating the cultivation of the latter, I feel very strongly the importance of the former. Such practical knowledge as will make a true engineer can only be secured in the old-fashioned way by a young man seeing work done and learning from it lessons from experience."

10. The committee are of opinion that the preliminary stage of practical training should consist, if at all possible, of at least a short time spent in mechanical engineering work-shops, or otherwise where he will be in contact with workmen. This introductory workshop experience is desirable even when students do not contemplate devoting themselves at a later stage to what is generally known as mechanical engineering. They will probably be already acquainted with the use of tools and machinery, but one thing which is of vast importance they have not been made acquainted with,—a knowledge of working men, their modes of thought and feelings, and, if the young engineer is in the future to occupy a high position in control of a large body of men, he will find he learned many things of value in this year or two of association with bona-fide working men.

11. The committee find that for shipbuilding and mechanical engineering, what appears to be an excellent system of apprenticeship has been in practice for many years in Montreal at the works of a large engineering company, and their system is as follows:—

12. The apprenticeship covers a period of four years. The rates of wages paid are:—

First year	20 cents per hour
Second year	22½ cents per hour
Third year	27½ cents per hour
Fourth year	32½ cents per hour

13. In addition to the wages, bonuses are paid for good conduct and diligence in the workshop or the drawing office, and also for attendance at evening classes. The bonus is as high as 50 per cent of the wages paid during the year. Apprentices are expected to attend classes three evenings a week. Vacancies on the staff are filled by apprentices having the highest number of marks.

14. The chairman of your committee has had young civil engineers serving a regular apprenticeship on his staff on the construction of harbour works, each under an agreement to serve two years. These young men had already taken university engineering degrees before commencing their practical training. They were employed in the drawing office in the designing of working drawings, took part in actual grading and testing of materials for concrete, inspected the making of concrete under many different conditions, assisted in measuring up for certificates at the end of each month, accompanied the resident engineer when all foundations were being examined before being approved, inspected making of piles and the driving of same, were thoroughly trained to become expert divers, so as to examine foundations below water in a diving dress, gained considerable experience of working under compressed air in caissons, learned by experience the difficulty of the construction of large cofferdams and the pumping out and unwatering of works. By the end of their second year's training from their practical experience, they are able to command higher salaries and likely to attain to a higher ultimate position than the young man who as soon as he leaves college immediately takes some position where, at the moment, he is able to earn more money to begin with, but learns little or nothing which is to be of value to him in future years.

15. The committee are of opinion that for civil engineers at least two years spent on the staff of the chief engineer, or contractor, on large public works, with or without pay, so long as the employer recognizes his responsibility and gives the young engineer all reasonable opportunity to gain experience, is probably the best form of practical training that the young engineer could have, as, if the works are sufficiently large and the apprentice sufficiently keen on acquiring knowledge, he will learn more in a month of the actual difficulties of engineering and construction and how to overcome them than he would in years of study without practical experience.

Respectfully submitted,

A. D. SWAN, M.E.I.C., *Chairman*,
R. S. LEA, M.E.I.C.,
F. P. SHEARWOOD, M.E.I.C.,
K. B. THORNTON, M.E.I.C.,
H. M. MACKAY, M.E.I.C.

Fuel Committee

The report of the Institute Fuel Committee was published in the November and December 1924 issues of The Journal, pages 678 and 721 respectively.

Committee on Deterioration of Concrete in Alkali Soils

The President and Council,

Three years ago our committee instituted a research, which had for its main object a study of the chemistry of cement and the action on it of so-called alkali waters. It was decided to raise sufficient funds to carry on the work for three years, which it is estimated would be the minimum time required to ascertain the exact chemical reactions that take place when concrete is disintegrated by alkali waters.

Your committee is very pleased to be able to report that very satisfactory progress has been made and that under the direction of Dr. Thorvaldson, the research has been very actively prosecuted and that at present he has prepared for publication scientific papers on "The Nature of the Action of Sulphates on Portland Cement", "The Action of Sulphates on the Individual Substances present in Portland Cement" and that several other papers will be ready for publication in the immediate future. It is the hope of the committee that by next summer a very full report of the entire work will be ready in which these condensed scientific papers will be incorporated and amplified. We feel that it will be possible then to state quite definitely just what reactions take place in the disintegration of concrete under alkali conditions, and also have remedies to suggest. Already various means of preventing the action are being investigated, but your committee feels that the commercial testing of any remedies suggested is a matter for the industries concerned and that our purpose will have been achieved when we have been able to show the exact cause and suggest possible remedies.

We have sufficient funds, as will be seen from the financial statement, to carry on the work for another six to nine months, when we expect the primary object for which this committee was formed will have been successfully attained.

Field Work

While we have considered our research to be concerned chiefly with the chemical investigation, the physical test blocks have been observed, and while we do not wish to point out any definite conclusions of particular value, the following report is submitted on the latest inspection:—

During the past year a few additional specimens have been made and treated with a number of surface coatings which have been brought to the attention of members of the committee. Specimens were also made with Lumnite cement, a new high alumina, high early strength cement, which is now being manufactured in the United States and which is similar in physical characteristics to the French "Ciment Electrique" which was used in 1922. All of the above specimens were prepared too late to be installed in 1924.

The condition of the blocks installed in 1921 and 1922 is shown in tables Nos. 1, 2 and 3. The descriptive phrases employed do not completely describe the relative conditions of the various specimens but unless they are described as "Good condition" apparent deterioration has taken place varying from surface roughening and scaling to complete disintegration.

Table No. 4 shows details of mixtures prepared in 1922, and which were not included in the tabulation found in the annual report of the committee for 1922 which was published in the February, 1923, issue of *The Journal.*

Table No. 1, — Condition of Concrete Block Specimens at Dates Indicated.

Full details as to cement and aggregate proportions will be found in the February 1923, issue of the Engineering Journal.

Two specimens of each batch are exposed at each site. One specimen of each batch was inspected at Deacon in 1923, both specimens at the other locations.

Unless otherwise indicated blocks were installed in the fall of 1921.

Batch No.	Cassils—April, 1924	Grandora—Sept. 30, 1924	Deacon—Sept. 6, 1923.
1	Good condition	Good condition	Good condition
2	Good condition	Good condition	Good condition
3	Slowly disintegrating	Slowly disintegrating	Good condition
4	Rapidly disintegrating	Some disintegration	Good condition
5	Good condition	Good condition	Good condition
6	Slowly disintegrating	Some disintegration	Some disintegration
7	Good condition	Good condition	Good condition
20	Rapidly disintegrating	Surface roughening	Some disintegration
21	Good condition	Good condition	Good condition
22	Rapidly disintegrating	Complete disintegration	Good condition
*23	Good condition	Surface roughening	Good condition
*24	(Not installed at Cassils)	Complete disintegration	(Not reported)
60	Rapidly disintegrating	Rapidly disintegrating	Slowly disintegrating
61	Good condition	Surface roughening	Good condition
62	Rapidly disintegrating	Complete disintegration	Some disintegration
63	Rapidly disintegrating	Some disintegration	Some disintegration
64	Rapidly disintegrating	Some disintegration	Slowly disintegrating
65	Rapidly disintegrating	Some disintegration	Slowly disintegrating
66	Rapidly disintegrating	Some disintegration	Slowly disintegrating
69	Rapidly disintegrating	Complete disintegration	Slowly disintegrating
*70	(Not reported)	Complete disintegration	Rapidly disintegrating
72	Slowly disintegrating	Asphalt peeling off at ground	Asphalt coating destroyed
73	Some disintegration	Good condition	Some disintegration
74	Rapidly disintegrating	Rapidly disintegrating	Good condition
76	Some disintegration	Some disintegration	Good condition
77	Complete disintegration	Some disintegration	Good condition
78	Rapidly disintegrating	Tar peeling off at ground	Some disintegration
78	Rapidly disiutegrating	Tar peeling off at ground	Some disintegration
*80	(Not reported)	Complete disintegration	Rapidly disintegrating
81	Complete disintegration	Rapidly disintegrating	Some disintegration
82	Rapidly disintegrating	Some disintegration	Good condition
83	Slowly disintegrating	Some disintegration	Some disintegration
84	Slowly disintegrating	Good coudition	Good condition
*85	Good condition	Some disintegration	Good condition

*Installed fall of 1922. Details of these mixtures will be found in the following table.

Table No. 2, — Condition of Gunite Block Specimens made at Brooks — Installed Fall of 1922.

Grandora (1924)	Deacon (1923)
Both specimens badly disintegrated.	Good condition.

Table No. 3, — Condition of 2" x 4" cylinders furnished by Super Cement (America) Ltd.

All specimens in good condition at time the above inspections were made.

Table No. 4, — Specimens Molded at Saskatoon in 1922 and Installed the Same Year.

Batch No.	Cement	Aggregate	Proportions by volume	Special treatment	Lb. cement per cu. yd. concrete	Compressive strength 28 days pounds
23	Electric[1]	Warman	1-1.36-1.66	None	785	[3]3500+
24	Commercial[2]	Warman	1-1.36-1.66	None	735	500
70	Canada	Warman	1-1.36-1.66	Alkagel	709	2245
80	Canada	Warman	1-2.3-2.8	Alkagel	522	1365
85	Electric	Warman	1-2.3-2.8	None	525	[3]3500+

[1]"Ciment Electrique" supplied by Bureau d'Organisation Economique Paris, France.

[2]A natural cement.

[3]Exceeded capacity of available testing machines.

Financial

The following summary of expenditures and receipts as to December 1st, 1924, is submitted, a detailed and itemized statement of expenditures from December 1st, 1923, to December 1st, 1924, is being sent to the financial supporters of the research.

Total Expenditures to December 1st, 1924

General	Committee meetings, travelling expenses	$ 1,836.56	
	Misc., telegrams, office expenses	353.85	
			$ 2,190.41
Physical Tests	Travelling allowances and expenses	1,123.66	
	Material and special equipment	1,696.11	
	Freight and cartage	353.09	
			3,172.86
Chemical Research	Travelling expenses	340.81	
	Salaries	21,977.47	
	Materials and equipment	5,060.71	
			27,378.99
Grand total			$32,742.26

Total Receipts to December 1st, 1923

	1921	1922	1923	1924	Total
Research Council	5,000	5,000	5,000	—	$15,000.00
Canada Cement Co.	3,000	3,000	3,000	—	9,000.00
Saskatchewan	3,000	3,000	3,000	—	9,000.00
Alberta	1,000	1,000	—	—	2,000.00
C. P. R.	1,000	1,000	1,000	—	3,000.00
City of Winnipeg	200	200	300	—	700.00
Interest on bank acc.			139.41	422.14	561.55

Total receipts	$39,261.55
Total expenditures	$32,742.26
Balance in bank	$ 6,519.29

Expenditures in Year Dec. 1st, 1923 to Dec. 1st, 1924

General	Travelling expenses of committee		$ 207.90
Physical			27.30
Chemical	Travelling expenses	$ 62.36	
	Salaries	8,148.75	
	Materials	542.81	
			8,753.92
Total			$ 8,989.12

From the above statement it will be seen that while we have neither solicited nor received funds during the past year, we have sufficient funds on hand to carry on the research for another six to nine months, by which time we hope to be able to make a final report of our activities of the past three years.

All of which is respectfully submitted,

C. J. MACKENZIE, M.E.I.C., *Chairman*.

Canadian Engineering Standards Committee

The President and Council,

The Canadian Engineering Standards Association, which was incorporated in 1919, is a voluntary body, composed of members who give their services on its working committees. These committees deal with the various technical subjects, and are in each case nominated by the various interests concerned, whether manufacturers, engineers, or purchasers. They are engaged in the preparation of standard specifications, standard methods of test, and the like, with the view of their general adoption in Canada, thus obtaining simplicity and economy in engineering products, and protecting the public safety. The 55 working committees of the association now number more than 400 members, and are under the general direction of a Main Committee of 48 members.

The Engineering Institute of Canada's representatives on the above committee are now:

Sir Alexander Bertram, (retires March 1925).
Prof. C. J. Mackenzie, (retires March 1926).
Frederick B. Brown, (retires March 1927).

Mr. Brown was nominated by the Council of the E.I.C. to replace the late Mr. Walter J. Francis.

Publications

During 1924, the association has issued six new publications, the complete list of its published standards being as follows:—

No. A 1-1922 Standard Specification for Steel Railway Bridges.
A1a-1922 Material Specifications, Steel Railway Bridges (separate reprint).
C 2-1920 Standard Requirements for Distribution Type Transformers.
C 3-1924 Standard Specification for Galvanized Telegraph and Telephone Wire.
B4 -1921 Standard Specification for Wire Rope for Mining, Dredging and Steam Shovel Purposes.
A 5-1922 Standard Specification for Portland Cement.
A 6-1922 Standard Specification for Steel Highway Bridges.
D 7-1922 Standard Specification for Flexible Steel Wire Rope and Strand for Aircraft Purposes.
G 8-1923 Standard General Specification for Commercial Bar Steels.
A 9-1923 Standard Specifications for Reinforcing Materials for Concrete.
C10-1923 Standard Specifications for Tungsten Incandescent Lamps.
D11-1924 Interim Report on the Manufacture, Testing and Use of Gasoline for Automotive Purposes.
B12-1924 Standard General Specification for Galvanized Steel Wire Strand.
E13-1924 Standard Specification for Railway Wire-Fencing and Gates.
C14-1924 Standard Specification for Reinforced Concrete Poles.
C15-1924 Standard Specification for Eastern Cedar Poles.
A16-1924 Standard Specification for Steel Structures for Buildings. (In the Press).

The following notes on the reports issued during 1924 will be of interest.

The *Report on the Manufacture, Testing and Use of Gasoline for Automotive Purposes* is not a specification, for the committee dealing with this subject found it was impossible to recommend a single definite specification, since the precise composition and fractional analysis of a motor gasoline having satisfactory vaporizing qualities depends largely upon the kind of crude oil available at the refinery where it is produced, and also upon the climatic conditions of the locality where it is to be used. An inquiry into the nature of the complaints made by gasoline users indicated that in the great majority of cases, the motorist's troubles are due to the manner in which the gasoline is used, rather than to the poor quality of the fuel. The report of the committee endeavours therefore to inform motorists, firstly, as to the methods employed in producing gasoline at the present time, to state the properties which should be possessed by gasoline of good quality, and to indicate the methods by which gasoline can be tested. The report concludes with notes on the nature of the various troubles produced by improper lubrication.

Specification for Galvanized Steel Wire Strand. The desirability of obtaining as wide agreement as possible on a specification covering the various sizes of galvanized steel wire strand was originally suggested to the association by officers of the Bell Telephone Company, and the formation of a committee for this purpose was approved in April 1920. Enquiries at that time showed that buyers in Canada were calling for over thirty different varieties of this product, and it was felt that upon consideration this number could no doubt be substantially reduced with benefit not only to the purchasers but also to the manufacturers. It was also found that the materials employed by manufacturers in filling a majority of their orders could be classed under three grades, namely, a low carbon steel wire ranging in tensile strength from 70,000 to 75,000 pounds per square inch; a wire of similar material but somewhat harder drawn, of which the smaller sizes showed an ultimate tensile strength up to 120,000 pounds per square inch; and an annealed "crucible" steel wire of higher carbon content of which the smaller sizes had a tensile strength as high as 210,000 pounds per square inch.

Only a small number of existing specifications were found to call for materials not included in the above classification, and it was therefore decided to retain these grades of material for the standard varieties of strand. It is believed that the three standard grades of material now adopted will satisfactorily fill the requirements of the great majority of purchasers.

As in the case of the Specification for Wire Rope (No. B4—1921) it has been thought desirable to retain the trade designation "crucible" as applied to a particular grade of material, though the committee realizes that the term is not applicable from a strictly metallurgical point of view.

Standard Specification for Railway Wire-Fencing and Gates. At the suggestion of some of the Canadian manufacturers of fence wire, and with the approval of officers of the railways, a C.E.S.A. Committee was formed in March, 1923, for the purpose of drawing up specifications for the types of wire fencing and steel gates needed to meet the various requirements of railway service in Canada. It was felt that the number of existing varieties could be reduced with advantage and economy, and that the standardization of the details of fences and gates should be considered.

In preparing the specifications now published, the committee has taken account of various existing requirements, such as those of the American Railway Engineering Association, the various provincial governments, and the Board of Railway Commissioners, and has endeavoured to harmonize the wishes of the railways with the limitations imposed by manufacturing conditions.

Specification for Reinforced Concrete Poles. In November 1922, the Main Committee approved the formation of a Joint Panel appointed from the membership of the committees on Concrete and Reinforced Concrete and on Wood Poles, to consider and prepare specifications for concrete poles.

The specification now published is the result of their work and is intended to describe the standard methods suitable for use under Canadian conditions.

It is believed that while stating the precautions desirable in the manufacture of concrete poles, and defining the standard classes and loadings for such poles, the specification leaves all necessary freedom to the designer in arranging and proportioning the reinforcement or in utilizing poles made by any of the special processes now available.

In drawing up the document, existing specifications have been freely consulted, and the Panel is particularly indebted to the Specifications of the American Railway Association (Telegraph and Telephone Section), and to data furnished by the Portland Cement Association and the Canada Cement Company.

Standard Specification for Eastern Cedar Poles. The difficulty of framing satisfactory specifications for wood poles has long been recognized. It is nevertheless evident that general agreement on sufficiently definite requirements would be beneficial, by informing lumbermen regarding the acceptability of their product, by promoting economy in handling, and by aiding in the conservation of our forest resources.

Recognizing this situation, the Main Committee in 1922 appointed a Committee on Wood Poles for Transmission Lines, and it was found that while several excellent specifications for poles, both eastern (white) cedar and western (red) cedar, were available, only a small proportion of poles actually offered for sale complied fully with their provisions, this being especially the case in eastern cedar poles, the conditions under which these are grown varying so greatly according to locality.

The present specification gives the result of the committee's enquiries and investigations regarding eastern cedar poles, and it is hoped that a similar specification for Western Cedar Poles will shortly be completed. The committee has endeavoured to draw up a specification which will classify poles in such a way as to permit the utilization for various purposes of as large a proportion as possible of poles available commercially. It is believed that the Specification will at the same time enable the purchaser to obtain material thoroughly suitable for each of his various purposes.

Standard Specification for Steel Structures for Buildings. In response to many requests, the Main Committee decided in October, 1923, to form a committee for the purpose of drawing up a Standard Specification for Steel Structures for Buildings, it being intended that this should deal with steel construction for buildings in the same way as that in which the C.E.S.A. Specifications for Railway and Highway Bridges treat of steel bridge construction.

Inquiries showed that such a specification would be welcomed by fabricators and manufacturers, as well as by engineers and architects. It was felt also that its use would promote economy and protect the public, especially if employed by local authorities in the formulation of their building by-laws, thus obtaining uniformity of practice throughout the Dominion.

The Committee on Steel Structures for Buildings includes architects, consulting engineers and representatives nominated by the fabricating companies, the inspection companies, and by the government departments concerned.

In preparing the specification, the committee has carefully considered the work done in the United States and elsewhere along similar lines. It will, however, be noted that no drastic changes in existing practice are recommended for the present. It is considered that further investigations and experimental data are needed in regard to such composite forms of construction as columns encased in reinforced concrete and beam flanges embedded in concrete floor-slabs, before definite means can be specified for taking advantage of the additional stiffness or strength so obtained.

In view of the complex technical problems now recognized as occurring in the construction of important buildings, it is considered essential that the computations involved in the proportioning of their structural steel work be made by, or under the direction of, a competent professional engineer.

Reorganization

During the year 1924, the organization of the association has been somewhat simplified by a reduction in the number of the so-called sectional committees, these having been reduced from 13 to 7 in number, each being now charged with the supervision of the work of the committees dealing with some particular branch of industry. Thus, for example, all work done by committees dealing with electrical matters is passed upon by the Sectional Committee on Electrical Work before being submitted to the Main Committee for authorization to publish.

The sectional committees as now organized are as follows:—

Sectional Committee on Civil Engineering and Construction.
Sectional Committee on Mechanical Work.
Sectional Committee on Electrical Work.
Sectional Committee on Automotive Work.
Sectional Committee on Railway Work.
Sectional Committee on Ferrous Metals.
Sectional Committee on Mining Work.

In outlining this scheme, the Main Committee has followed the classification as to branches of industry which was agreed upon by the Conference of Secretaries of the various national standardizing bodies in 1923, and is now in use by practically all of these organizations.

Work in Progress

As regards work in progress, the following notes deal with some of the more important topics now under consideration.

Specification for Movable Bridges. This specification is now in draft form and is being considered and criticized by the committee. When completed, it will be available as a supplement to the C.E.S.A. Specifications for Steel Railway Bridges and Steel Highway Bridges, as it deals with those features of bridges of both types which pertain specially to movable spans.

Concrete and Reinforced Concrete. During the past three years, a committee of the C.E.S.A. has been engaged in the preparation of a specification for concrete and reinforced concrete, following in this work, the general lines of the important report of the American Joint Committee on Standard Specifications for Concrete and Reinforced Concrete. It is expected that the C.E.S.A. specification, when completed, will be substantially in agreement with the American one, such minor modifications, however, being introduced as will render the document more suitable for use in this country. Progress in this work is necessarily slow, both on account of the complexity of the subject and also the desirability of keeping closely in touch with the work in the United States.

Road Materials and Construction. In connection with the extensive programme of road construction which has been going on for the past four years, practically all over the Dominion, it has appeared important to obtain general agreement as far as possible regarding such matters as definitions of terms relating to road materials and road engineering, methods of testing road materials, and standard types of road construction, with the idea of reducing as far as possible, the inevitable divergencies in practice due to the diversity of local conditions in various provinces.

A feature of the work of the C.E.S.A. Committee on Road Materials and Construction, is a scheme for uniform nomenclature for road materials, and a standard system of classification of items involved in road construction.

Canadian Electrical Code. As a result of a request addressed to a number of manufacturers and organizations interested, funds have recently been provided for the preparation of a preliminary draft for part I of this code, and the work has commenced and progressed during the summer, two engineers having devoted their whole time to it during the months of July, August and September. As a result, the preliminary draft of part I has been completed and some progress has been made with part II.

Part I is now being duplicated for distribution to the members of the several provincial committees, so that their detailed criticisms may be obtained. The document consists of about 100 typewritten pages, and outlines the proposed "Rules and Regulations for Electrical Installations in, on, or over Buildings, using Potentials of from 10 to 5,000 volts". In the preparation of these draft rules, consideration has been given not only to fire hazard and injury to persons and property, but also to proper maintenance and operation. The rules are based upon the two American codes (the National Electrical Code and the National Electrical Safety Code), and upon the rules and regulations of the Hydro-Electric Power Commission of Ontario. Considerable use has also been made of the local regulations prescribed in various cities, such as Winnipeg, Chicago, etc.

After consideration by the various provincial committees, the various amendments and suggested changes will be considered by the C.E.S.A. Committee on Canadian Electrical Code.

In regard to this work, considerable assistance has been received not only from the manufacturers, but also from the Hydro-Electric Power Commission of Ontario, and the various underwriters associations, and arrangements are being made for consultation with the committees of the American Engineering Standards Committee which are now engaged in the revision of the two American codes, namely, the National Electrical Code and the National Electrical Safety Code.

Traffic Signals for Highways. The C.E.S.A. committee on this subject was formed as the result of a request for co-operation received from the American Engineering Standards Committee. There is a movement in the United States looking to the standardization of colours and forms for traffic signals on highways, and it is felt that by reason of the large and increasing interchange of motor traffic between Canada and the United States, the greatest possible measure of uniformity of practice between the two countries in this respect is desirable. The C.E.S.A. committee has three panels dealing respectively with signs on highways at level crossings of steam and electrical railways, signals on vehicles, and danger and direction signals on highways. It should be noted that a good deal of work has been accomplished in connection with the last named item by the various Interprovincial conferences of highway officials, and it is hoped that means will be found for harmonizing this with the general trend of American practice.

Heavy Steel Castings. Some time ago, as a result of certain failures of heavy cast steel rotor rings, the C.E.S.A. was requested to arrange for the organization of a committee to consider the possibility of drawing up specifications and prescribing methods of test for heavy steel castings which will guard as far as possible against the repetition of such occurrences.

This committee has already commenced its work, and a good deal of information regarding American and European practice has been collected. In this connection, particular assistance has been received as the result of a request addressed to the various national standardizing bodies through the Swiss Standards Committee, and communications have been received from England, Holland, Germany, Switzerland, and the United States, giving comments and suggestions for the consideration of our committee.

Co-operation

In all of its work, the Canadian Engineering Standards Association is endeavouring to co-operate as far as possible with other national standardizing bodies. With this in view, information is interchanged with the national standardizing bodies in the following countries:—

Australia	Great Britain	Hungary	Russia
Austria	Finland	Italy	Switzerland
Belgium	France	Japan	Sweden
Czecho-Slovakia	Germany	Norway	United States
Denmark	Holland	Poland	

Finance

The association has hitherto been financed by an annual grant of $10,000. from the Dominion government, supplemented by contributions from firms and organizations interested in its work. These contributions during 1924 amounted to $6,125.

In February 1924, a letter was received from the Hon. T. A. Low, minister of trade and commerce, advising that while the grant for 1924-25 would be given, the government's financial aid would then be withdrawn. It is understood accordingly that no grant for the C.E.S.A. is included in the estimates for 1925-26. Continuation of the association's work on an adequate scale is not considered possible if it is dependent solely on private contributions, and representations are being made to the premier and to Mr. Low regarding this.

An expression of opinion by the annual meeting of *The Engineering Institute* as to the value of the association's work to the general public, would no doubt have considerable influence with the Cabinet.

Respectfully submitted,

ALEX. BERTRAM, M.E.I.C., *Vice-Chairman.*

Branch Reports

Border Cities Branch

The President and Council,

The executive of the Border Cities Branch beg to submit the following annual report for the year ending December 31st, 1924.

During the past year two events occurred in the branch that seem to call for special mention. On the evening of February 6th, in the Prince Edward hotel, Windsor, the Border Cities Branch sponsored its first ball. This was considered by all to have been an unqualified success and was thoroughly enjoyed by all. Credit for the success of this affair is due principally to the energetic and efficient Entertainment Committee under the able chairmanship of A. J. M. Bowman, A.M.E.I.C.

The other outstanding feature of the year was the presentation of the charter to the branch. At this meeting, which was held on November 8th, the members had the pleasure of meeting Dr. Arthur Surveyer, M.E.I.C., president of *The Institute*, who presented the charter.

During the year there were held eight regular meetings and one special meeting. The executive met on several different occasions. The meetings held and the speakers present were as follows:—

Jan. 8—"**The Financing of Public Utilities,**" by O. E. Fleming, K.C.
Feb. 8—"**Asphalt Paving,**" by Germain P. Graham.
Mar. 14—"**Alberta Coal,**" by W. H. Baltzell, M.E.I.C.
April 11—"**The Design and Construction of Highway Bridges,**" by T. U. Fairlie, A.M.E.I.C.
May 9—"**Corrosion of Metals and the Factors which Inhibit Corrosion,**" by Morgan Smith.
Oct. 10—"**Waterproofing of Concrete,**" by J. E. Rothermel.
Nov. 8—The presentation of the charter by president Dr. Arthur Surveyer, M.E.I.C.
Nov. 14—"**Civic Management,**" by C. H. R. Fuller.
Dec. 12—Annual meeting.

In regard to committees, the only committee that was active during the year was the Entertainment and Papers Committee, the personnel of which was, from January to May, A. J. M. Bowman, A.M.E.I.C., chairman; S. E. McGorman, M.E.I.C., D. A. Molitor, M.E.I.C., and from October to December, L. McGill Allan, A.M.E.I.C., chairman; and A. J. M. Bowman, A.M.E.I.C. This committee has been a great help to the executive in taking practically full charge of the arrangements for the speakers and of the meetings.

As the other committees did not function it seems that a few words of explanation would not be out of the way. The duties of the Advertising Committee was found to entail the soliciting of advertising for the *Journal* by the members of the committee who it was found were often subjected to some embarrasement due to the positions they held and the favours which the advertisers felt they should receive from the firms by whom the committeemen were employed. It was therefore thought advisable by the executive that the committee be allowed to rest in status quo.

Membership

The personnel of the Membership Committee was carefully selected by the executive early in the year but before it could function properly the members, L. B. Tillson, A.M.E.I.C., chairman and G. J. Burgess, A.M.E.I.C., were given positions which took them out of the city for long periods at a time and it is only recently that they realized that they were unable to give proper attention to the work assigned to them. It is therefore necessary for the secretary to give a brief summary regarding the membership of the branch. The following is a list of the resident and non-resident members for 1923 and 1924:—

	Branch Residents		*Branch Non-residents*	
	1923	*1924*	*1923*	*1924*
Members	16	19	3	2
Associate Members	43	38	9	11
Juniors	14	14	3	7
Students	22	25	5	5
Affiliates	1	1	—	—
Total	96	97	21	25

This gives a total membership of 122 which is a net gain of 5. The executive feel that this increase, though small, is creditable, considering the adverse business conditions in the Border Cities during the last few months. This necessitated the closing down of several large industries, which had engineering staffs. A large gain is expected early in the year following the already noticeable bettering of commercial and economic conditions.

It is to be regretted that during the last year, death has claimed one of our most active and valuable members in the person of A. J. Riddell, A.M.E.I.C., who was chairman of the branch for the year 1921.

Financial Statement

Receipts

To balance in bank	$202.25	
Rebates from headquarters	194.35	
Branch news	25.12	
Advertising	71.30	
Dinners paid for at meetings	199.75	
Interest at bank	3.56	
Total		$696.33

Expenditures

Notices, printing	$ 43.11	
Postage, revenue, stamps, telegrams, misc	7.73	
Services, cigars, entertainment at meetings	58.08	
Hotel for dinners at meetings	220.96	
Filing cabinet	16.75	
Refund to headquarters of original grant	50.00	
Typing and multigraphing	9.25	
Flowers	15.00	
Donation General Hospital fund	25.00	
Dance deficit	14.70	
Total	$460.50	
Cash on hand at bank	235.83	
		$696.33

Respectfully submitted,

J. E. PORTER, A.M.E.I.C., *Chairman.*
F. JAS. BRIDGES, A.M.E.I.C., *Secretary-Treasurer.*

Calgary Branch

The President and Council,

On behalf of the Executive Committee, we beg to submit the following report of the activities of the Calgary Branch for the year ending December 31st, 1924.

The slate of officers elected on March 11th, 1923, held office until the next annual meeting of the branch, March 8th, 1924. The following is the list of officers elected on March 8th, 1924, for the branch year 1924-25:

Chairman......R. S. Trowsdale, A.M.E.I.C.
Vice-Chairman..A. L. Ford, M.E.I.C.
Sec-Treasurer...G. P. F. Boese, A.M.E.I.C.
Executive Committee.....J. H. Ross, A.M.E.I.C., W. S. Fetherstonhaugh, M.E.I.C., B. Russell, A.M.E.I.C., B. L. Thorne, M.E.I.C.,
Ex-officio members emeriti, — J. A. Spreckley, A.M.E.I.C., P. J. Jennings, M.E.I.C.
Auditors.......H. R. Carscallen, A.M.E.I.C. W. St. J. Miller, A.M.E.I.C.
Branch Editor...W. St. J. Miller, A.M.E.I.C.

Membership

The membership of the branch is as follows:

	Branch Residents	*Branch Non-Res.*	*Total as at Dec. 31st, 1924*	*Total as at Dec. 31st, 1923*
Members	21	2	23	20
Associate members	53	18	71	78
Juniors	2	1	3	9
Students	..	1	1	3
Affiliates	1	..	1	1
Branch Aff.	15	1	16	8
	92	23	115	119

During the year, two Associate Members were transferred to the class of Member, so that the list really shows five Associate Members less than the previous year. Two of the Juniors were transferred to the grade of Associate Member, and others have left the district. It will be noticed the branch has increased its Affiliate membership considerably. The regrettable loss, by death of W. A. Davidson, M.E.I.C., occurred on March 6th.

Meetings

Fourteen Executive Committee meetings were held during the year, and the business of the branch kept up to date.

General meetings, dinners, luncheons, and special affairs were as follows:

Jan. 7—Annual dinner. Five minute talks were given by members representing various sections of the branch. A musical programme and stunts were features of the occasion.
Jan. 21—"Automatic regulating control for irrigation canal openings," by Major F. G. Cross, A.M.E.I.C.
Jan. 30—Farewell lunch to V. M. Meek, A.M.E.I.C., (Chairman of the branch), leaving for Ottawa.
Feb. 5—"Depreciation in relation to Municipal Assets," by F. M. Harvey, city auditor.
Feb. 18—"The Deterioration and Preservative Treatment of Timber," by A. S. Dawson, M.E.I.C.
Mar. 8—Annual meeting.
Mar. 31—Luncheon to Fraser S. Keith, M.E.I.C., general secretary, followed by an address by Mr. Keith on "Institute Affairs Generally."
April 8—"Civic Financing," A. G. Graves, city commissioner.
April 26—Presentation of papers by Juniors of The Institute in competition for the prize offered by W. J. Dick, M.E.I.C., won by H. J. McLean, Jr.E.I.C. The papers were as follows: "Evaporation," — by H. J. McLean, Jr. E.I.C., "Seepage Investigations," — by W. Crook, Jr.E.I.C., "Preparation of Maximum Strength Concrete," — by C. M. Moore, Jr.E.I.C.
July 19—Trip by automobile to the Calgary Power Company's hydro-electric plants at Kananaskis. Luncheon and inspection of the plants.
Aug. 23—Trip by automobile to Strathmore, where the members and their wives indulged in drives, golf, etc., followed by supper.
Aug. 28—Luncheon to F. C. Scobey, irrigation engineer of the U. S. Dept. of Agriculture, followed by an address by Mr. Scobey on "Conveyance of Water."
Oct. 22—Presentation of Branch Charter by Major Geo. A. Walkem, M.E.I.C., vice-president of The Institute. This was the occasion of a dinner in honour of Major Walkem, who afterwards made an inspiring address to the members.
Nov. 14—"Central Heating for Business Communities," by W. B. Trotter, A.M.E.I.C., (illustrated by lantern slides).
Nov. 24—Ten minute addresses on Calgary industries by six members, as follows:
"Meat Packing Industry," by A. S. Chapman, A.M.E.I.C.
"Imperial Oil Refineries," by R. L. Dunsmore, A.M.E.I.C.
"Railway Activities," by T. Lees, A.M.E.I.C.
"Lumber & Wood Working Industry," by R. C. Harris, A.M.E.I.C.
"Iron Foundries," by A. G. Willson, A.M.E.I.C.
"Leather Manufacture," by R. M. Dingwall, A.M.E.I.C.
This was the occasion of a supper preceding the meeting.
Dec. 19—"A Recent Electrical Application," (illustrated by lantern slides), by Dr. R. W. Boyle, M.E.I.C., dean of the Faculty of Applied Science, Edmonton University.

The average attendance at the above meetings was 40.

At the general meeting on April 8th, J. A. Spreckley, A.M.E.I.C., the retiring secretary, was presented with a silver cigarette case by the members of the branch as a token of appreciation of his services during his tenure of office.

B. L. Thorne, M.E.I.C. and G. P. F. Boese, A.M.E.I.C., represented the branch, as delegates, at the eighteenth annual convention of the Western Canada Irrigation Association held at Calgary on July 29th to 31st.

R. S. Trowsdale, A.M.E.I.C., represented the branch at the annual western meeting of the Canadian Institute of Mining and Metallurgy held at Blairmore, October 16th to 18th.

On August 29th, the visiting members of the British Association for the Advancement of Science, were given a pamphlet describing water power, irrigation and mining developments in Alberta, and were met by a committee who conducted them to the principal places of engineering interest in the city of Calgary.

Financial Statement

Assets and Liabilities as at December 31st, 1924

Assets		
Cash in bank	$ 152.41	
Market value of securities	1,057.23	
Fees collectable from Branch Affiliates	12.00	
Rebates — remittance due from headquarters	33.00	
		$1,254.64
Liabilities		
Expenses — speaker, meeting Dec. 1924 (approximate)	$ 15.00	
Sundry expenses	3.00	18.00
Net value of assets at Dec. 31st, 1924		$1,236.64
Net value of assets at Dec. 31st, 1923		1,207.60
Increase in value of assets		29.04

Revenue and Expenditures

Expenditures		
Expenses meeting and speakers	$ 91.94	
Stenographic services	19.90	
Printing and miscellaneous expenses	198.50	
Purchase of bonds	206.27	
		$ 516.61
Revenue		
Interest on bonds and savings	$ 52.27	
Rebates	246.45	
Branch news	58.32	
Branch Affiliates	33.00	
		$ 390.04
		$ 126.57
Bank balance at December 31st, 1923	$ 311.98	
Bank balance at December 31st, 1924	152.41	
	$ 159.57	
Amount of rebates due, as per wire of general secretary dated Dec. 31st, 1924	33.00	
		$ 126.57

Audited and found correct, January 5th, 1925.

H. R. Carscallen, A.M.E.I.C.,
W. St. J. Miller, A.M.E.I.C., } *Auditors.*

Respectfully submitted,
R. S. Trowsdale, A.M.E.I.C., *Chairman.*
G. P. F. Boese, A.M.E.I.C., *Secretary-Treasurer.*

Cape Breton Branch

The President and Council,

On behalf of the Executive Committee of the Cape Breton Branch we beg to submit the following report on the activities of the branch during the year ending December 9th, 1924.

The following officers were elected by letter ballot on December 11th, 1923:

Chairman — Horace Longley, M.E.I.C.
Committeemen — A. Dawes, M.E.I.C.
J. R. Morrison, A.M.E.I.C.

At an executive meeting held in September, Mr. Longley resigned the position of chairman, and the executive appointed S. C. Mifflen, A.M.E.I.C., in his place; W. E. Clarke, M.E.I.C., being appointed to take Mr. Mifflen's place on the committee. Geo. Morrison, A.M.E.I.C., was also appointed a member of the executive to replace Mr. Dawes, who was leaving Cape Breton.

Owing to the continued industrial depression in this district, our membership has shown a slight falling off during the year, several of our members having left the city. The number of members last year was forty-two, it is now thirty-eight, with four applications pending. In addition to this there are forty-four non-resident members. Several of our members have been out of work for some time, and the executive instructed the secretary to cancel the arrears for branch dues owed by them, and to notify them that they would be exempt from local dues until again becoming employed. Five members were affected by this, the total amount cancelled being forty-seven dollars. In addition to this the arrears now outstanding amount to sixty-six dollars, not including the dues for the current quarter. In order that we may carry on without the assistance of the unemployed members, it will be necessary for all others to pay up regularly. If all paid up each quarter, the question of reducing the local dues could be seriously considered.

Financially we are in a somewhat better position than last year. This is principally due to the fact that headquarters is now paying the branches a rebate from the dues of members of the branch districts, and also to a donation of thirty dollars and ninety-five cents from the executive of the Engineering Society of the Dominion Iron and Steel Company employees, which was in existence here a few years ago.

Meetings

The following meetings were held during the year:

1923
Dec. 11—Annual meeting.
1924
Jan. 7—"The Application of Alternating Current to the Mining Industry," by Geo. Morrison, A.M.E.I.C.
Feb. 6—"Ice Formation and Prevention," by Dr. Howard T. Barnes. (Public meeting).
Mar. 11—"Mine Ventilation," by A. L. Hay, A.M.E.I.C.
April 29—"Research in Industry," by Dr. Bigelow.
May 13—"Compressed Air", by J. P. Cotter.

May 27—"**Our Interest as Engineers in Depreciation,**" by F. A. Bowman, M.E.I.C.

Sept. 23—"**Mechanical Cutting, Loading, and Hauling in Coal Mines,**" by S. W. Farnham.

Oct. 21—"**The Manufacture of Carbide,**" by M. W. Booth, A.M.E.I.C.

Nov. 19—Dinner at Vidal hotel and address on the "**British Empire Exhibition,**" by Fraser S. Keith, M.E.I.C., secretary of The Institute.

Financial Statement

Following is the financial statement:

On hand, Dec. 10th, 1923	$ 92.97	
Receipts		
Rebates from headquarters for branch dues and branch news used in *The Journal*	147.87	
Local dues	234.00	
Donation from D. I. & S. Co. Engineering Society	30.95	
Surplus from dance held last year	1.55	
Total		$507.34
Expenditures		
Rent for one year, to Jan. 31st, 1925	$180.00	
Printing and advertising	49.55	
Postage, telegrams, long distance calls, etc	13.49	
Flowers	28.00	
Expenses in connection with Dr. Barnes visit	31.45	
Deficit on dinner at Vidal hotel	12.15	
		$314.64
Showing a balance on hand of		$192.70

Respectfully submitted,

SYDNEY C. MIFFLEN, A.M.E.I.C., *Chairman.*
DONALD W. J. BROWN, Jr.E.I.C., *Secretary.*

Edmonton Branch

The President and Council,

We beg to submit, below, our annual report, covering the activities of the Edmonton Branch for the calendar year 1924.

Meetings

Five general meetings have been held as follows:—

Feb. 14—A. W. Haddow, A.M.E.I.C., city engineer, Edmonton, spoke on the subject of "**The Proposed Pigeon Lake Water Supply Scheme.**"

Mar. 20—F. Morrison, professor of applied mechanics, University of Alberta, read a paper on "**Concrete, Some Results of Recent Research Work on Local Materials.**"

April 17—A dinner meeting. General business only was transacted, including nomination of committee for drawing up officers' ballot for ensuing branch year.

Oct. 11—Colonel Boyden, of the Portland Cement Association, addressed the membership.

Dec. 12—A. Chard, Alberta provincial freight and traffic supervisor informed a large audience on the topic of "**Freight Rates.**"

In addition to the above general meetings the following functions were held:—

Jan. 16—A smoker was held, in conjunction with the Northern Alberta branch of the Canadian Institute of Mining and Metallurgy. To this entertainment the engineering students of the University of Alberta were invited.

Sept. 29—A special meeting and banquet was arranged for the purpose of entertaining our vice-president, Major Geo. A. Walkem M.E.I.C., of Vancouver. Major Walkem's visit, for the purpose of presenting to this Branch its Charter, was much appreciated.

General

During the year:—

(a) The Executive Committee have met on seven occasions.

(b) All volumes of engineering works, etc., the property of the branch, have been located in the Edmonton Municipal Library, where they are accessible to the membership.

(c) All employing engineers in Northern Alberta, provincial cabinet ministers and executive heads, have been circularized and made acquainted with the report on "Classification, Remuneration and Tariff of Fees of Engineers", as published in *The Engineering Journal* in October 1923.

(d) The informal meeting with General Secretary, Fraser S. Keith, M.E.I.C., on April 1st, was attended by the full executive membership and his visit, although necessarily short, was appreciated.

(e) The admittance of Branch Affiliates has been made possible by the adoption and authorization of a by-law covering this need.

Membership

A comparison of the branch membership is as follows:

	1923. Branch Residents	1923. Branch Non-Residents	1924. Branch Residents	1924. Branch Non-Residents
Members	11	1	14	2
Associate Members	42	7	47	8
Juniors	3	1	5	1
Students	4	1	7	2
Branch Affiliates	—	–	—	–
Total	70		87	

The demise of President W. J. Francis on March 6th, was regretted by all members.

Financial Statement
For Calender Year, 1924.

Balance on hand Jan. 1st, 1924	$ 59.50	
Rebates, Jan., Feb., Mar	65.40	
Rebates Apr., May, June, July	19.50	
Rebates, Aug., Sept., Oct.,	16.05	
Rebates, Nov., Dec.	21.15	
Branch news during the year	12.93	
Branch Affiliates dues	5.00	
		$199.53
Total disbursements	$136.68	
Balance at December 31st, 1924	62.85	
		$199.53

Respectfully submitted,

KELLS HALL, A.M.E.I.C., *Chairman.*
W. R. MOUNT, A.M.E.I.C., *Secretary-Treasurer.*

Halifax Branch

The President and Council,

The Executive Committee of the Halifax Branch for the year 1924 respectfully submits this report of the activities of the branch.

Much pleasure is taken in calling your attention to a growing interest in the affairs of this branch which is evidenced by increased attendance at the meetings and by the fact that nearly ninety per cent of the members in the city of Halifax exercised their franchise by voting in the election of the officers of the branch for 1925.

The total membership of the branch has increased from 145 to 152. The increase is caused by the addition of one Junior and six Students. The number of corporate members stands as in 1924.

The practice of appointing an entertainment committee chairman, who chooses his own committee members, to arrange special entertainment, such as readings, songs, music, decoration, etc., for the next meeting has thus far proven a very desirable thing. These committees are finding a great deal of entertaining talent among our members and among the students in the technical schools of the universities in Halifax.

We are grateful for your continued thoughtfulness of our welfare as evidenced from time to time by such things as your permitting the general secretary, F. S. Keith, M.E.I.C., to visit us in November last.

C. H. WRIGHT, M.E.I.C., *Chairman.*
K. L. DAWSON, A.M.E.I.C., *Secretary-Treasurer.*

Meetings

During the year 1924 this branch has held eight meetings as follows:

Jan. 17—Regular monthly meeting held in the gymnasium of the Nova Scotia Technical College, C. H. Wright, M.E.I.C., was chairman. H. G. Acres, M.E.I.C., vice-president of The Engineering Institute of Canada, and chief hydraulic engineer of the Hydro-Electric Power Commission of the province of Ontario, described the "**Chippawa-Queenston Power Development,**" using many slides and two reels of films. Attendance 150. The Honorable E. H. Armstrong, premier of Nova Scotia, was a welcome visitor.

Feb. 7—Regular monthly meeting held at the Green Lantern, Chairman C. H. Wright, M.E.I.C., in the chair. Supper meeting. Speaker, F. A. Bowman, M.E.I.C. Subject, "**Our Interest as Engineers in Depreciation**". Entertainment Committee, W. J. De Wolfe, A.M.E.I.C., chairman, W. P. Copp, A.M.E.I.C., and R. L. Nixon, A.M.E.I.C. Orchestra of students from Dalhousie University and songs from J. A. Johanson, S.E.I.C. Among the guests were R. T. McIlreith of the Board of Commissioners of the Public Utilities of Nova Scotia and A. J. Barnes. Attendance 40.

Feb. 8—Special joint meeting of the Halifax Branch of The Engineering Institute of Canada and the Nova Scotian Institute of Science in the Assembly Hall of Nova Scotia Technical College. Joint chairmen, Professor F. R. Faulkner, M.E.I.C., and Professor H. L. Bronson, Ph.D. Speaker, Professor Howard T. Barnes, D.Sc., F.R.S. Subject, "**The Formation and Prevention of Ice**". Attendance 75.

Mar. 6—Regular monthly meeting held in the Green Lantern, Chairman C. H. Wright, M.E.I.C., in the chair. Speaker, Gordon S. Stairs, A.M.E.I.C., town manager of Wolfville, N. S. Subject, "**Town Management**". Beginning at 7 o'clock, this meeting was open to the public. Among those who took advantage of this were Mayor Mosher of Dartmouth, Robert Stanford, chairman of the Dartmouth Board of Trade, George A. Orman, secretary of the Dartmouth Board of Trade, J. W. Douglas, manager of the Dartmouth Branch of the Royal Bank of Canada. At the close of the address all these gentlemen joined in the discussion. Present 55. E. M. Archibald, A.M.E.I.C., was chairman of the Entertainment Committee and the singing was led by the students' orchestra, Nova Scotia Technical College.

April 3—Regular monthly meeting held in the Green Lantern. Chairman C. H. Wright, M.E.I.C., in the chair. Speaker, J. T. Farmer, M.E.I.C., immediate past-chairman of the Montreal Branch, chairman of the fuel committee of the Montreal Branch and member of the fuel committee of The Institute. Subject, "**Fuels and Furnaces**". At the close there was a discussion of various types of fuels obtainable in the local market. Entertainment Committee chairman, S. W. Gray, A.M.E.I.C. Vocal and instrumental solos and readings by H. H. Schurman, S.E.I.C., W. E. Davison, K. C. Mason and W. F. McCulloch. Present 45.

Oct. 16—Regular monthly meeting held in the Green Lantern. Vice-Chairman W. F. McKnight, A.M.E.I.C., in the chair. H. S. Johnston, M.E.I.C., described the "**Electric Power Developments on the East River at Sheet Harbour**". Appointments of committees for nominations and annual meeting. Present 31.

Nov. 17—Regular monthly meeting held in the Green Lantern. Chairman C. H. Wright, M.E.I.C., in the chair. F. A. Bowman, M.E.I.C., vice-president of the Institute for the maritime provinces, presented the branch charter. Presentation of illuminated address and loving cup to J. B. Hayes, A.M.E.I.C. At 8 o'clock the meeting adjourned to convene as soon as possible in the lecture hall of the Church of England Institute for the purpose of hearing a lecture on "**The Wembley Exhibition**," by Fraser S. Keith, M.E.I.C., general secretary of The Institute and delegate to the World Power Conference at Wembley. Attendance 50.

Dec. 18—Annual meeting and dinner in the St. Julien room of the Halifax hotel. Honorable E. H. Armstrong, premier of the province, was a special guest and gave a short address. The speaker of the evening was Professor H. F. Munro, of Dalhousie University, a recognized authority on international law, and the subject "**Engineers and World Peace**". Chairman of committee in charge, Major H. W. L. Doane, M.E.I.C. Singing of new songs led by the composer, F. R. Faulkner, M.E.I.C. Prize in special stunt competition won by C. MacIntosh, S.E.I.C. Chairman of the meeting, C. H. Wright, M.E.I.C. Attendance 90.

Membership

The membership of the Halifax Branch now stands as follows:—

	Branch Residents	*Branch Non-Residents*	*Total*
Honorary Members	1	—	1
Members	21	13	34
Associate Members	42	34	76
Juniors	8	7	15
Students	12	14	26
Total	84	68	152

Financial Statement

Receipts

Rebates	$172.50	
Branch news	36.53	
Meetings	216.00	
Dues — Branch affiliates	15.00	
Bank interest	8.63	
	$448.66	
On hand January 1st, 1924	120.66	
		$569.32

Expenditures

Postage	$ 23.96	
Meetings	354.95	
Printing	68.35	
Journal subscriptions, Branch Affiliates	6.10	
Honorarium to secretary	50.00	
Miscellaneous	6.60	
		$509.96
Cash on hand and in bank	49.36	
Due from headquarters	10.00	
		59.36
		$569.32

Respectfully submitted,

C. H. Wright, M.E.I.C., *Chairman.*
K. L. Dawson, A.M.E.I.C., *Secretary-Treasurer.*

Hamilton Branch

The President and Council,

The Executive Committee of the Hamilton Branch submits the following report for the year 1924.

The branch year dates from June 1st. The following compose the executive committees during 1924.

January to June		*June to December*
H. U. Hart, M.E.I.C.	Hon. Chairman.	
J. W. Tyrrell, M.E.I.C.	Chairman	J. J. MacKay, M.E.I.C.
W. G. Milne, A.M.E.I.C.	Vice-Chair	C. H. Marrs, M.E.I.C.
W. F. McLaren, M.E.I.C.	Sec.-Treas	H. B. Stuart, A.M.E.I.C.
J. J. MacKay, M.E.I.C., (1 yr.)		F. P. Adams, M.E.I.C. (1 yr.)
C. H. Marrs, M.E.I.C. (1 yr.)		C. J. Nicholson, A.M.E.I.C. (1 yr.)
F. P. Adams, M.E.I.C. (2 yrs)		W.L. McFaul, A.M.E.I.C. (2 yrs.)
C. J. Nicholson, A.M.E.I.C. (2 yrs)		L. W. Gill, M.E.I.C. (2 yrs.)
	Ex-officio	
F. W. Paulin, M.E.I.C.		R. K. Palmer, M.E.I.C. (Councillor)
	Members emeriti	
J. W. Tyrrell, M.E.I.C. (Past Chairman)		W. F. McLaren, M.E.I.C. (Past Sec.-Treas.)

Meetings

Jan. 18—The out of town members entertained the Hamilton members at Brantford. Prof. P. Gillespie, M.E.I.C., of the University of Toronto, gave an address, illustrated with lantern slides on "**Engineering Achievements in Canada in the Last Half Century**". This was followed by solos, a comedy skit and refreshments.
Attendance 70 of which about one-half came from Hamilton.

Feb. 14—"**Asphalt Paving**" by Germain P. Graham of the Asphalt Association of New York, illustrated by lantern slides. A presentation was made to J. R. Dunbar, Jr.E.I.C., winner of the Students' prize.
Attendance 75 including Mayor Jutten.

Feb. 27—Joint banquet with Canadian section of the American Waterworks Association presided over by F. A. Dallyn, M.E.I.C., chairman of the Canadian section, A.W.A. The guest of honour, George W. Fuller, M.E.I.C., of New York, chairman of the American Waterworks Association addressed the meeting on "**Water Purification**". Some 15 members of this branch were present.

Mar. 28—Joint meeting in Hamilton with Toronto section, American Institute of Electrical Engineers. J. F. Peters, electrical engineer from the Westinghouse Company in East Pittsburg addressed the meeting on "**The Klydonograph and its application to Research Work on Transmission Lines**". The discussion was animated. The Westinghouse Company furnished cigars and refreshments.
Attendance 150.

May 15—Annual meeting. The result of the voting for the new executive was reported. The retiring secretary, W. F. McLaren, M.E.I.C., was presented with a Member's badge in appreciation of his 3 years' service. William H. Breithaupt, M.E.I.C., of Kitchener, addressed the meeting on "**Grand River Conservation and Development**".
Attendance 60.

Dec. 11—Lecture in Technical School auditorium by D. M. Strickland, manager development department, American Rolling Mill Co. on "**Modern Rolling Mill Operation**" illustrated by moving pictures. The meeting was open to the public and was well patronized by those connected with similar and allied industries. Attendance 200.

Membership

December 31st, 1923 Branch Res.	Branch Non-Res.	Total		*December 31st, 1924* Branch Res.	Branch Non-Res.	Total
21	3	24	Members	20	4	24
59	12	71	Associate Members	52	12	64
13	2	15	Juniors	12	1	13
33	17	50	Students	30	16	46
37	—	37	Branch Affiliates	33	—	33
163	34	197		147	33	180

Financial Statement

Receipts

On hand January 1st, 1924	$362.84	
Rebates	241.05	
Branch news	17.37	
Brantford Party	7.76	
Journal subscriptions	6.00	
Affiliate fees	30.00	
Miscellaneous	.82	
		$665.84

Expenditures

Printing	$ 84.83	
Stenographer	50.00	
Journal subscriptions	8.00	
Exchange	.50	
Postage and excise	7.53	
Telegrams	.78	
Meeting expenses	29.00	
Miscellaneous	7.40	
On hand 31st, January 1924	477.80	
		$665.84

Respectfully submitted.

H. B. STUART, A.M.E.I.C., *Secretary-Treasurer.*
J. J. MACKAY, A.M.E.I.C., *Chairman.*

Kingston Branch

The President and Council,

On behalf of the Executive Committee of the Kingston Branch, we beg to submit the following report of the activities of the branch, from January 1st, 1924, to December 31st, 1924.

Meetings

Meetings were held at intervals of approximately two weeks during the first three and the last three months of the year. A large percentage of our membership is from the staff and students of the science faculty of Queen's University, and since practically all of these members are absent from the city during the summer months, it is found inadvisable to attempt meetings during this period. The attendance, on the whole, has been very good and quite satisfactory to the executive. An attempt is now being made to add a social side to the meetings, as well as the purely technical, in the hope that this procedure may even more greatly increase the interest.

Ten meetings were held during the year, the list of which is as follows:—

Jan. 15—"**Radio — Its Principles and Recent Developments,**" D. G. Geiger, S.E.I.C., of Queen's University, Kingston.

Jan. 28—"**Water Supplies,**" Prof. W. P. Mason, of the Rensselaer Polytechnic Institute, Troy, N. Y.

Feb. 18—"**The Fuel Problem in Ontario,**" James White, M.E.I.C., Chairman of the former Conservation Commission of Canada.

Mar. 6—"**The Construction of a Modern Hydraulic Power Plant,**" Julian C. Smith, M.E.I.C.

Mar. 25—Annual dinner. Special speaker, Dean O. Skelton on "**Economic Conditions in Europe**".

Oct. 14 "**Railway Construction in India,**" A. Austin of the Indian State Railways.

Oct. 28—Annual business meeting. — Election of officers and executive for the following year.

Nov. 4 Special meeting, — addressed by Hammett P. Hill, K.C., of Ottawa on the "**Construction and Story of the Rideau Canal**".

Nov. 19—"**Mountaineering,**" Capt. H. Westmorland, member of the Alpine Club and Alpine Club of Canada.

Dec. 4—"**The History and Construction of the Jock Harty Arena,**" Messrs. M. B. Baker, G. McLachlan, L. F. Grant, A.M.E.I.C., L. M. Arkley, M.E.I.C., W. P. Wilgar, M.E.I.C.

Membership

The approximate membership of the branch is as follows:—

Honorary Member	1
Members	11
Associate Members	21
Juniors	4
Students	24
Affiliates	1
Total	62

The executives of the branch holding office during the parts of the two years covered by this report were as follows:—

1923-1924		1924-1925
T. A. McGinnis, M.E.I.C.	Chairman	L. F. Grant, A.M.E.I.C.
Col. T. V. Anderson, M.E.I.C.	Vice-Chair	R. J. McClelland, A.M.E.I.C.
A. Jackson, A.M.E.I.C.	Sec.-Treas.	G. J. Smith, A.M.E.I.C.
Maj. G. R. Turner, A.M.E.I.C.	Executive	G. C. Wright, M.E.I.C.
R. J. McClelland, A.M.E.I.C.		J. M. Campbell, M.E.I.C.
W. Casey, M.E.I.C.		W. P. Wilgar, M.E.I.C.

Financial Statement

The following is a financial statement for the year 1924:

Receipts

Jan. 1	Balance brought forward	$ 91.63	
Jan. 1	Bank interest	.19	
Mar. 25	Dinner collections	45.00	
May 23	Rebates on fees	60.90	
May 23	Branch news	10.71	
June 30	Bank interest	.83	
Oct. 8	Rebates on fees	13.80	
Oct. 29	Bank interest	.76	
Dec. 11	Rebates on fees	9.60	
Dec. 11	Branch news	3.28	
Dec. 31	Bank interest	.31	
Dec. 31	Accounts receivable, rebates on fees	7.80	
Dec. 31	Accounts receivable, Branch news	8.95	
			$253.76

Disbursements

Feb. 13	Expenses — Dr. Mason	$ 26.11	
Feb. 18	Services janitor of building	2.00	
Feb. 28	Taxi hire — Mr. James White	3.50	
Mar. 7	Services janitor of building	4.00	
Mar. 21	Expenses — Col. MacPhail annual meeting	10.00	
Mar. 25	Annual dinner	57.30	
Oct. 28	Stamps and stationery to date	8.26	
Oct. 29	Secretary's honorarium	50.00	
Dec. 31	Accounts payable — stamps and Stationery to date	2.83	
Dec. 31	Accounts payable — printing to date	3.62	
Dec. 31	Balance carried forward	86.14	
			$253.76

All of which is respectfully submitted,

LEROY F. GRANT, A.M.E.I.C., *Chairman.*
GORDON J. SMITH, A.M.E.I.C., *Secretary-Treasurer.*

Lakehead Branch

The President and Council,

On behalf of the Executive Committee I beg to submit the following annual report of the Lakehead Branch of *The Engineering Institute of Canada.*

Membership

On January 1st, 1924, there were 37 corporate members and 8 non-corporate members, and on December 31st, 1924, there are 40 corporate members and 14 non-corporate members, showing an increase during the year of 3 corporate and 6 non-corporate members.

Meetings

Regular meetings were held in January, February, March, April, and December, and special meetings as follows:—

Mar. 3—A dinner was held at the Shuniah Club in honour of Fraser S. Keith, M.E.I.C., general secretary of The Institute, whose visit is always looked forward to with the keenest pleasure by the members of the Lakehead Branch.

May 5—A special meeting was held to hear Col. H. J. Lamb, M.E.I.C., of Toronto, speak on "**The Great Lakes and Some Structures Thereon.**" Col. Lamb's address, illustrated by lantern slides, was greatly appreciated by all present.

Oct. 18—The BIG EVENT of the life of the Lakehead Branch was held in the form of a dinner in the Shuniah Club, when the branch had as its guest of honour Major Geo. A. Walkem, M.E.I.C., vice-president of The Institute, who on this occasion presented the charter from headquarters to the Lakehead Branch.

As in other years no meetings were held during the summer months.

The result of the ballot for officers of the branch for the ensuing year resulted as follows:—

Chairman — H. S. Hancock, A.M.E.I.C.
Vice-Chairman — H. M. Lewis, A.M.E.I.C.
Secretary-Treasurer — Geo. P. Brophy, A.M.E.I.C.
Executive Committee — Geo. Blanchard, A.M.E.I.C.
A. G. Jeffreys, M.E.I.C.
M. W. Turner, A.M.E.I.C.
H. G. O'Leary, A.M.E.I.C.

Since the above were elected, Mr. Jeffreys moved to Montreal and so sent in his resignation as a member of the executive. At the meeting held December 17th, 1924, M. W. Jennings, A.M.E.I.C., was elected to replace Mr. Jeffreys.

Financial Statement

Revenue

Balance in bank, Dec. 31st, 1923	$ 72.24	
Rebates on fees	74.10	
Rebates due from headquarters	4.80	
Dinner, March 3, 1924	29.00	
Dinner, Oct. 18, 1924	13.00	
		$193.14

Expenditure

Telegrams	$ 2.19	
Postage	7.50	
Exchange on cheques	.45	
Sundries	13.94	
Printing	2.65	
Dinner, March 3, 1924	37.00	
Dinner, Oct. 18, 1924	31.45	
Balance in bank, Dec. 31, 1924	97.46	
Cash on hand	.50	
		$193.14

Respectfully submitted,

GEO. P. BROPHY, A.M.E.I.C., *Secretary-Treasurer.*

Lethbridge Branch

The President and Council,

On behalf of the Executive Committee of the Lethbridge Branch, we beg to submit the following report for the year ending December 31st, 1924.

At the annual meeting of March 15th, 1924, the following officers were elected:—

Chairman	John Dow, M.E.I.C.,
Sec.-Treasurer	George S. Brown, A.M.E.I.C.,
Executive	H. R. Miles, M.E.I.C.,
	P. M. Sauder, M.E.I.C.,
Ex-Officio	S. G. Porter, M.E.I.C.,
	G. N. Houston, M.E.I.C.,
	H. P. Keith, A.M.E.I.C.

J. H. Turner, M.E.I.C., was subsequently appointed a member in place of H. P. Keith, A.M.E.I.C., who removed to the Edmonton district.

Meetings

The executive held six meetings with an average attendance of six. Eleven general meetings were held at which the attendance averaged forty. The following is a list of the meetings:

Jan. 12—"**Fire Protection, Fire Fighting and First Aid,**" by Fire Chief Hardy of the Lethbridge Fire Department.

Jan. 26—"**Notes on Mining in Alberta,**" by J. H. Turner, M.E.I.C.

Feb. 9—"**Radio,**" by W. Mason, wire chief, Alberta Government Telephones.

Feb. 23—"**The Deterioration and Preservative Treatment of Timber,**" by A. S. Dawson, M.E.I.C.

Mar. 15—"**Aerial Photography,**" by George Davies, manager, Lethbridge Iron Works.

April 3—"**Institute Affairs,**" by Fraser S. Keith, M.E.I.C.

Sep. 30—"**Institute Affairs and The Engineer as a Public Man,**" by Major Geo. A. Walkem, M.E.I.C.

Oct. 14—"**Field Control of Concrete,**" by Col. H. C. Boyden, (Illustrated).

Nov. 7—"**Personal Experiences as a Member of the Second Peary North Pole Expedition,**" (Illustrated), by J. Davidson, Calgary, Alberta.

Nov. 22—"**Dairy Industry,**" by D. P. Carlyle, manager, Crystal Dairy, Lethbridge, Alta.

Dec. 20—"**The Social Scientific Century,**" by Dean R. W. Boyle, M.E.I.C., Alberta University, Edmonton, Alberta.

Membership

The membership of the branch is as follows:—

	Branch Residents	*Branch Non-residents*	*Total*
Members	8	—	8
Associate Members	15	11	26
Juniors	1	1	2
Students	2	2	4
Institute Affiliates	1	—	1
Branch Affiliates	38	—	38
Total	65	14	79

Financial Statement

Trial Balance as at March 13th, 1924, (end of branch year).

	Dr.	*Cr.*
General fund	—	$227.38
Bank	$133.88	—
Cash	—	—
Membership accounts	123.50	—
Institute Journal	—	30.00
	$257.38	$257.38

Receipts

Cash in bank, March 11th, 1923	$113.98	
Rebates on members	72.00	
Affiliate dues	136.00	
Branch news	13.89	
Bank interest	62.69	
		$338.56

Disbursements

Printing	44.67	
Sundries	86.71	
Institute Journal	23.30	
Advance repaid headquarters	50.00	
	$204.68	
Cash in bank	163.88	
		$38.56

Assets

Cash in bank	$133.88	
Rebate on 8 Members	20.00	
Rebate on 18 Associate Members	36.00	
Rebate on 1 *Institute* Affiliate	3.25	
Rebate on 2 Juniors	2.00	
Rebate on 1 Student	.25	
Branch Affiliate dues	62.00	
		$257.38

Liabilities

Subscription for Branch Affiliate to *Journals* .... $ 30.00

We have examined the vouchers and papers of the Lethbridge Branch, *The Engineering Institute of Canada*, also statement drawn up by G. S. Brown, A.M.E.I.C., secretary-treasurer, and find same to be a correct and a true account of the standing of the branch.

G. H. DUNNING,
C. J. BRODERICK,
Auditors.

Financial Statement, December 31st, 1924.

Receipts

Cash in bank March 15th, 1924	$133.88	
Rebates and Affiliate fees	115.13	
Branch news	26.34	
		$275.35

Disbursements

Journal subscriptions from Affiliates	$ 40.15	
Printing and advertising	23.39	
Sundries, (branch meetings, room rent, etc)	79.23	
	$142.77	
Cash in bank, Dec. 31st, 1924	132.58	
		$275.35

Assets

Cash in bank, Dec. 31st, 1924	$132.58	
Rebates as per wire from headquarters Dec. 31st 1924	12.60	
		$145.18

Liabilities

Accounts payable	$ 24.08	
Institute Journal	10.00	
		$ 34.08

Respectfully submitted,

JOHN DOW, M.E.I.C., *Chairman.*
GEORGE S. BROWN, A.M.E.I.C., *Secretary-Treasurer.*

London Branch

The President and Council,

On behalf of the Executive Committee of the London Branch, we beg to submit the following report for the year ending December 31st, 1924.

Seven executive, nine regular and one special meetings were held during the year. Meetings which were of popular interest were open and were well attended by the general public.

Membership

	1923	*1924*
Members	13	15
Associate Members	34	33
Juniors	12	6
Students	21	26
	80	80

Financial Statement

Receipts

Balance in bank Jan. 1st, 1924	$ 18.25	
Donations	2.00	
Rebates from headquarters (dues, Branch news)	126.05	
Receipts from annual dinner	29.75	
Bank interest	.83	
Rebates due from headquarters	11.40	
		$188.28

Expenditures

Notices	9.29	
Printing	4.49	
Postage	18.49	
Telegrams	2.07	
Telephone	.60	
Janitor's services	5.00	
Rental of auditorium, Dec. 18th	3.00	
Entertaining guests	25.75	
Express charges	3.00	
Expenses of out of town speakers	27.44	
Cigars (annual dinner)	5.41	
Annual dinner	30.00	
Moving picture machine rental	10.00	
Sundries	2.75	
	147.29	
Balance in bank	29.59	
Rebates due from headquarters	11.40	
		$188.28

Balance in bank	$29.59	
Rebates due from headquarters	11.40	
		$ 40.99
Bills payable (est'd)		2.00
Net credit as at Dec. 31st, 1924		$ 38.99

We have examined the above statement prepared by the secretary and find same to be a correct and true account of the standing of the branch.

ALFRED J. STEVENS, M.E.I.C., }
W. M. VEITCH, A.M.E.I.C., } *Auditors.*

Respectfully submitted,
E. V. BUCHANAN, M.E.I.C., *Chairman.*
E. A. GRAY, A.M.E.I.C., *Secretary-Treasurer.*

Moncton Branch

The President and Council,

On behalf of the Executive Committee we beg to submit the fifth annual report of Moncton Branch.

The Executive Committee held six meetings during the year and transacted a considerable amount of business. There were ten meetings of the branch held, five of which were supper-meetings and one at Mount Allison University, Sackville, N. B. Two of our meetings were open to the public and at one of these Fraser S. Keith, M.E.I.C., the genial and efficient secretary of *The Institute* was present and gave a splendid address on the Wembley Exhibition, illustrated with lantern slides; another pleasing feature of this meeting was the presentation of the charter to Moncton Branch by Vice-President F. A. Bowman, M.E.I.C., of Halifax.

Membership

Our membership at present consists of 80 members, comprised as follows:—

	Branch Residents	Branch Non-residents	Total
Members	11	2	13
Associate Members	23	9	32
Juniors	5	4	9
Students	23	2	25
Affiliates	1	—	1
	63	17	80

Officers

The annual meeting of the branch was held on May 15th, and the following officers were elected for 1924-1925.

Chairman, — F. O. Condon, M.E.I.C.
Vice-Chairman, — C. S. G. Rogers, A.M.E.I.C.
Secretary-Treasurer, — M. J. Murphy, A.M.E.I.C.
Executive Committee, — F. B. Fripp, A.M.E.I.C.,
G. C. Torrens, A.M.E.I.C.,
G. E. Smith, A.M.E.I.C.

The following members of the Executive Committee hold office for another year:—

H. J. Crudge, A.M.E.I.C.,
E. G. Evans, M.E.I.C.,
J. D. McBeath, M.E.I.C.,
W. B. MacKenzie, M.E.I.C., *ex-officio.*

Financial Statement

The financial statement for the year ending December 31st, 1924, is as follows:—

Revenue

Balance in bank Jan. 1st, 1924	$107.14	
Rebates on dues and Branch news	150.79	
Tickets sold for supper-meetings	94.25	
Bank interest	2.39	
	$354.57	
Rebates due from headquarters	15.00	
		$369.57

Expenditures

Postage	$ 5.00	
Expenses of meetings	152.89	
Printing	36.26	
Telegrams and telephone	3.12	
Miscellaneous	10.63	
Total	$207.90	
Balance in bank	146.67	
	$354.57	
Rebates due from headquarters	15.00	
		$369.57

Respectfully submitted,
FRED. CONDON, M.E.I.C., *Chairman.*
M. J. MURPHY, A.M.E.I.C., *Secretary-Treasurer.*

Montreal Branch

The President and Council,

On behalf of the Executive Committee we beg to submit the annual report of the Montreal Branch for the year ending December 1924.

The personnel of the Executive Committee during the past year was as follows:—

Chairman, O. O. Lefebvre, M.E.I.C., Vice-Chairman, J. L. Busfield, M.E.I.C., Secretary-Treasurer, E. A. Ryan, A.M.E.I.C., Past-Chairman, J. T. Farmer, M.E.I.C., Executive, A. C. Tagge, M.E.I.C., F. A. Combe, M.E.I.C., D. C. Tennant, M.E.I.C., W. C. Adams, M.E.I.C., P. S. Gregory, A.M.E.I.C., C. V. Christie, A.M.E.I.C., *Ex-officio,* Frederick B. Brown, M.E.I.C., *Walter J. Francis, M.E.I.C., J. A. Duchastel, M.E.I.C., Geo. R. MacLeod, M.E.I.C., Chas. M. McKergow, M.E.I.C., J. M. R. Fairbairn, M.E.I.C., R. A. Ross, M.E.I.C., F. P. Shearwood, M.E.I.C., Arthur Surveyer, M.E.I.C., J. B. Challies, M.E.I.C., (Nov. and Dec.)

*Deceased March 6th, 1924.

It is with sincere sorrow that we record the death of the late Walter J. Francis, M.E.I.C., president of *The Institute,* and founder and first chairman of the Montreal Branch, who for nearly twenty-eight years took a leading part in *Institute* affairs and contributed much to its progress. His great ability and energies were unstintingly given, and his loss is severely felt by all with whom he was associated.

Another loss sustained by this branch occurred in the passing away of our highly esteemed honorary member, Baron Shaughnessy. His life work in connection with the up-building of this country and particularly in connection with great works of engineering and transportation will always remain a magnificent monument to his genius.

With a view to promoting a closer co-operation between the Executive Committee and the Papers and Meetings Committee, a policy of choosing as chairman of the latter committee one of the members of the executive, was adopted, and the results have proven this policy to be highly satisfactory. The various committees of the branch are as follows:—

Papers and Meetings Committee		*Industrial Section*
Chairman	W. C. Adams, M.E.I.C.	A. F. Hanly, A.M.E.I.C.
Vice-Chairman	J. S. Cameron, A.M.E.I.C.	K. G. Cameron, A.M.E.I.C.
	Civil Section	*Railway Section*
Chairman	H. Massue, A.M.E.I.C.	W. Walker, A.M.E.I.C.
Vice-Chairman	J. B. D'Aeth, M.E.I.C.	J. F. Pringle, A.M.E.I.C.
	Electrical Section	*Municipal Section*
Chairman	L. H. Marrotte, M.E.I.C.	Geo. R. MacLeod, M.E.I.C.
Vice-Chairman	G. E. Templeman, A.M.E.I.C.	F. C. Laberge, M.E.I.C.
	Mechanical Section	*Publicity Committee*
Chairman	J. D. Alder, M.E.I.C.	W. H. Abbott, A.M.E.I.C.
Vice-Chairman	J. A. McCrory, A.M.E.I.C.	E. Prevost, Jr.E.I.C.
Secretary Ex-officio	E. A. Ryan, A.M.E.I.C.	

Following the precedents of previous years the branch has continued its participation in matters of public interest. In this connection may be mentioned the question of the Montreal-South Shore bridge, for the design and supervision of which Canadian engineers have been retained largely as a result, no doubt, of the very strong protests made by the Executive Committee of the branch.

The Branch Fuel Committee, appointed in 1923 to study the fuel question as it applies to this city and make recommendations to the public, completed its work and published in booklet form a highly interesting report on "Fuels and Furnaces for Domestic Heating" which was presented before a public meeting of the branch held early in the year.

The branch has also co-operated with other public bodies in giving assistance on a code of building by-laws for the city of Montreal, and in urging the appointment of a city planning commission.

A paper was read before the branch on the "Hudson's Bay Railway and Port Nelson", a subject that was very much in the public eye at that time. This occasioned a considerable amount of discussion in other branches, and drew forth comment in many sections of the country by the Press. Owing to the importance of the subject at the time, and the vast amount of uncertain information broadcasted from various quarters, your executive deemed it wise to afford the members an opportunity to discuss the subject at greater length and an evening was set aside for the purpose in May. Many notable contributions to the hitherto indefinite knowledge of the subject were made on that occasion and, owing to the revelations in a carefully prepared discussion by J. L. Busfield, M.E.I.C., we decided to draft a resolution to be transmitted to the federal government at Ottawa, subject to the approval of the Council of *The Engineering Institute*, which, summarized, is as follows:

"WHEREAS there is a strong demand for the completion of the Hudson's Bay Railway, — a subject of national interest, — and whereas data compiled by members of the Montreal Branch of *The Engineering Institute of Canada* and presented at a meeting held in May indicate the project to be economically unsound and the practicability doubtful, it is resolved that the data collected be forwarded through a delegation to the federal government, urging that it be given due consideration and in view of the facts presented that a complete investigation of the project be carried out to determine whether or not its completion be in the best interests of Canada."

The resolution was duly proposed, and seconded and carried by a vote of 94 pro and 6 con, at the aforesaid meeting. It was transmitted to Council the following day and in June a reply was received indicating that, "it had been noted and no action taken". Your committee at its next meeting in August carefully considered this reply and, after a lengthy discussion, forwarded another request to Council urging that the resolution be given due attention as it was felt that the principles Council was endeavouring to enforce "would have a stultifying effect on the individual efforts of this and any other branch in regard to matters of public interest", and furthermore that this evidence of imposing restrictions on local branches, in questions such as this, was contrary to an important section of its by-laws which reads, "to enhance the usefulness of the profession to the public."

This last request failed, as did the former, to obtain any action and we were reluctantly obliged to abandon our efforts to give effect to the expressed desires of a largely attended representative gathering of this *Institute*.

Following the request of the required number of members of the branch, a municipal section was formed, the first meeting in connection with which was held on March twenty-seventh. Since that time under the able direction of its first chairman, Geo. R. MacLeod, M.E.I.C., it has contributed largely in securing valuable papers for *The Institute*.

Under the auspices of the mechanical section of the branch a meeting was held in April to which all resident members of the American Society of Mechanical Engineers, were invited. The purpose of this meeting was to discuss ways and means whereby there might be greater co-operation between these two bodies in promoting the interests of this branch of the profession. A sub-committee was later appointed to study and report on this meeting. This committee has since recommended that a further study be made by the incoming executive.

There has been a slight increase in the membership for the past twelve months indicating that notwithstanding a marked exodus of trained men across the border, the popularity of the Montreal Branch to young engineers, and those coming from other districts continues to be maintained. The enrollment at the present time consists of the following:—

	Branch Residents	*Branch Non-Res.*	*Total*	*Increase*
Honorary Member	1	..	1	..
Members	205	16	221	4
Associate Members	410	46	456	28
Juniors	70	13	83	12
Students	285	30	315	11
Affiliates	10	..	10	1
Branch Affiliates	28	..	28	11
	1,009	105	1,114	67

Papers and Meetings Committee

It would not be practicable, in a report of this sort, to attempt to include information as to all points which are of interest in connection with our work, although there are some which seem worthy of recording here, even though in doing so we reveal the fact that we fell quite short of accomplishing all we had hoped to accomplish.

Soon after our appointment we had a meeting at which we set the following marks at which to aim:

(a) Arrange to have a non-technical paper about once a month by a prominent person, on a subject of general engineering or national interest, the other papers to get right down to technical engineering details.

(b) Under no circumstances would we attempt to attract members to meetings by any other means than high quality papers and by means of the press and meeting notice cards, making the scope of the papers clear. Quality papers are of greater importance than a large attendance.

(c) The chairman for each meeting, also some persons to lead in discussion, should be selected well in advance of the meeting so as to ensure the best results in the conduct of the meeting as well as to bring out the best possible discussion.

(d) We would endeavour to have all papers published in advance, so as to aid those selected to lead the discussion in preparing for it, as well as to provide copies for members in their seats to aid them in following the speaker.

Your committee feels that these are all good points and that, although we did not succeed in accomplishing all we had hoped, we believe that we did meet with some success and that future committees will probably be able to secure an improvement over what we have accomplished along these lines.

To last year's committee belongs the credit for the meetings held during the last half of the 1923-24 season. They are included in the following list for the year, however, so as to make it complete.

Probably the outstanding event of the season, as far as the addresses of general interest are concerned, was the talk by Sir Ernest Rutherford at a luncheon given under the auspices of *The Institute* as a whole, on September 25th, at the Windsor hotel. Aside from this the papers for the year just closed were as follows:

Jan. 10—"**Some Secondary and Impact Effects in Pony Truss Railway Bridges**," (illustrated), by Prof. H. M. Mackay, M.E.I.C. Attendance 100.

Jan. 17—"**Test on 43,000-horse power Hydro-Electric Unit**," (illustrated), by W. R. Way, Jr.E.I.C. Attendance 89.

Jan. 24—"**Steam Heating**," (illustrated), by C. F. Eveleth. Attendance 86.

Jan. 31—"**The Financing of Water Power Projects**," by A. J. Nesbitt. Attendance 225.

Feb. 7—"**The Decennial Responsibility of the Engineer**," by John T. Hackett. Attendance 75.

Feb. 14—"**The Wonderworld of Color**," (illustrated), by Dr. Leo. E. Pariseau. Attendance 152.

Feb. 21—"**Presentation of Report and Public Meeting of the Montreal Branch Fuel Committee**," (illustrated), by F. A. Combe, M.E.I.C. Attendance 105.

Feb. 28—"**Raising Sunken Ships by Reno System of Submarine Tractor and Open Bottom Vertical Submersible Pontoons**," (illustrated), by W. W. Johnston. Attendance 110.

Mar. 6—"**The Cement Industry in Canada**," by A. C. Tagge, M.E.I.C. (Cancelled because of the death of President Francis.)

Mar. 13—"**The Pulp and Paper Industry**," (illustrated), by H. J. McLean, A.M.E.I.C. Attendance 107.

Mar. 20—"**The Lake St. John Power Development**," (illustrated), by O. O. Lefebvre, M.E.I.C. Attendance 160.

Mar. 27—Inauguration of the Municipal Section of Montreal Branch. Attendance 74.

Apr. 3—"**The Hudson Bay Railway and Port Nelson**," (illustrated), by L. C. Nesham, A.M.E.I.C. Attendance 225.

Apr. 10—"**Voice Highways in the Making**," (illustrated), by W. Stanley Vipond, M.E.I.C. Attendance 85.

Apr. 17—"**Considerations on a Project of Town Planning for the Island of Montreal**," by S. J. Fortin, M.E.I.C. Attendance 85.

Apr. 24—"**The Engineer in the Nation**," by Sir Arthur Currie. Attendance 120.

May 1—"**Practical Issues in Canadian Progress**," by Dr. R. C. Wallace.

May 8—"**Discussion on Hudson Bay Railway**." Attendance 260.

Oct. 2—"**Some Impressions from the World Power Conference**," by F. B. Brown, M.E.I.C. Attendance 95.

Oct. 9—"**Stability of Dams**," (illustrated), by C. L. Cate, A.M.E.I.C. Attendance 133.

Oct. 16—"**Proprietary Asphalt Pavements Covered by Trade Names and Patents**," by C. A. Mullen, M.E.I.C. Attendance 74.

Oct. 23—"**Feed Water Heaters**," (illustrated), by J. D. Alder, M.E.I.C. Attendance 70.

Oct. 30—"**Steel Rails**," by C. B. Bronson. Attendance 110.

Nov. 6—"**Recent Advancement in the Construction and Operation of Grain Elevators**," (illustrated), by L. Coke Hill, M.E.I.C. Attendance 130.

Nov. 13—"**The Work of the Quebec Public Service Commission**," by F. C. Laberge, M.E.I.C. Attendance 57.

Nov. 20—"**The Canadian Patent Act as Affecting Engineers**," by Russel Smart, M.E.I.C. Attendance 86.

Nov. 27—"**The New 20,000,000-gallon Reservoir of the Montreal Aqueduct**," (illustrated), by J. F. Brett, A.M.E.I.C. Attendance 103.

Dec. 4—"**Recent Developments in the Design of Fluid Flow Meters**," (illustrated), by A. Craigon. Attendance 69.

Dec. 11—"**Cost of Electric Power**," (illustrated), by P. T. Davies, Attendance 102.

Dec. 18—Annual meeting.

We have arranged for a programme for the last half of the 1924-25 season and have turned the same over to the executive.

In closing we wish to strongly recommend that the various sections of the branch actually organize as such. It is our feeling that unless this is done, little can be accomplished towards improving our meetings over what they have been in the past.

We wish also to recommend that action be taken by the incoming executive to eliminate the overlapping of the committees during the last half of the seasons, that is, having a committee function after it has lost its official existence.

Respectfully submitted,
W. C. ADAMS, M.E.I.C., *Chairman,*
Papers and Meetings Committee.

Financial Statement

Ordinary: *Revenue*			
Branch news		$ 45.44	
Commissions on advertising		4.50	
Affiliate dues		161.00	
Rebates — Sept., Oct., Nov., Dec., 1923	$245.88		
Jan., Feb., March 1924	792.00		
Apr., May, June, July 1924	328.60		
Aug., Sept., Oct., 1924	141.90		
		1,508.38	
Interest on savings deposits		8.13	
Extraordinary:			$1,727.45
Special subscription and sale of pamphlets by Montreal Branch Fuel Committee			21.00
Cash in bank, January 1st, 1924			796.90
			$ 2,545.35
Ordinary: *Expenditures*			
Post card notices		$ 615.60	
Other printing, multigraphing, stamps		279.89	
Stationery		16.10	
Secretary's honorarium		300.00	
Clerical assistance		100.00	
Telephone service and telegrams		43.28	
Moving pictures and lantern slides		59.88	
Subscriptions to *Journal* for Affiliates		46.00	
Miscellaneous expenses: gratuities, notices re annual and professional meeting, chairs and signs, weekly meetings, etc.		150.96	
			1,611.71
Cash in bank — savings a/c			277.61
Cash in bank — current a/c			656.03
			$2,545.35

Respectfully submitted,
O. O. LEFEBVRE, M.E.I.C., *Chairman.*
E. A. RYAN, A.M.E.I.C., *Secretary-Treasurer.*

Niagara Peninsula Branch

The President and Council,

The sixth year in the life of the branch has been brought to a successful close. A number of very successful functions have been held, which have been reported at length in the Journal. A list of these follows:—

Jan. 9—"**Electrical Night,**" at Welland; speakers — F. H. Farmer, M.E.I.C., "**The Installation of Unit No. 6 at Queenston**"; E. B. Snyder, "**Insulators**"; R. M. Love, "**Street Illumination,**" — attendance 47.

Feb. 1—Annual dance, at Niagara Falls.

Feb. 12—"**Asphalt,**" by Germain P. Graham, at St. Catharines, — attendance 35.

May 20—Annual meeting at St. Catharines. "**Ice conditions on the St. Lawrence,**" by Russell Yuill, A.M.E.I.C., — attendance 53.

June 16—Picnic at Niagara-on-the-Lake, — attendance 70.

Aug. 23 and 24—Visit of the London Branch, — attendance 39.

Sept. 13—"**Clam-bake**"—Guests of David Dick Jr., — attendance 70.

Oct. 22—Trip to Horton Steel Works, Bridgeburg, — attendance 65.

Nov. 7—"**Centenary of Welland Canal,**" Presentation of branch charter by Dr. Arthur Surveyer, M.E.I.C., president E.I.C., and address on "**Some Transportation Problems,**" by E.W. Beatty, K.C., president C.P.R.,—attendance 175.

Dec. 9—"**Northern Ontario,**" by Hon. Charles McCrae, Minister of Mines, Ontario, at Niagara Falls, — attendance 50.

Membership

The membership is still in a flourishing condition, as shown by the following table:—

	1923	*1924*	*Loss*	*Gain*
Members	19	18	1	–
Associate Members	88	92	–	4
Juniors	19	20	–	1
Students	30	33	–	3
Branch Affiliates	10	11	–	1
	166	174	1	9
Net gain during year				8

The branch by-laws were adopted by letter ballot closing February 10th, 1924. No other special committees functioned during the year

Financial Statement
December 31st, 1924

Receipts		
Balance on hand Jan. 1st, 1924	$243.54	
Rebates, Branch news and commissions	303.90	
Affiliate fees	18.00	
Proceeds of meetings	104.02	$669.46
Expenditures		
Printing, stationery and notices	$110.78	
Expenses meetings	235.57	
Postage, telephone, express and telegrams	47.91	
Secretary's honorarium	100.00	
Balance in bank Dec. 31st, 1924	152.70	
Rebates earned, not yet to hand	22.50	$669.46

All of which is respectfully submitted,
E. P. JOHNSON, A.M.E.I.C., *Branch Chairman.*
R. W. DOWNIE, A.M.E.I.C., *Secretary-Treasurer.*

Ottawa Branch

The President and Council,

On behalf of the Managing Committee of the Ottawa Branch, we beg to submit the following report for the calendar year 1924.

The annual general meeting of *The Institute* was held in Ottawa on the 23rd and 24th January, 1924, and had a distinctly invigorating effect on the healthy growth of the Ottawa Branch. The arrangements for the meeting were under the competent guidance of Lieut. Commander C. P. Edwards, A.M.E.I.C., who, with his committee, deserves the hearty thanks of the branch for the painstaking efforts which ensured the success of the meeting.

Another feature was the hearty cooperation with kindred societies in the holding of meetings, both luncheon and evening. Joint meetings were held with the Professional Institute of the Civil Service of Canada, the Canadian Institute of Mining and Metallurgy and the Society of Chemical Industry. To one of the luncheons members of the Canadian Club were invited. By a policy of cooperation towards common ends it is believed that the best interests and prestige of *The Institute* and the profession will be served.

Another development of importance which the Ottawa Branch was instrumental in bringing about was the admission of several senior officers of the Royal Canadian Air Force. These members will probably form the nucleus of an important section of *The Institute,* machinery for the formation of which was provided at the last annual meeting. It is a pleasure to state that the representations of the Ottawa Branch in this matter were most sympathetically received and unanimously supported by Council. The action in the cases of the senior officers of the Air Force constituted a precedent which is being, and will be, followed by similar action in regard to many officers of the same force.

There is reason to believe that the prestige and consequent influence of the profession is being heightened. It may be that to some extent this is due to the dignified but aggressive publicity which is being given to our activities. This phase is exemplified by the publicity given at the annual meeting last January by the local and Canadian press, to whom the thanks of the branch are due.

During the year several members of the branch were selected to play parts which indicate the heightened prestige of the profession and which reflect credit on the profession and on the branch.

It was with profound regret that members of the Ottawa Branch learned of the sudden death on March 6th, 1924, of our esteemed president, Mr. Walter J. Francis. *The Institute* was fortunate, however, in having such a distinguished gentleman as Dr. Arthur Surveyer, M.E.I.C., as his successor.

We have also to express our regret at the loss through death of eight members of the Ottawa Branch, namely, one Honorary Member, Dr. E. G. Deville, six Members, W. C. Way, W. A. Bowden, J. St. V. Caddy, L. J. R. Steckel, L. N. Rheaume, and R. F. H. Bruce, and one Associate Member, Lt. Col. F. O. Hodgins.

The fourth annual " 'Engineers' Ball' " was held on January 24th, 1924, in connection with the general annual meeting of *The Institute* and by its unqualified success has become one of the established functions of the branch.

The fifth annual 'Popular Lecture' was given by Colonel E. W. Stedman, M.E.I.C., chief technical officer of the Air Board, and was quite in the class of its predecessors.

The balance sheet shows that we had a successful financial year. Although considerable expense was incurred on account of the general annual meeting being held in Ottawa, our assets have been decreased by only $333.31, leaving a working capital of $1,610.83.

The membership of the branch was increased by 44 during the year, which is a splendid indication of the standing of the engineering profession in Ottawa.

During the year the Managing Committee held ten meetings. In addition the Branch held evening meetings and luncheons.

Proceedings and Publicity

During the year seven luncheons and ten evening meetings of the branch were held, as follows:

Jan. 3—"**The Burning of Canadian Fuels in Pulverized Form for the Generation of Steam in Industrial Power Plants,**" by A. J. T. Taylor, president of the Combustion Engineering Corporation, Ltd., Toronto; evening meeting at the Victoria Memorial Museum.

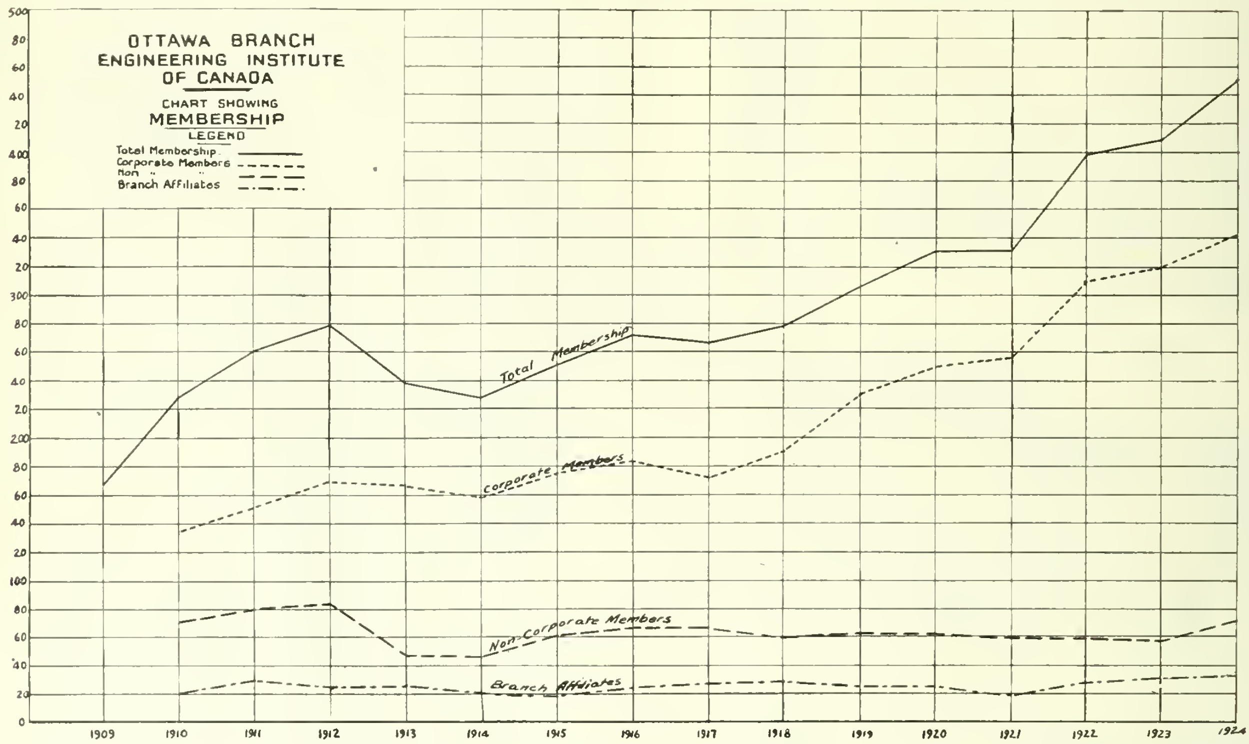
Jan. 10—Annual meeting — Daffodil Tea Rooms.
Feb. 4—"**Asphalt Paving,**" by Germain P. Graham, formerly of the City Engineering Department, Albany, N. Y., and manager of the Albany, N. Y. branch of the Asphalt Association; evening meeting at the Victoria Memorial Museum.
Feb. 14—"**The Young Engineer and Scouting,**" by John A. Stiles, B. A. Sc., M.E.I.C., assistant chief commissioner, Boy Scouts Association for Canada; luncheon meeting at the Chateau Laurier.
Feb. 19—"**Canada's Arctic Expedition of 1923,**" by J. D. Craig, B.Sc., M.E.I.C., International Boundary Commission engineer and advisory engineer, Northwest Territories and Yukon Branch, Department of the Interior; joint evening meeting with the Professional Institute of the Civil Service of Canada at the Victoria Memorial Museum.
Feb. 29—"**Roadless Vehicles,**" by Lewis K. Davis, general manager, Roadless Patents Holding Company, Washington, D.C.; evening meeting at Victoria Memorial Museum.
Mar. 20—"**A Quarter of a Century of Science,**" by Dr. H. M. Tory, M.A., D.Sc., LL.D., F.R.S.C., president, University of Alberta; luncheon meeting at Chateau Laurier.
Mar. 24—"**Aeroplane Surveying,**" by Professor H. L. Cooke, M.A., professor of physics, Princeton University, Princeton, N.J., evening meeting at Victoria Memorial Museum.
April 7—"**Aeroplane Progress.**" The annual popular lecture by Wing Commander E. W. Stedman, O.B.E., M.E.I.C.; evening meeting at Victoria Memorial Museum.
Nov. 26—"**Sodium Silicate,**" by E. T. Sterne, B.Sc., chemical director, G. E. Sterne & Son, Brantford, Ontario; joint evening meeting with Ottawa Branch, Society of Chemical Industry at Victoria Memorial Museum.
Dec. 11—"**The International Geodetic and Geophysical Conference, October, 1924, in Madrid, Spain,**" by Noel J. Ogilvie, D.L.S., M.E.I.C., director, Geodetic Survey of Canada; luncheon meeting at the Chateau Laurier.
Dec. 18—"**Concrete,**" by E. Viens, A.M.E.I.C., Public Works Department, Alan K. Hay, A.M.E.I.C., Ottawa Suburban Roads Commission, and Howells Frechette, M.Sc., Department of Mines; evening discussion at the University Club.

On January 23rd and 24th, 1924, the general annual meeting of The Institute was held in Ottawa. The complete arrangements for this meeting were carried out by a local committee under the capable chairmanship of Lieut. Commander C. P. Edwards, O.B.E., A.M.E.I.C., and included the following functions:

Jan. 23—1.00 p.m. — Luncheon in the Chateau Laurier, at which The Institute was honoured by the presence of His Excellency the Governor General. Addresses of welcome were delivered to outside members by the president of The Institute, Walter J. Francis, the late Mr. Walters, then mayor of Ottawa, and by Geo. A. Mountain, M.E.I.C., past-president of The Institute.

7.30 p.m. — Annual banquet of The Institute.

9.00 p.m. — Smoker under the chairmanship of Lieut.-Commander C. P. Edwards, O.B.E., A.M.E.I.C.



May 1—"**The National Importance of the Mining Industry,**" by Professor R. C. Wallace, M.A., Ph.D., D.Sc., professor of geology, University of Manitoba, and president of the Canadian Institute of Mining and Metallurgy; joint luncheon meeting with the Canadian Institute of Mining and Metallurgy at the Chateau Laurier.
Sep. 2—Complimentary luncheon at the Chateau Laurier to Squadron Leader A.S.C.S. MacLaren, O.B.E., M.C., D.F.C., A.F.C., and his associates of the British "Round-the-World Flight."
Sep. 4—"**The Brown Coals and Lignites of the British Empire and Why Coals Coke,**" by Dr. William A. Bone, F.R.S., professor of chemical technology in the Imperial College of Science and Technology, London, England; joint evening meeting at the Victoria Memorial Museum.
Oct. 16—"**World Power Conference,**" by J. B. Challies, C.E., M.E.I.C., Department of the Interior; John Murphy, M.E.I.C., Department of Railways and Canals, G. Gordon Gale, M.Sc., M.E.I.C., of the Hull Electric Company, and B. F. Haanel, B.Sc., M.E.I.C., Department of Mines; luncheon meeting at the Chateau Laurier.
Nov. 6—"**The Making of Bank Notes,**" by J. A. Machado, President, Canadian Bank Note Company, Ltd.; luncheon meeting at the Chateau Laurier.

Jan. 24—1.00 p.m. — Luncheon to members and ladies, at which Hammett P. Hill delivered an address on "**Colonel By and the Rideau Canal.**"

3.00 p.m. — Visit to the British American Nickel Corporation, Deschenes, Quebec, through the courtesy of the Hon. E. N Rhodes, president of the corporation.

9.00 p.m. — Annual ball of the Ottawa Branch held in the Chateau Laurier ball room.

The attendance at the luncheon meetings has averaged about 90, while at the evening meetings the attendance has been as high as 400.

During the year the branch continued the policy of inviting prominent men to address the luncheon meetings. Of the meetings held four were joint meetings with other technical societies in Ottawa.

Membership

During the year the total membership increased from 408 to 452 and the corporate membership from 320 to 344. The growth in the membership from 1909 to date is shown graphically on the accompanying chart.

The following table shows in detail the comparative figures of the Branch membership for the years 1922, 1923 and 1924:

	1922	*1923*	*1924*
Honorary Members	2	2	1
Members	100	113	112
Associate Members	211	207	232
Affiliates of *Institute*	6	6	6
Juniors	32	30	35
Students	19	18	31
Branch Affiliates	28	32	35
Total	398	408	452

Rooms and Library

The policy of the branch remains unchanged as regards the question of securing permanent quarters. Part of the furniture, owned by the branch, is still on loan to the Minto Skating Club and the remainder is stored in an unused office, being protected, however, by insurance.

The library is situated on the 3rd floor of the Journal building, where it may be consulted by members during regular office hours and at other times by appointment with the Branch Librarian.

During the year accessions were received from J. B. Challies, M.E.I.C., F. H. Peters, M.E.I.C., the headquarters of *The Institute* and a number of government agencies.

The income for the last two years is, for 1923 — $1,014.36, and for 1924 — $1,209.93; the expenditure for 1923 — $979.32 and for 1924 — $1,548.90. The increase in revenue is chiefly due to the large increase in the amount received from the headquarters of *The Institute* for advertising in the Journal. The annual income of the branch from the Victory bonds is $37.50.

Financial Statement

Statement of receipts and expenditures for the year ending December 31st, 1924.

Receipts

Balance in bank Jan. 1st, 1924	$436.46	
Cash on hand Jan. 1st, 1924	1.16	
Interest Victory bonds	37.50	
Rebates from headquarters:—		
Sept., to Dec., 1923	96.50	
Jan., Feb. and Mar., 1924	303.00	
April to July, 1924	150.40	
Aug. to Oct., 1924	81.20	
Branch news, Nov. and Dec. 1923	14.45	
Branch news, Jan. to April, 1924	17.23	
Branch news, May, June and Sept., 1924	13.83	
Branch news, Oct. and Dec., 1924	10.67	
Journal advertising, 1923	219.57	
Journal advertising, 1924	170.22	
Contribution from headquarters towards annual general meeting	250.00	
Branch Affiliate fees	84.00	
Mining Institute — share of luncheon expenses	11.87	
Proceeds from sale of bonds	337.28	
Proceeds from sale of luncheon tickets	513.50	
Refund from annual general meeting committee	131.06	
Bank interest	11.36	
		$2,891.26

Expenditures

Chateau Laurier for luncheons	$792.50	
Daffodil Tea-room — annual meeting	41.00	
Printing	47.49	
Subscription to *Engineering Journal* and Engineering News-Record	11.00	
Advertising	104.50	
Crabtree, for half-tones	7.95	
Insurance,	2.00	
Scrims, for flowers	76.25	
M. F. Cochrane, for annual general meeting	900.00	
Advance to Ball Committee, for 1925	15.00	
Sundries, lantern operator, gratuities, etc.	66.50	
Petty cash, postage, etc	141.14	
Balance in bank, Dec. 31st, 1924	679.68	
Balance, cash on hand	6.25	
		$2,891.26

Advertising in the Journal

Commissions for advertising secured in the *Journal* during 1924 amount to $170.22, which is equivalent to the rebates received from 85 Associate Members.

Finances

The financial position of the branch continues to be very satisfactory, as may be seen from the attached statements of assets and liabilities and of receipts and expenditures. Although these statements show a larger bank balance than last year our assets are somewhat reduced owing to the fact that our expenditures were considerably increased on account of the expenses incurred in connection with the annual general meeting held in Ottawa in January, 1924. Although the net cost of this meeting to the branch was $518.94, our assets have been reduced by only $333.31, which shows a saving during the year of $185.63.

The branch closed the year with a balance of $679.68 in the bank, $6.25 in cash on hand, and $700.00 in Victory bonds, a total balance on hand of $1,385.93. In addition to this balance the branch has assets of $48.90 in rebates due from headquarters, and $176.00 in furniture, equipment, etc., making a total of $1,610.83. The financial standing of the branch from 1910 to the present date is shown graphically on the accompanying chart.

Statement of assets and liabilities for year ending December, 1924

Assets		
Furniture (cost $200.00)	$ 80.00	
Library:— Book cases (cost $72.50)	50.00	
Bound magazines (nominal)	1.00	
Books	25.00	
Rebates due from headquarters on 1924 fees	48.90	
Stationery and equipment	20.00	
Victory bonds, due November 1st, 1934	500.00	
Victory bonds, due October 15th, 1934	200.00	
Cash in bank	679.68	
Cash on hand	6.25	
Liabilities		$1,610.83
Surplus	$1,610.83	
		$1,610.83

Audited and found correct: Noel Ogilvie, M.E.I.C.

Respectfully submitted,

J. L. Rannie, M.E.I.C., *Chairman.*
F. C. C. Lynch, A.M.E.I.C., *Secretary-Treasurer.*

Peterborough Branch

The year 1924 constituted the fifth in the history of this branch and was notable amongst other reasons in receiving the charter.

The annual meeting was held on May 8th, and in addition to the business end a paper on "*Engineering Education*" was given by General Secretary F. S. Keith, M.E.I.C. A spirit of optimism prevailed at this meeting, which it is pleasing to note has continued.

Eleven regular meetings were held throughout the year on subjects covering all branches of engineering with the very good average attendance of 48. The complete list of these meetings being as follows:—

Jan. 10—"**The Commercial Urge for Town Planning,**" by Horace L. Seymour, M.E.I.C., of Toronto.
Jan. 24—"**Steam Boilers,**" by Thos. H. Fenner, A.M.E.I.C.
Feb. 6—"**Asphalt Pavements,**" by Germain P. Graham of Toronto, representing the Asphalt Corporation of New York.
Feb. 28—"**Testing and Inspection of Materials,**" by W. P. Dobson, B.A.Sc., M.E.I.C., director of laboratories, H.E.P.C., Toronto.
Mar. 13—"**Good Roads,**" by E. L. Miles, F.R.S.A., M.E.I.C., of Lindsay, Ontario.
Mar. 27—"**Development of Canadian Iron Ores,**" by J. D. Jones, M.E.I.C., general manager of Algoma Steel Corporation.
April 10—"**Development of Moving Picture Industry,**" by B. E. Norrish, M.Sc., A.M.E.I.C., Montreal.
May 8—Annual meeting and a paper on "**Engineering Education,**" by General Secretary Fraser S. Keith, M.E.I.C.
June 28—Annual outing.
Aug. 10 and 11—Visit to Queenston.
Oct. 9—"**Automatic Stations,**" — both generating and railway substations by D. V. Canning, B.Sc., Jr.E.I.C., Peterborough.
Oct. 16—Courtesy Branch visit to Lindsay where a paper on "**History of Development of Sewage Disposal,**" was given by R. O. Wynne-Roberts, M.E.I.C., Toronto.
Nov. 18—Annual banquet and presentation of branch charter, the latter by J. B. Challies, C.E., M.E.I.C.
Dec. 11—"**Description of Canadian Government Annual Arctic Trip,**" by J. D. Craig, B.A., B.Sc., M.E.I.C.

Other activities included our annual outing which was a wet affair although not in the present day sense of the word, and in spite of the weatherman's offering it was a great success particularly in its main objective, that of promoting professional fellowship.

A visit to Queenston was organized in the summer and was thoroughly enjoyed by those participating, although small in number.

The sixth annual banquet was held on November 18th, which was also the occasion of the presentation of the branch charter by Vice-President J. B. Challies, M.E.I.C.

Except in point of numbers this event proved to be the best ever. A stunt complaint was laid during the dinner on the absence of menus and programmes which completely fooled those not in the know, and the programme when eventually handed round was run off with pep and strictly to schedule.

This branch covers an extensive territory and it is most gratifying to the executive to see at both regular and special meetings members from the entire district and hopes this interest will continue.

The annual report of this branch for this past year cannot be complete without a reference to the death of our esteemed late president, Walter J. Francis. He had a keen local interest in our affairs and his oss is felt by the entire branch membership.

Membership

It is pleasing to note our total membership has increased by 21, the grade showing as compared with 1923 being as follows:—

	1923	1924
Members	22	24
Associate Members	42	41
Junior Members	10	11
Students	19	32
Affiliates	2	2
Branch Affiliates	23	29
	118	139

Financial Statement

Receipts		
Balance in bank, Jan. 1st, 1924	$ 16.86	
Rebates on fees	151.95	
Journal news	22.21	
Affiliate fees and *Journal* subscription	69.23	
Rent for m. p. machine	3.00	
Receipts — annual dinner	120.00	
Bank interest	.54	
		$383.79
Expenditures		
Rent	$ 50.00	
Journal subscriptions	34.78	
Expenses — annual dinner	153.43	
Printing	74.63	
Lunch	8.75	
Speaker and meeting expense	35.11	
Funeral expense	5.00	
Postage, war tax, etc	6.69	
Balance in bank, Dec. 31st, 1924	15.40	
		$383.79

Archie B. Gates, A.M.E.I.C., *Treasurer.*

On behalf of the executive, respectfully submitted:—

E. R. Shirley, M.E.I.C., *Chairman.*
P. Manning, A.M.E.I.C., *Secretary.*

Quebec Branch

Au Président et au Conseil,

Le Conseil de la Section de Québec a l'honneur de vous soumettre son rapport annuel pour l'année 1924 comme suit:—

Rôle des Membres

	Résidents	*Non résidents*	*Total*
Membres	17	9	26
Membres associés	58	38	96
Membres junior	10	8	18
Membres étudiants	17	19	36
Membres affiliés	3	..	3
Total des membres			179

Assemblée Annuelle

L'assemblée annuelle de la Section de Québec a été tenue le 30 avril 1924, sous la présidence de A. R. Décary, M.E.I.C. Les officiers dont les noms suivent ont été élus pour l'année 1924:

Président — A. R. Décary, M.E.I.C.
Vice-Président — A. B. Normandin, A.M.E.I.C.
Secrétaire — J. Eug. Roy, A.M.E.I.C.
Conseillers — J. P. P. Joncas, A.M.E.I.C.; S. L. deCarteret, A.M.E.I.C.; T. E. Rousseau, A.M.E.I.C.; Hector Cimon, A.M.E.I.C.; J. E. Gibault, A.M.E.I.C.

Assemblées

Le Conseil de la Section de Québec a tenu ses assemblées régulièrement durant l'année 1924.

Les déjeuners et assemblées du soir de chaque mois ont été tenus régulièrement au château Frontenac et à l'Hôtel de Ville de Québec, à partir du mois de novembre 1923 jusqu'au mois de mai 1924.

A nos différents déjeuners et assemblées du soir, nous avons eu fréquemment l'occasion de compter parmi nous des membres de l'*Institut*, étrangers à notre branche, ainsi que des personnages de marque dans la vie publique. Toutes nos réunions ont assemblé la presque totalité des membres de notre Branche, et la presse a toujours eu l'amabilité de donner de très bons comptes rendus de nos travaux.

Toutes les questions soumises par le Conseil Général à la Section de Québec ont été étudiées, discutées et transigées.

Notre Section a suivi avec intérêt, les travaux de l'*Institut* et a prêté son plein concours à toutes les questions ayant pour but de protéger et de promouvoir les intérêts de l'*Institut* et de ses membres.

Notre Comité Spécial s'est occupé de surveiller, de faire une étude sérieuse et de faire un rapport aussi complet que possible sur toutes les demandes d'admission qui ont été référées à notre Branche, et les recommandations nécessaires ont été faites au Conseil Général de l'*Institut* qui a bien voulu en tenir compte.

Causeries

Les causeries suivantes ont été faites à nos différents déjeuners et assemblées du soir:

"**Améliorations sur la division du Saguenay, C.N.R., depuis quatre ans,**" par L. C. Dupuis, A.M.E.I.C.

"**La question économique,**" par J. E. Grégoire, Avocat, Professeur à l'Université Laval.

"Le génie civil et les sciences," par Sir George Garneau.

"La voirie dans notre province," par Alex. Fraser, A.M.E.I.C.

"Le béton dans la construction des rues et des grandes routes," par K. H. Talbot, gérant des ventes, compagnie Koehring de Milwaukee, Wis.

"L'école d'arpentage et de génie forestier, Université Laval," par J. P. P. Joncas, A.M.E.I.C.

"La commission des eaux courantes et les forces hydrauliques de la Côte Nord," par A. O. Bourbonnais.

"Compresseurs à air portatifs," par A. F. Hanly, A.M.E.I.C., de la compagnie Ingersoll-Rand Ltée, Montréal.

"Les minérais métallifères de Québec", par Théo. C. Denis, surintendant des mines de la province de Québec.

"Le code d'étiquette professionnelle."

État financier de l'année 1924

Recettes

Caisse au 1er janvier 1924	$102.07	
Intérêt sur compte de banque	0.99	
Remises du Bureau Chef:—		
Cotisations des membres	150.72	
Annonces pour *Journal*	3.61	
Rabais dû, du Bureau-Chef	13.80	
		$271.19

Dépenses

Impressions, timbres, etc	$ 45.81	
Dépenses pour assemblées	45.65	
Divers	128.00	219.46
Solde au 1er janvier 1925		37.93
Rabais dû, du Bureau-Chef		13.80
		$271.19

Respectueusement soumis,

A. R. DÉCARY, M.E.I.C., *Président.*

LOUIS BEAUDRY, S.E.I.C., *Secrétaire-Trésorier.*

Quebec Branch

The President and Council,

The executive of the Quebec Branch begs to present the following annual report on the work of said branch during the year 1924:—

Membership

	Branch Residents	*Branch Non-Residents*	*Total*
Members	17	9	26
Associate Members	58	38	96
Juniors	10	8	18
Students	17	19	36
Affiliates	3	..	3
Total membership			179

Annual Meeting

The annual meeting of the Quebec Branch was held on April 30th, 1924, under the chairmanship of A. R. Décary, M.E.I.C., The following officers were elected for the year 1924:

Chairman	A. R. Décary, M.E.I.C.
Vice-Chairman	A. B. Normandin, A.M.E.I.C.
Secretary	J. Eug. Roy, A.M.E.I.C.
Executive	J. P. P. Joncas, A.M.E.I.C. S. L. deCarteret, A.M.E.I.C. T. E. Rousseau, A.M.E.I.C. Hector Cimon, A.M.E.I.C. J. E. Gibault, A.M.E.I.C.

Meetings

The executive of the Quebec Branch has held its meetings regularly during the year 1924.

The monthly luncheons and evening meetings of the branch were held regularly at the Chateau Frontenac and at the City Hall from the month of November 1923 to the month of May 1924.

It has been our pleasure to have frequent opportunities of welcoming outside members of our *Institute* and also prominent men in public life at our different luncheons and evening meetings. All our meetings did gather together practically the full membership of the branch, and a very good publicity of the activities of the branch was given through the press.

All questions submitted by the Council of *The Institute* have been studied, discussed and transacted.

Our branch has followed with interest *The Institute* deliberations and has devoted its full energy to all matters aiming to the protection and promotion of the interest of *The Institute* and its members.

Our special committee has followed closely, studied seriously and made as complete report as possible on all applications for membership which have been referred to this branch, and the necessary recommendations have been made to the Council of *The Institute* who has kindly taken them into consideration.

Addresses

The following addresses were made at our different luncheons and evening meetings:

"Improvements on the Saguenay Division, C.N.R., since Four Years," by L. C. Dupuis, A.M.E.I.C.

"Economics," by J. E. Grégoire, barrister and professor at Laval University.

"Civil Engineering and Sciences," by Sir George Garneau.

"Highways in the Province of Quebec," by Alex. Fraser, A.M.E.I.C.

"Concrete in Street and Highway Construction," by K. H. Talbot, sales manager, Koehring Company of Milwaukee, Wis.

"Land Surveying and Forestry Engineering School of Laval University," by J. P. P. Joncas, A.M.E.I.C.

"Quebec Streams' Commission and Hydraulic Powers of the North Shore," by A. O. Bourbonnais.

"Portable Air Compressors," by A. F. Hanly, A.M.E.I.C., of the Canadian Ingersoll-Rand Co. Ltd. Montreal.

"Metallic Ores of Quebec," by Théo. C. Denis, superintendent of mines for the province of Quebec.

"The Code of Ethics."

Financial Statement

For the year 1924.

Revenue.

Cash in bank, Jan. 1st, 1924	$102.07	
Bank interest	0.99	
Rebates from headquarters:—		
Members' fees	150.72	
Advertising	3.61	
Rebates due from headquarters	13.80	
		$271.19

Expenditures

Printing, stamps, etc	$ 45.81	
Expenses of meetings,	45.65	
Miscellaneous	128.00	
		$219.46
Balance on hand, January 1st, 1925	$ 37.93	
Amounts receivable, rebates due from headquarters.	13.80	
		$271.19

Respectfully submitted,

A. R. DÉCARY, M.E.I.C., *Chairman.*

LOUIS BEAUDRY, S.E.I.C., *Secretary-Treasurer.*

Saguenay Branch

The President and Council,

The Saguenay Branch has just ended its first complete calendar year and feels most optimistic as to the future success of its activities.

Meetings

The branch had the pleasure of hearing at various times Messrs. O. O. Lefebvre, M.E.I.C., chief engineer, Quebec Streams' Commission; Theo. J. Lafrenière, M.E.I.C., chief sanitary engineer, Provincial Board of Health; H. S. Van Scoyoc, M.E.I.C., publicity manager, Canada Cement; G. E. LaMothe, A.M.E.I.C., Forestry Department, Price Brothers, and G. B. Snow, A.M.E.I.C., on various subjects of interest to the engineering profession. There were also two moving pictures and two excursions or outings, these latter being described below.

During the fall of 1923 these seemed to be a very manifest interest in the various lectures arranged by the branch, but after January 1924 owing to the very difficult and often impossible state of the winter roads the lectures were poorly attended, those coming from any distance being rarely in evidence.

Hence, at the annual meeting it was decided that the branch would confine its activities to those months of the year when transportation facilities were such as to permit of an easy attendance at lectures, etc. Thus this winter no effort has been made to constitute a regular programme,—this being reserved for the coming spring and summer.

The branch held during last summer two very interesting excursions, the first, (coinciding with the annual meeting), being held on June 6th, to La Grande Décharge, Lake St. John where the members were the guests of the Quebec Development Company and were provided with an exceptional opportunity of visiting the extensive hydro-electric development there.

Later in the season the members were the guests of the Quebec Streams' Commission in a visit to the most important dams in the Lake Kenogami reservoir project. The success at both excursions was such hatt it is intended to organize several more next summer.

Officers

At the annual meeting held at Grande Décharge the results of the elections were given out; the Executive now being made up as follows:—

Chairman	W. G. Mitchell, M.E.I.C.
Vice-Chairman	H. G. Cochrane, A.M.E.I.C.
Secretary-Treasurer	Burroughs Pelletier, A.M.E.I.C.
Executive Committee	H. V. Bignell, A.M.E.I.C. (1 year). G. E. LaMothe, A.M.E.I.C. (1 year). E. Lavoie, M.E.I.C. (2 years). J. E. A. McConville, A.M.E.I.C., (2 years). C. N. Shanly, M.E.I.C., *(ex-officio)*.

Membership

The membership of the branch is increasing steadily and actually is as follows:

Members	3
Associate Members	31
Juniors	9
Students	16
Total	59

Financial Statement

As at January 1st, 1925.

Receipts		
Balance on hand Dec. 31st, 1923	$ 86.38	
Remittance from headquarters (May)	39.00	
Remittance from headquarters (Oct.)	21.95	
Remittance from headquarters (Dec.)	11.55	
Rebates from headquarters to Dec. 31st	1.20	
Total receipts	$160.08	
Disbursements		
Expenses re lectures and moving pictures:—		
Mr. O. O. Lefebvre's	$ 8.02	
Mr. H. S. Van Scoyoc's	8.50	
Mr. T. Lafrenière's	6.30	
Mr. G. E. LaMothe's	1.85	
Mr. G. B. Snow's	8.10	
Moving picture	1.85	
Expenses re excursions:—		
To St. Joseph d'Alma, (annual meeting)	49.16	
To Lake Kenogami Reservoir	11.81	
Expenses re annual elections	4.84	
Postage and stationery	6.30	
Total disbursements	$106.73	
Balance on hand	$ 53.35	
		$160.08

Respectfully submitted,

H. G. Cochrane, A.M.E.I.C., *Vice-Chairman.*
Burroughs Pelletier, A.M.E.I.C., *Secretary-Treasurer.*

Saskatchewan Branch

The President and Council,

On behalf of the branch executive, we beg to submit the following report covering the activities and condition of the Saskatchewan Branch during the year 1924. As the branch year does not end until February 28th, this report is really supplemental to the annual report which will be issued later.

The activities and interests of the branch are probably very well reflected in the list of papers and addresses presented at branch meetings. A glance at this list will reveal that we both started and finished the year with a discussion of the Hudson Bay Railway and Route. The fact is none the less significant for being accidental and interest is by no means confined to the engineering profession.

Meetings

The annual meeting in March saw the retirement of our very efficient and genial secretary-treasurer Mr. McCannel, a retirement made necessary by the pressure of his many other duties. The other branch officers come and go with annual precision but a secretary-treasurer of Mr. McCannel's qualities lives long in the memory of the branch.

During the year we were twice favoured with official visitors from *Institute* headquarters, visits which have done much to broaden our viewpoint and rekindle our enthusiasm and loyalty to both the profession and *The Institute*. In April we were glad to welcome Secretary Keith with his infectious optimism and broad knowledge of engineering affairs throughout the Dominion. In October the branch charter was officially presented by Major Geo. A. Walkem, M.E.I.C., the vice-president for this zone. This event is of outstanding importance in the annals of the branch and the personal contact with Major Walkem was stimulating and helpful to those who met and heard him.

The annual summer meeting of the branch was held in Saskatoon on August 22nd, and was arranged to coincide with the visit of the British Association for the Advancement of Science. The professional meeting was well attended and was addressed by Dr. Geo. Howe of Glasgow University and by Sir Charles Parsons of steam turbine fame. The success and enjoyment of the day is largely due to the efforts of the Saskatoon members and the kindness and generosity of the university and the city.

The wish is often expressed that members living outside Regina could enjoy a more active participation in the meetings and affairs of the branch. Any suggestion to this end would be welcomed by the executive. The joint meeting with Saskatoon by means of long distance telephone was a step in this direction and has earned for the Department of Telephones the appreciation of the branch.

The matter of engineering legislation is being placed before the provincial government this year. It is yet too soon to say whether our hopes will be realized.

During the year seven executive meetings have been held and fourteen regular and Special Meetings. The meetings have all been preceded by a dinner and held in the dining room at the Parliament Buildings where the accommodation is very comfortable. In the winter months the attendance is good but suffers somewhat in the fall and spring when field work is under way. How well the branch has been provided for by the Papers and Library Committee and by the Entertainment Committee will be seen from the following list of meetings and papers:

Jan. 15—**"The Hudson Bay Route,"** J. A. Campbell, commissioner Northern Manitoba.

Jan. 23—**"Efficient Coal Burning in Steam Boiler Furnaces,"** E. W. Bull, superintendent light and power, Regina.
"History and Development of Automatic Telephone," W. L. Campkin, Jr. E.I.C., Department of Telephones, Regina.
"Refinery Engineering," E. A. Duschak, A.M.E.I.C., chief engineer, Imperial Oil Co., Regina.
"Chainage Measurements," D. A. Smith, A.M.E.I.C., of Smith & Phillips, engineers and surveyors.

Feb. 14—**"Advantages of Generation and Distribution of Electrical Energy direct from Coal Fields,"** J. B. Hamilton, A.M.E.I.C., superintendent of utilities, Estevan.

Feb. 28—Joint meeting held simultaneously at Saskatoon and Regina with aid of long distance telephone apparatus. Address delivered in Saskatoon by Prof. G. M. Williams, A.M.E.I.C., subject **"Research and Progress in Engineering."** Discussion and conversations carried on from each end and heard at the other.

Mar. 7—Annual meeting.—Popular entertainment: Reports of committees, address by retiring Chairman, Lieut.-Col. A. C. Garner, M.E.I.C.; election of officers; address of newly-elected Chairman Prof. C. J. Mackenzie, M.E.I.C., on **"Student Activities and Engineering Education".**

April 5—Social meeting at home of L. A. Thornton, M.E.I.C., on occasion of Secretary Keith's visit.

April 10—**"Highways,"** H. R. Mackenzie, A.M.E.I.C., chief field engineer, Department of Highways, Regina.

April 24—**"The Panama Canal,"** J. McD. Patton, A.M.E.I.C.
"Problems in Telephone Maintenance Engineering," T. Leach, Department of Telephones.
"Health Engineering," R. H. Murray, A.M.E.I.C., Department Public Health.

Aug. 22—Summer meeting at Saskatchewan University, Saskatoon. Held on the occasion of the visit of the British Association for Advancement of Science and opening of new chemistry building. Addressed by Dr. Howe, professor electrical engineering, University of Glasgow and by Sir Charles Parsons, the inventor of the steam turbine. The professional meeting was followed by a very fine social entertainment given by the university and the city of Saskatoon.

Oct. 9—**"Field Control of Concrete,"** Col. H. C. Boyden, of the Portland Cement Association.

Oct. 20—Presentation of Branch Charter by Major Geo. A. Walkem, M.E.I.C., Vancouver.

Nov. 13—Ladies' night. Dinner and theatre party.

Nov. 27—**"Railway Maintenance,"** P. C. Perry, A.M.E.I.C., division engineer, Canadian National Railways, Regina.

Dec. 11—**"The Hudson Bay Railway,"** Lieut.-Col. A. C. Garner, M.E.I.C.

Financial Statement

March 1st to December 31st, 1924.

Revenue		
Bank balance March 1st, 1924	$ 2.37	
Branch dues	127.80	
Headquarters rebates Jan.-Oct.	159.45	
Sundry	25.24	
		$314.86
Expenditure		
Meetings	$ 34.37	
Stationery and notices, etc	82.44	
Sundry	36.65	
Scholarship	100.00	
Bank balance	61.40	
		$314.86
Assets		
Cash in bank	$ 61.40	
Outstanding branch dues	168.00	
Headquarters rebates Nov. and Dec. per headquarters' telegram	34.63	
Outstanding headquarters rebates	180.27	
Furniture, library	50.00	
		$494.30

Liabilities

Dues paid in advance	$ 35.00	
Accounts payable	150.00	
Surplus	309.30	
		$494.30

Respectfully submitted,

R. N. Blackburn, M.E.I.C., *Vice-Chairman.*
J. W. D. Farrell, A.M.E.I.C., *Secretary-Treasurer.*

Sault Ste. Marie Branch

The President and Council,

Although in point of numerical increase and attendance at meetings the year was not an exceptionally good one, yet in spite of the depressed conditions at the Sault, and the consequent smaller than usual number of engineers at the headquarters of the branch, the work was fairly well maintained.

The difficulty of rendering the assistance that we would like to the branch district members has been felt by the executive of the branch, but in spite of a circular letter from the chairman of the branch there has been little discovered yet that can be done as contacts with the members at a distance are lacking.

Meetings

The principal activity of the branch is the monthly meeting, held on the last Friday of each month except June, July and August. The meetings were attended by an average of fourteen. The custom of having a dinner before the meeting was continued. The Papers and Publicity Committee was very active and provided much good material which was listened to with much profit by our members. The addresses and papers were as follows:

Jan. 25—**"Storage of Coal,"** by Wm. Seymour, M.E.I.C.
Feb. 29—**"Radio,"** by Jas. Donnelly.
Mar. 28—**"The Occurrence, Characteristics and Commercial Importance of Iron Ore Bodies in Algoma,"** by G. W. McLeod.
Apr. 25—**"City Government by City Manager and Commission,"** by Hy. Sherman, city manager, Sault Ste. Marie, Mich.
May 30—**"Tar and its Derivatives,"** by J. Hayes Jenkinson, A.M.E.I.C.
Sept. 26—**"The Proposed St. Lawrence Power Development,"** by J. W. LeB. Ross, M.E.I.C.
Oct. 31—**"Public Utilities,"** by A. E. Pickering, M.E.I.C.
Nov. 28—**"Work of the Weather Bureau,"** by A. G. Burns, of Sault Ste. Marie, Mich.
Dec. 19—**"Work of the Ontario Branch, Air Service,"** by Capt. Maloney.

In addition to these meetings we had a meeting at the new Technical School at Sault Ste. Marie, and heard of the work done there and inspected the building. On October 16th, the branch charter was presented by Major Geo. A. Walkem, M.E.I.C., vice-president of *The Institute.*

Membership

The present membership of the branch is:

	Branch Residents	*Branch Non-Residents*	*Total*
Members	10	14	24
Associate Members	15	45	60
Juniors	5	5	10
Students	7	22	29
Affiliate	1	..	1
Branch Affiliates	6	..	6
Totals	44	86	130

Financial Statement

Receipts

Balance from 1923	$ 82.59	
Income from headquarters rebates	178.05	
Commissions from advertising (for 1924 and 1925)	96.00	
Branch news	10.04	
Fees Affiliates	15.00	
Dinners paid	60.52	
		$442.20

Expenditures

Postage and post cards	$ 18.29	
Printing notices, etc	21.25	
Stenographer	3.00	
Cartage and livery	2.50	
Journal subscriptions	6.09	
Gratuities	4.50	
Dinners (except Oct. 16)	62.00	
Presentation of charter	49.00	
Cigars and cigarettes	23.70	
Telegrams	3.01	
Sundry	14.94	
Balance forward	233.92	
		$442.20

Respectfully submitted,

William S. Wilson, A.M.E.I.C., *Secretary-Treasurer.*

St. John Branch

The President and Council,

This is the seventh annual report of the St. John Branch of *The Engineering Institute of Canada*, for the year ending December 31st, 1924.

The executive has conducted the business of the branch during 1924 by assembling twelve times. The members of the branch have held seven meetings in St. John, at which addresses were delivered, in addition to a joint dinner with the Association of Professional Engineers of the Province of New Brunswick, in January, a dinner at the annual meeting of the branch in May, and a dinner to a member leaving the branch in June.

In March the branch met jointly with the Engineering Society of the University of New Brunswick at Fredericton. It is proposed to repeat this trip during 1925.

Officers of *The Institute* who have visited this branch during the year have included F. A. Bowman, M.E.I.C., of Halifax, vice-president, on two occasions, and Fraser S. Keith, M.E.I.C., of Montreal, general secretary, in November last. In March, Mr. Bowman was one of the speakers at the meeting in Fredericton, and in November at St. John presented the charter to the branch. Mr. Keith spoke at Fredericton and also at St. John on Wembley and the World Power Conference.

During the year this branch has been honoured by addresses from members of other branches and our own members have in turn given papers before neighbouring branches to the mutual advantage of all.

During the year we have been pleased to have Institute members from other branches attend our meetings and luncheons. This branch welcomes the transient engineer to St. John and the activities of this branch, and believes that herein is presented another opportunity of enlarging the fraternal spirit among *Institute* members.

All branch committees continue to function. The addresses delivered before the branch have all been of a high order. The members maintain good interest in branch meetings, and all meetings are open to the public.

Membership

This branch includes all *Institute* members living in the nine western counties of New Brunswick. A statement of membership as on December 31st, 1924, follows:—

Grade	*Branch Residents*	*Branch Non-residents*	*Total*
Members	15	10	25
Associate Members	26	12	38
Juniors	13	8	21
Students	6	1	7
Affiliates	2	—	2
Branch Affiliates	3	—	3
Total	65	31	96

Total at end 1924, 96; total at end of 1923, 91; net gain, 5. Applications for admission pending, 3.

Financial Statement

Year ending December 31st, 1924.

Receipts

Balance in bank Dec. 31st, 1923	$125.38	
Rebates of members' fees	162.50	
Branch news	54.40	
Branch Affiliates, dues and *Journal* subscriptions	18.00	
Sundries, one copy July *Journal*	1.00	
		$361.28

Expenses

Hall and meeting	$ 37.15	
Printing and stationery	53.00	
Branch Affiliates, *Journal* subscriptions	4.00	
Entertainment	56.75	
Sundries, 12 copies July *Journal*	12.00	
Outstanding disbursements, May 4th, 1923 — April 28th, 1924	116.28	
	$279.18	
Balance in bank Dec. 31st, 1924	82.10	
		$361.28

Assets

Balance in bank Dec. 31st, 1924	$ 82.10	
Rebates of members' fees outstanding	29.40	
		$111.50

Liabilities

Outstanding accounts	$ 52.26	
Surplus on Dec. 31st, 1924	59.24	
		$111.50

Respectfully submitted,

G. G. Hare, M.E.I.C., *Chairman.*
W. J. Johnston, A.M.E.I.C., *Secretary-Treasurer.*

Toronto Branch

The President and Council,

On behalf of the Executive Committee we beg to submit herewith the annual report of the activities of the Toronto Branch for the calendar year 1924. Our year extends from March elections to the following March, so that part of the calendar year is under one executive and the balance under the succeeding executive.

The executive for the calendar year 1924:—

January to March, 1924		*March to December, 1924*
C. R. Young, M.E.I.C.	Chairman	J. M. Oxley, M.E.I.C.
J. M. Oxley, M.E.I.C.	Vice-Ch.	N. D. Wilson, A.M.E.I.C.
J. A. Knight, A.M.E.I.C.	Sec.-Treas	J. H. Curzon, A.M.E.I.C.
Peter Gillespie, M.E.I.C.	Executive	R. W. Angus, M.E.I.C.
T. R. Loudon, M.E.I.C.		H. K. Wickstead, M.E.I.C.
J. G. R. Wainwright, A.M.E.I.C.		E. T. J. Brandon, A.M.E.I.C.
N. D. Wilson, A.M.E.I.C.		J. G. R. Wainwright, A.M.E.I.C.
R. C. Muir, M.E.I.C.		T. R. Loudon, M.E.I.C.
A. C. Oxley, A.M.E.I.C.		Peter Gillespie, M.E.I.C.
C. H. Mitchell, M.E.I.C.	*Ex-Officio.*	G. T. Clark, A.M.E.I.C.
R. O. Wynne-Roberts, M.E.I.C.		C. R. Young, M.E.I.C.
G. T. Clark, A.M.E.I.C.		E. G. Hewson, M.E.I.C.
Wm. Storrie, M.E.I.C.		J. A. Knight, A.M.E.I.C.

Committees

The Library Committee has made a catalogue of technical publications obtainable in Toronto at the various libraries.

The various committees and chairman are:

Finance	N. D. Wilson, A.M.E.I.C.
Publicity	J. A. Knight, A.M.E.I.C.
Programme	J. M. Oxley, M.E.I.C.
Student Relations	T. R. Loudon, M.E.I.C.
Reception	R. O. Wynne-Roberts, M.E.I.C.
Library	A. C. Oxley, A.M.E.I.C.
Fuel	M. J. Butler, M.E.I.C.
Professional Fees	Frank Barber, M.E.I.C.

Meetings

During the calendar year there were twelve executive meetings. Attendance at general meetings was not as good as might be expected for such a large branch membership. Possibly the farflung boundaries of the city had something to do with it, although the meeting-place is very central. Meetings were held in the Mining building of the University of Toronto as a rule.

Regular meetings and subjects for calendar year 1924 were as follows:

Jan. 10—"**The Public Health Machinery of Canada,**" by Dr. J. A. Amyot.

Jan. 17—"**Public Speaking for Engineers,**" by Professor W. H. Groves.

Jan. 24—"**Biography of Sir Sandford Fleming,**" by Professor Peter Gillespie, M.E.I.C.

Feb. 7—"**The Toronto Transportation Commission,**" by H. H. Couzens.

Feb. 14—Student Papers:—
- 1st. G. H. Rowat, S.E.I.C., — "**The Photo Clastic Method of Stress Determination**".
- 2nd. L. H. Burpee, S.E.I.C. — "**Power Development on the St. Maurice**".
- 3rd. H. A. McIntosh — "**Causes of Lack of Balancing in Automobile Engines**".
- 4th. S. Hardcastle, S.E.I.C.,— "**Concrete Plant Layout**".

Feb. 27—Joint meeting with A.S.M.E. — "**Research and Automobile Development,**" by C. F. Kettering.

Mar. 6—"**Northern Expeditions,**" by J. D. Craig, M.E.I.C.

Mar. 13—"**Insulation and Heating Possibilities in Buildings,**" by J. Govan.

Mar. 20—Branch annual meeting.

Oct. 16—"**The Centenary of Portland Cement,**" by J. M. Oxley, M.E.I.C.

Oct. 30—"**The Aeroplane in Forest Patrol, Surveying and Engineering,**" by Ellwood Wilson, M.E.I.C., also "**Aerial Surveys for Railway Location,**" by H. K. Wicksteed, M.E.I.C.

Nov. 6—"**The Resurrection of Europe,**" by Vincent Massey.

Nov. 13—"**Vertical Transportation,**" by A. G. McLaughlin.

Nov. 27—"**Standards,**" by R. J. Durley, M.E.I.C.

Dec. 11—"**Mexico and Its Volcanoes,**" by Professor A. P. Coleman.

Dec. 18—"**City Bridges,**" by Thomas Taylor, M.E.I.C.

Membership

The membership of the branch has decreased to some extent, no doubt due to members moving to territory under jurisdiction of other branches. The membership at December 31st, 1924 was:—

	Branch Residents	*Branch Non-residents*	*Total*
Members	139	4	143
Associate Members	263	16	279
Juniors	51	4	55
Students	134	14	148
Affiliates	5	—	5
Branch Affiliates	2	—	2
Total	594	38	632

Financial Statement

Owing to heavy expenditures at the beginning of the year, the balance on hand is not as great as that of 1923.

Revenue		
Cash on hand — January 1st, 1924	$1,098.56	
Rebates and Branch news	875.35	
Interest to December 31st, 1924	15.50	
Affiliate fees	10.00	
		$1,999.41
Expenditure		
Advertising and printing	$ 420.37	
Rent of room No. 22	84.00	
Secretary's honorarium	100.00	
Library Committee	119.50	
Stenographic services	42.40	
Insurance	21.15	
Postage, exchange and tax	21.50	
Student prizes	50.00	
Lectures — expenses	93.85	
Convention expenses	188.00	
General expenses	20.16	
Smoker expenses	61.25	
	$1,322.18	
Balance on hand	677.23	
		$1,999.41

Respectfully submitted,

J. Morrow Oxley, M.E.I.C., *Chairman.*
John H. Curzon, A.M.E.I.C., *Secretary-Treasurer.*

Vancouver Branch

The President and Council,

I have the honour to report on the affairs of the Vancouver Branch, for the year 1924, as follows:

General Meetings

The attendance at the general meetings of the branch averaged about 95, as compared with 25 for 1923 and 30 for 1922.

Five of these meetings were held on the following dates:

Feb. 19—"**The Greater Vancouver Water Problem,**" by Ernest A. Cleveland, M.E.I.C., comptroller of Water Rights, Victoria.

Special invitations were sent to the mayors, aldermen, reeves and councillors of the cities and municipalities of the Greater Vancouver group, and also to a number of prominent citizens. The attendance was 225 including visitors, which constitutes a record for this branch.

Mar. 26—"**Progress and Policy of The Institute,**" by Fraser S. Keith, M.E.I.C., general secretary of The Institute.
"**Water Resources in Canadian National Parks,**" by H. B. Muckleston, M.E.I.C.

Sept. 27—Inspection of municipal works in Point Grey.

On this occasion, the members of the party were the guests of the Reeve and Council.

Nov. 13—"**Grain Elevators and Grain Elevator Construction,**" (Illustrated with lantern slides), by E. F. Carter, M.E.I.C.

Dec. 18—Annual general meeting: Annual business and election of officers.
"**A Short Talk on Radio Communication,**" (Illustrated with lantern slides), by Herbert Vickers, M.E., M.Sc., Ph.D., head of Dept. of Mech. and Elec. Engineering, University of British Columbia.

Executive Committee

The Executive Committee held six meetings during the year. The resignation of T. W. Fairhurst, A.M.E.I.C., who removed to New York, U.S.A., shortly after his election to the executive, caused a vacancy for a committeeman, which was filled by L. F. Merrylees, A.M.E.I.C., on resolution of the executive at the meeting of January 10th.

General Review of 1924 Business

Institute Nominating Committee:

On January 10th, 1924, the Executive Committee appointed Wm. Smaill, M.E.I.C., to represent the Vancouver Branch on *The Institute* Nominating Committee during 1924. Mr. Smaill was reappointed for the year 1925 at the Executive meeting of December 10th.

Membership Committee:

The results of the activities of this committee comprising the whole executive, are apparent in the considerable increase in new members, especially among the students of the University of British Columbia. The membership in the student grade has increased from 23 to 40, which is a very encouraging factor in our year's work. The branch has gained also in corporate members, and several important additions are expected shortly as a further result of this year's efforts.

Branch Elections:

Fifty-two marked ballots were returned out of a total of 154 mailed to the membership of the branch for the 1925 elections. Last year, 50 ballots were returned out of 132. Considering that the actual cost of the letter ballot is over $10.00, besides the labour in addressing and mailing, the interest of the members is not very encouraging.

Quarters:

A sub-committee consisting of the chairman and secretary-treasurer, was appointed by the Executive Committee to co-operate with representatives from the other bodies interested in the joint quarters at 930 Birks Building, in a thorough search of the business district for more suitable quarters. It was decided, after considerable investigation, that no material advantages could be gained by moving into any other quarters than available, and that it would be advisable to leave the matter in abeyance for the present.

Library:

A sub-committee consisting of A. Lighthall, A.M.E.I.C., H. Idsardi, A.M.E.I.C., and F. W. Coffin, S.E.I.C., was asked to report on the Joint Library at 930 Birks Building, with a view to definite action by the branch, either in support of an improvement scheme or withdrawal from the library and disposal of our portion of the books.

(The report of this committee was read at the annual general meeting of the branch, December 18th, and referred by resolution to the incoming executive for definite recommendation at a future general meeting.)

Branch By-Laws:

The committee consisting of W. G. Swan, M.E.I.C., and the secretary-treasurer, appointed at the last annual general meeting to undertake the revision of the branch by-laws, has been unable to function because of the decision to await the adoption of a model set of branch by-laws by *The Institute* Council. An *Institute* committee has had this matter in hand, but up to September 10th, the date of the last advice on the matter from Mr. Keith, nothing definite had resulted.

Branch Charter:

The branch charter was received from headquarters in September and is now in possession of the executive. It is the wish of the Council that a formal presentation of the charter to the branch be made by Vice-President Geo. A. Walkem, M.E.I.C., on behalf of *The Institute.* Owing to Mr. Walkem's numerous engagements, it has not been possible to arrange a suitable occasion on which to have the presentation made, but it is expected that the new executive will have an opportunity early in the coming year, when the present session of the legislature closes.

It is a matter of considerable moment to *The Institute* and the engineering profession in general, and one in which the branch may justly take pride, that our western vice-president Major Geo. A. Walkem M.E.I.C., not only holds the office of reeve of the municipality of Point Grey, but also occupies a seat in the provincial legislature at Victoria for the Point Grey-Richmond riding.

Group Photograph of Messrs. Cambie, White & Kennedy:

At the request of the Victoria Branch, an enlargement, 16 by 20 inches, of the group photograph of Messrs. Cambie, White and Kennedy, published on page 84, of *The Engineering Journal,* February 1924, was presented to the Archives Department of the Provincial Library at Victoria, on November 11th, 1924. The inscription plate bears the title "Pioneer Railway Builders".

Students' Prizes

The Walter Moberly Memorial Prize:

Acting on the resolutions referring to the disposal of the Moberly Fund, passed at the last annual general meeting and the general meeting of March 26th, 1924, the Executive Committee sold the four one hundred dollar Canadian War Loan Bonds in which the principal was invested, and combining the proceeds with the interest accumulated in the savings bank, purchased one $500.00 City of Vancouver 5 per cent 1964, and one $100.00 Canadian Renewal 5 per cent 1943, having a total annual interest return of $30.00.

These bonds have been deposited for safe-keeping in the Hamilton Street branch of the Canadian Bank of Commerce. The officers of the bank have very kindly arranged to have the coupons clipped free of charge as they mature, and deposited to the credit of a special savings account. Through this very considerate attitude of the bank, the annual income will not be impaired in any way, and therefore may be devoted wholly to the object intended. The balance in the fund at the date of this report is $30.47.

The Board of Governors of the University of British Columbia has accepted the offer of a $25.00 annual book prize to be awarded for the best summer essay written by students in the graduation year of the Faculty of Applied Science. This prize will henceforth be known as "The Walter Moberly Memorial Prize," and the first award will be made during the present session, there being twelve competitors, — a very encouraging start.

The A. D. Swan Special Book Prize:

The $25.00 students' prize donated by A. D. Swan, M.E.I.C., in March 1921, but never awarded, was offered for the second time by the executive, to third year students in the Faculty of Applied Science of the University of British Columbia, for the best summer essay handed in during the present session. It was decided to make this also a book prize, called "The A. D. Swan Special Book Prize", for the reason that it stands for this session only. There have been eleven entries for this competition.

Cash Prize:

At the general meeting of the branch held on November 13th, a very noteworthy offer of a $50.00 cash prize was made by a visitor at the meeting, H. H. Broughton, M. Inst. M.E., to be awarded to the author of the best student's essay on "Handling of Bulk Cargo". This was supplemented by Mark R. Colby, another visitor, who offered an additional $25.00 in respect of the same competition. The Executive Committee has this matter in hand and will shortly announce the conditions of the competition.

Membership

Grade	*18th, Dec., 1924*	*19th, Dec., 1923*
Branch Residents:		
Members	61	55
Associate Members	87	75
Juniors	6	2
Students	40	23
Affiliates	nil	1
Total	194	156
Branch Non-Residents:		
Members	19	18
Associate Members	55	50
Juniors	10	10
Students	9	5
Affiliates	1	1
Total	94	84

Financial Statement

Receipts

Balance on hand at Dec., 19th, 1923	$167.87		
Less A. D. Swan donation	25.00		
		$142.87	
Rebates on fees, Sept., 1923 to Oct. 1924		381.60	
Branch news to Nov. 1924		18.22	
Rental of lantern		2.00	
Total			$544.69

Expenditures

Rent — 930 Birks bldg	$240.00
Rent — Board of Trade auditorium	20.00
Printing	20.15
Postage and revenue tax	15.17
Telegrams	3.84
Stationery, etc	2.00
Addressograph	4.24
Bank exchange	1.00
Honorarium to secretary	50.00
Library	5.18
Carbons for lantern	1.00
Entertaining, etc	6.50
Balance Dec., 18th, 1924	175.61
Total	$544.69

There are no outstanding accounts to be paid. The balance, $175.61, on hand at the date of this report, shows a gain of $32.74 since the beginning of the year; but it should be noted that the rebates on fees and branch news cover a period of fourteen months instead of twelve.

If the receipts be adjusted to a period of twelve months by deducting $46.05, the rebates for the last two months, the corresponding balance would be $129.06. Consequently we would have an operating deficit of $13.81 for the year instead of a surplus. The operating deficit for the year 1923 was $64.07 and for the year 1922 was $89.42.

The average monthly receipts from rebates on fees were approximately $21.00 during 1922, and the same during 1923, but increased to about $28.00 during the present year on account of the percentage now rebated to the branch on fees of branch district members. If however, we take the actual receipts for the ten months of the current year since the new rebates went into effect, the monthly average for 1924 becomes approximately $33.00. On this basis our estimated revenue from fees for the next 12 months would be about $400.00, to which should be added about $25.00 for branch news etc., making a total of $425.00.

The cost of operating the branch for the past two years has been approximately $370.00 per year, which figure may be regarded as a minimum for estimating normal expenditures under present conditions. I can see no reason why our expenses for the coming year should be materially increased, unless we undertake greater activities than during the past two years.

In any case, it is evident that our annual operating deficits should cease from now on, because of the increased revenue resulting from rebates on the fees of our district members, the growing membership of the branch, and the increase from 25 per cent to 30 per cent in the amount rebated on each fee. It should not be forgotten that our important minor sources of revenue are branch news and advertising in the *Journal*. The receipts from these sources will be in proportion to our efforts, and are well worth the attention of the incoming Executive Committee.

It should be noted that the theoretical revenue from rebates of fees for the year 1925 is about $540.00. We cannot hope to reach this figure because a proportion of our members each year allow their dues to run into arrears. If the reverse were true, the branch would be in a much improved position financially.

Under present conditions I believe that we may reasonably hope for an increase of at least $50.00 in our working balance at the end of the year 1925.

The assets of the branch in furniture and books have not yet been valued.

Respectfully submitted,

P. H. BUCHAN, A.M.E.I.C., *Secretary-Treasurer.*

Victoria Branch

The President and Council,

On behalf of the Executive Committee of the Victoria Branch, we beg to submit the following report covering the year ending Nov. 30th, 1924.

Meetings

The branch held regular monthly business meetings throughout the year, and to make these more interesting, and to give some practice in speaking, adopted the plan of having discussions on some previously announced subject of interest to engineers. Leaders in these discussions were named in advance and all present were expected to take some part in the discussion. The more important events of the year were as follows:—

1924

Jan. 19—Luncheon in honour of F. M. Preston, A.M.E.I.C., city engineer of Victoria, to congratulate him on the successful completion of the Johnson Street bridge.

Feb. 13—"Highways," by P. Philip, M.E.I.C.

Mar. 2—Visit to Dominion Astrophysical Observatory near Victoria and the 72-inch reflector which is the second largest telescope in the world, by courtesy of Dr. J. S. Plaskett, F.R.S., the director.

Mar. 12—"The Johnson Street Bridge," by F. M. Preston, A.M.E.I.C.

Mar. 26—"Movable Bridges," by E. E. Brydone-Jack, M.E.I.C.

April 12—Visit to Dominion drydock, under construction, at Esquimalt, conducted by Messrs. J.P. Forde, M.E.I.C., G. B. Mitchell, M.E.I.C., and W. A. Gourlay, B.A.Sc., Fraser S. Keith, M.E.I.C., general secretary, was with us on this visit, and Mr. Keith later addressed the members and their wives at a reception at the home of the branch chairman.

May 28—Discussion on "Highways as affected by Motor Cars, and Motor Cars as affected by various types of Highways," led by E. E. Brydone-Jack, M.E.I.C., and P. Philip, M.E.I.C.

June 1—Visit to H. M. S. Hood and Repulse of Special British Service Squadron.

Sept. 5—Luncheon in honour of H. M. Bigwood, A.M.E.I.C., on his leaving for Alberni.

Oct. 8—Discussion on "British Columbia Dams," led by E. Davis, M.E.I.C. and E. G. Marriott, A.M.E.I.C.

Oct. 18—Visit to Dominion Drydock, under construction, conducted by Messrs. J.P. Forde, M.E.I.C., W. A. Gourlay and G. B. Mitchell, M.E.I.C.

Nov. 5—Luncheon in honour of Geo. A. Walkem, M.L.A., M.E.I.C., vice-president of E.I.C. who presented the branch charter.

There was an average attendance of 48 at the above meetings.

Membership

The branch membership as at November 30th 1924, is as follows:—

	Branch Residents	*Branch Non-Residents*	*Total*
Members	34	5	39
Associate Members	37	4	41
Juniors	2	1	3
Students	3	0	3
Affiliates	1	0	1
	77	10	87

The increase over the 71 shown in last years report is due to the inclusion of all of Vancouver Island and the islands adjacent, in the branch territory.

Messrs E. E. Brydone-Jack, M.E.I.C., and P. Philip, M.E.I.C., of this branch were elected as president and vice-president respectively of the Association of Professional Engineers of British Columbia for 1924 and Mr. Philip is the newly-elected president for 1925. Mr. Philip was also recently appointed deputy minister of public works.

Committees

Executive Committee:

G. B. Mitchell, M.E.I.C. (Chair)	Patrick Philip, M.E.I.C.
F. C. Green, M.E.I.C., (ex officio)	M. P. Blair, M.E.I.C.
J. N. Anderson, A.M.E.I.C.	R. A. Bainbridge, M.E.I.C.
E. E. Brydone-Jack, M.E.I.C.	E. P. Girdwood, M.E.I.C.

At a meeting of the executive held on December 18th 1924, the following committees were appointed:—

Papers Committee: F. L. Macpherson, M.E.I.C., (Chair.); Patrick Philip, M.E.I.C., N. A. Yarrow, A.M.E.I.C.

Legislation Committee: All executive.

Applications Committee: All executive.

Town Planning Committee: E. A. Cleveland, M.E.I.C., (Chair.); W. S. Drewry, A.M.E.I.C., E. G. Marriott, A.M.E.I.C.

Social Committee: F. G. Aldous, A.M.E.I.C., E. G. Marriott, A.M.E.I.C., C. F. P. Faulkner, A.M.E.I.C.

Publicity Committee: C. F. P. Faulkner, A.M.E.I.C., J. N. Anderson, A.M.E.I.C., J. H. Blake, A.M.E.I.C.,R. F. Davy, A.M.E.I.C.

Attendance Committee: All executive.

Library and House Committee: E. P. Girdwood, M.E.I.C., C. F. P. Faulkner, A.M.E.I.C., C. J. S. Orton, A.M.E.I.C.

Financial Statement

The financial statement for the year ending November 30th, 1924 is as follows:—

Receipts

Balance in bank Dec. 1st, 1923	$ 38.89	
Cash on hand Dec. 1st, 1923	8.78	
		$ 47.67
Branch Fees from Dec. 1st, 1923 to Nov. 30th, 1924	129.00	
Rebates from headquarters	152.18	
Sundries	1.90	
		$283.08
		$330.75

Disbursements

Rent of room for year	90.00	
Printing notices	31.48	
Typing	6.75	
Exchange on cheques	.35	
Light account	3.91	
Insurance	5.45	
Stationery	14.60	
Postage and excise	31.85	
Membership Chamber of Commerce	25.00	
Honorarium	30.00	
Lectures and visits	36.14	
Magazines	7.41	
Janitor	1.50	
Office door plate	2.50	
Telegrams	6.37	
Telephone	1.65	
Maps of district	1.00	
Guests at dinner	2.00	
Overpaid dues, adjustment	.40	
Extension cord	2.35	
		$300.71
Balance in bank Nov. 30th, 1924	10.11	
Cash on hand Nov. 30th, 1924	19.93	
		$ 30.04
		$330.75

Respectfully submitted,

F. C. GREEN, M.E.I.C., *Chairman.*
E. P. GIRDWOOD, M.E.I.C., *Secretary-Treasurer.*

Winnipeg Branch

The President and Council,

On behalf of the Winnipeg Branch we beg to submit the following report for the year 1924.

Membership

The membership of the branch at this date is 293 and of the branch district 31, a total of 324, distributed as follows:—

	Branch	*Branch District*	*Total*
Members	47	3	50
Associate Members	159	21	180
Juniors	27	3	30
Students	29	4	33
Affiliates	5	—	5
Branch Affiliates	26	—	26
	293	31	324

Fifteen regular meetings were held during the year with an average attendance of 54. Excluding the smoking concert held on October 2nd, which was a joint affair with the Association of Professional Engineers, the average attendance was 45. The following is a detailed list of the regular meetings:—

Meetings

Date	*Subject*	*Speaker*	*Attendance*
Jan. 3	"The Constitution of Matter"	Rev. Father Morton	97
Feb. 7	"The Financing of Mining Enterprises"	Dr. R. C. Wallace	49
Feb. 21	"Radio"	J. M. F. Wilson, A.M.E.I.C.	21
Mar. 6	"The Corrosion of Metals"	Dr. J. W. Shipley	46
Mar. 20	"Forestry"	Col. Stevenson	28
April 3	Reports of Committees		33
April 17	"Electric Steam Generators"	L. G. De Kermor	97
May 1	Annual meeting		48
Sept. 18	"Construction of Reinforced Concrete Grain Elevators"	A. E. Macdonald, Jr.E.I.C.	23
Oct. 2	Smoking concert		175
Oct. 16	"Modern Flour Milling"	Theo. Kipp, M.E.I.C.	17
Nov. 6	"City Financing"	H. C. Thomson	53
Nov. 20	"Caterpillar Mounting under a Walking Dredge"	A. E. Hardy, S.E.I.C.	
	"Railway Maintenance — Relaying Track"	F. Robertson	36
Dec. 4	"Steam Standby Plant, City of Winnipeg"	D. S. Young, S.E.I.C.	
	"Mechanical Grain Car Unloaders"	W. J. Reekie, S.E.I.C.	36
Dec. 18	"Winnipeg River Watershed"	J. W. Sanger, A.M.E.I.C.	49

A branch golf competition was held on Southwood Course during the summer in which 28 members took part, the competition being won by S. S. Kennedy, A.M.E.I.C.

General

At a smoking concert held on October 2nd a very pleasant ceremony was held when the Branch Charter was presented by Major Walkem, M.E.I.C., vice-president for the zone, to H. A. Bowman, A.M.E.I.C., and C. A. Millican, A.M.E.I.C., on behalf of the branch. Both Mr. Bowman and Mr. Millican are Charter Members of the Winnipeg Branch.

The papers of November 20th, and December 4th, were given by Students of *The Institute* attending the university and were the papers which won prizes presented by the branch to the Engineering Faculty of the University.

The branch was visited at the meeting held on March 6th, by Fraser S. Keith, M.E.I.C., general secretary, who addressed the branch on *Institute* affairs. During the course of his address Mr. Keith was handed a telegram announcing the death of the president, Walter J. Francis, so that the loss was brought home in a peculiarly poignant manner to the branch.

Financial Statement

The following is the financial statement for the year.

Receipts

Main Society Dues	$ 10.00	
Local dues	469.00	
Rebates from headquarters	328.21	
Branch news	10.84	
Bank interest	33.77	
Bond interest	27.50	
Advertising	36.00	
Total receipts	915.32	
Bank balance, Dec. 31st, 1923	1,172.01	
Cash in hand and with secretary, Dec. 31st, 1923	36.00	
Over deposit	206.67	
		$2,330.00

Expenditures

Total expenditures	$1,044.81	
Bank balance Dec. 31st, 1924	1,253.44	
Cash in hand and with secretary Dec. 31st, 1924	31.75	
		$2,330.00

Assets

Cash balance	$1,285.19	
Rebates last quarter	38.60	
Local dues in arrears, 50 per cent written off	919.50	
Office furniture and library, 5 per cent depreciation	307.44	
War bonds	500.00	
		$3,050.73

Liabilities

Accounts payable		103.35
Surplus		$2,947.38

Respectfully submitted,

D. L. McLean, A.M.E.I.C., *Chairman.*
P. Burke-Gaffney, A.M.E.I.C., *Secretary-Treasurer.*

Building Construction Under Winter Conditions

C. D. Harrington,
Vice-President and Manager, Anglin-Norcross, Limited, Montreal.

Paper read before the Annual General and General Professional Meeting, Montreal, Thursday, January 29th, 1925.

For the purpose of this paper only certain trades common to the building industry will be dealt with, as I consider that outside of these trades the remaining ones require no very particular care and are not seriously affected by winter conditions.

The trades, therefore, under consideration will be as follows:—

A. — Excavation.
B. — Foundations, — preparation for.
C. — Concrete work, — plain and reinforced.
D. — Masonry work, (i. e.) brick, terra cotta, stone work.

and I will take these up in the above mentioned order.

Excavation

On small work where the volume of material to be removed is not large, and consequently, the equipment employed is light and depends on man's strength, the unit cost is of necessity considerably increased due to the ground being frozen to varying depths up to say five feet.

Over and above the pick and shovel, steel wedges and sledge hammers are of great assistance where the frost is not too deep. Where the frost is very deep drilling the frozen ground at intervals dependent on the nature of the material and using suitable explosives will be found to be very advantageous. If the blocks after shooting are large, they may be broken down with steel wedges and hammers or handled directly to the teams with a small derrick.

On large earth excavations where the employment of heavy mechanical equipment is warranted, the additional cost due to frost etc., is practically negligible. Where the frost is not heavy the shovel can handle same without assistance, but when the frost is heavy, the shovel must be assisted.

Under the latter condition, the following method for assisting the shovel has been found to be very inexpensive and most satisfactory: Drill holes by hand using hand hammers and pointed bars about 1½ inch in diameter, heating the pointed end of the bars to a red glow before starting; drill to about six inches from the bottom of the frost; load and shoot. The spacing of the holes, and the amount, and most suitable kind of explosive can readily be determined by trial, and the heating of the bars will be found to assist their progress greatly. No covering other than a mat should be necessary for shots of this kind.

For trenches and pier holes, etc., these can either be followed up immediately behind the shovel before the frost gets in, or the surface of the ground over the trenches and pier holes, etc., may be covered with a light covering of manure thereby keeping the frost out until the work is started.

If air is available, certain tools along the lines of a jack hammer combined with tools specially made to suit the conditions will be found to be of great assistance, particularly where the dig is shallow and entirely frozen.

In my opinion, rock work should be handled quite as advantageously in winter as in summer. True, excessive cold and snow will cause certain time to be lost but not more than will be lost by excessive heat and rain.

Hand drillers will do, if anything, more work in winter than in the summer. Steam drilling is not economical in winter, due to excessive fuel requirements, condensation trouble and freeze ups.

Air gives no trouble if properly cooled and dried before being admitted to the feed lines. This can be done by passing the warm moist air coming directly from the compressor through either two or three separate containers as may be found necessary, this will remove all moisture and, consequently, the drills receive only cold dry air.

The freezing of explosives should not be permitted, as when frozen, they are dangerous and uncertain. Keep them in a moderately heated place as far away from the actual work as possible. Double board walls filled with manure, and manure on the roof will keep frost out.

Certain rocks will shatter more readily in winter than in summer, which, of course, is an advantage.

Preparation for Foundations

Rigid inspection and the greatest constant care must be exercised at all times. Our enemies are ever present and can be found under the following headings:—

(1) *Filtration Plant* — Frost in the ground under footings, piers or slabs. It must be removed and not permitted to return.

(2) *School North End.* — Ice or snow on top of the ground, which, when covered with dirt, looks harmless. Find it and remove it.

(3) *Cotton Mill Milltown.* — Ice between banks and foundation walls where the backfilling has not been done at all or has not been properly done. Don't let it get there.

Neglecting these points may cause loss of life, serious damage, long delays and great monetary loss. Inspection, common sense, quick lime, manure, coarse salt, steam, picks and shovels are all the equipment required to beat them.

Concrete Work

In general, all concrete work is affected by cold more or less seriously, according to the temperatures and the bulk of concrete being poured.

It is safe to say that from the time the thermometer reaches 40° on down, great vigilance and care should be taken; unfortunately, the lack of recognition of this fact has left a serious trail of disaster as a record.

In pouring concrete in temperatures from 40° down, all stone, sand and water must be heated, and for certain classes of heavier work, this precaution, with the addition of top covering, will suffice. If, however, the work is light and the temperatures low, the top covering should be materially increased. As a guide on walls 16 inches thick and over, the wall forms with top covering is sufficient, lighter walls should have external heat or additional side covering in low temperatures, this also applies to piers. Floors on earth must have top covering to keep the frost out of the ground.

Coming to what might be termed structural concrete, such as columns, beams, floor slabs, where the individual members are comparatively small and the slabs comparatively thin, we are faced with a more serious problem, for it is essential to entirely close in this work and apply artificial heat.

In reasonable temperatures, canvas, sacking, or tar paper, will suffice for top covering, but in lower temperatures, hay, straw, manure, sawdust, etc. are required.

A steam line direct from the boiler to the water tank of the mixer will give hot water in sufficient quantities at all times. On small work, a corrugated sheet steel pipe of 20-inch diameter or over, having a wood fire inside and both ends open, if placed under a pile of sand or stone, will heat same readily.

On larger work, where large stock piles must be maintained, perforated steam coils, carried on planks on the ground, with the perforations down, will be found to be very effective, and in addition, the piles should be covered with tarpaulins or canvas.

The closing in of reinforced concrete structures can be done in numerous ways, a complete separate housing, boarding on the vertical shores carrying the spandrel beams, tarpaulins, etc. The method adopted will depend on location, as costs vary greatly. The forms having been erected, the entire floor housed in and the steel laid heat must be applied. This can be very efficiently done by the use of salamanders and coke; the salamanders, about one to every 100 square feet, being placed about half way between floor and ceiling. After the slab is poured, these fires should be maintained for at least 48 hours, when they can be withdrawn and moved to the next floor, with this method, no top covering of the slab is required.

Winter work requires one additional set more shores than summer work, as it is not safe to put the load on as fast.

Before placing any concrete in column forms, all bottoms must be thoroughly steamed out to remove any ice which may have formed, and a handful or two of salt will prevent any ice from re-forming.

All beams and slabs, where any snow or ice has accumulated, should be thoroughly steamed off. All reinforcing steel or structural steel must be inspected carefully to see that no ice coating is present. The heated concrete should be placed as rapidly as possible, after it leaves the mixer, a concrete bucket, hopper and buggies although slower than shooting, are more economical in winter weather.

After a day's pour, all horizontal and vertical joints should be very carefully inspected and signs of ice or leaks through bulk heads thoroughly removed before starting up again. All laitance should be removed from column heads as ice often looks like laitance.

In winter, shores should be left in for at least one day per foot of span and careful records should be kept of dates of pouring, so that the stripping dates can be accurately determined.

I do not recommend any of the anti-freeze materials that are on sale for severe climates such as we have here.

If the weather looks doubtful or snow is expected and the reinforcing steel for any particular piece of work is laid, it will be found economical to cover it with tarpaulins, as it is far cheaper to lift the snow off on the tarpaulins than to attempt to broom it off or steam it off.

Concrete frozen solid and then allowed to thaw and set continuously is good, but concrete subjected to repeated short intervals of thawing and freezing is useless.

Laying cement finish monolithic with the slab in winter is very expensive and not satisfactory as a rule. It is better to lay a thicker finish at a later date thereby overcoming possible difficulties of bonding.

Loose ice and frozen lumps of sand must be guarded against carefully.

Masonry

As a general rule, all sand and water used in mortar should be heated. If say ten per cent slaked hot lime be added, it will be found to be of great assistance.

When setting cut stone wet or damp, mortar will be found to be unsatisfactory and not practical. The best method is to mix the mortar absolutely dry using finely screened materials. Lay a full even bed of this dry mortar and work the stone to be set to its proper place, inserting small wooden wedges in the face joints to prevent any twisting or slipping when this dry mortar eventually sets up. With the aid of a trowel, these dry joints can be packed absolutely full.

Great care must be taken to see that all ice and snow is removed from all bricks, terra cotta or stone before laying or setting commences. All brick, stone or terra cotta should be absolutely dry, and heating brick and terra cotta before setting will be found to be beneficial. Never attempt to grout masonry work of any kind with wet grout in winter, as it will expand with frost and throw your work out of line. With the use of good cement mortar no other protection is necessary other than a top covering of boards or canvas which will keep snow off. All work must be carefully inspected every morning before starting up to be sure that no ice has formed on top of the previous day's work, if so, a little coarse salt will remove it. Lime mortar, as a rule, deteriorates rapidly in climates like ours, and should not be used on exterior work.

Towards spring, when there is frost at night and a fairly strong sun during the day, walls will often twist badly, and if noticed at once, they can easily be straightened by the use of a straight edge and a fairly heavy hammer.

Breeze blocks should never be used in winter without first having been subjected to rigid inspection as a breeze block taken right out of the mould and allowed to freeze solid looks and acts exactly like a properly cured block.

The advantage of dry bricks will be very apparent towards spring, because a wet frozen brick laid in the sun begins to thaw and the additional moisture added to the mortar makes it almost impossible to keep the wall plumb and level, and it will also be found to greatly limit the height of work that can be laid in a day.

It will always be found economical to protect masons on the scaffold from the wind and cold, as far as possible. Tarpaulins make excellent wind shields and salamanders here and there along the scaffold help greatly. For protecting stock piles of brick, etc., against snow or sleet, tarpaulins or canvas will be found to be very useful.

Dry hot sand can be procured readily by placing the sand on large sheets of sheet metal supported on loose brick piers and placing a wood fire under the sheets.

The supplying of a well heated shed for all trades where the men can eat their mid-day meal in comfort usually pays dividends.

The surface of brickwork laid in winter usually, at a later date, becomes covered with a white hairy coating which I believe can be classed as salts of magnesia. This coating looks very badly but is not harmful. A mild solution of muriatic acid will remove this trouble temporarily, but the only final cure which will eventually take place will be found to be time and the elements. This condition seldom occurs during the summer months. No gypsum products are seriously affected by frost. Slab work of this nature can be poured without any protection and apparently is unharmed.

In concluding, I cannot see any real reason why construction work should let up on account of our winter. Any reputable contractor can, with care, close supervision and a very small additional expense, overcome all the difficulties presented, and in a great many cases owners will receive returns on their investments much more quickly.

Pouring Concrete in Zero Weather

Details of the construction of a large Hydro-Electric plant in Northern Quebec under severe winter conditions.

C. N. Shanly, M.E.I.C.
Construction Engineer, Price Bros. and Co. Limited, Kenogami, Que.

Paper read before The Annual General and General Professional Meeting, Montreal, Thursday, January 29th, 1925.

The tremendous increase in the amount of winter construction, which has been so marked in recent years, and the (as yet) unfortunate scarcity of published information dealing with the effects of low temperatures, both on costs and methods employed to combat them, have prompted the writer to set down such data as he has been able to gather from his experience, supplemented here and there by notes supplied by the courtesy of brother engineers who have been engaged on winter work. The data has been collected entirely on hydro-electric developments in the northern part of Quebec province, and deals almost exclusively with mass concrete.

Winter Conditions

Before going into the subject of winter concreting, it would not be out of place perhaps to consider, briefly, the conditions which low temperatures impose on winter work in general. In this connection, it may be taken as axiomatic that almost any construction which can be undertaken in summer can be as satisfactorily carried on during the winter months, provided the necessary precautions against frost are taken. Usually, these precautions will add both to the cost and the time of doing the work. On the other hand, there are some operations which are better adapted to winter than to summer conditions:

The factors against winter work are, briefly, as follows:

(1) — Winter conditions affect labour adversely, heavy clothing impedes movement, and severe weather necessitates that men be allowed to stop work frequently to warm themselves.

(2) — The hours of daylight are shorter, artificial lighting is more expensive and less satisfactory.

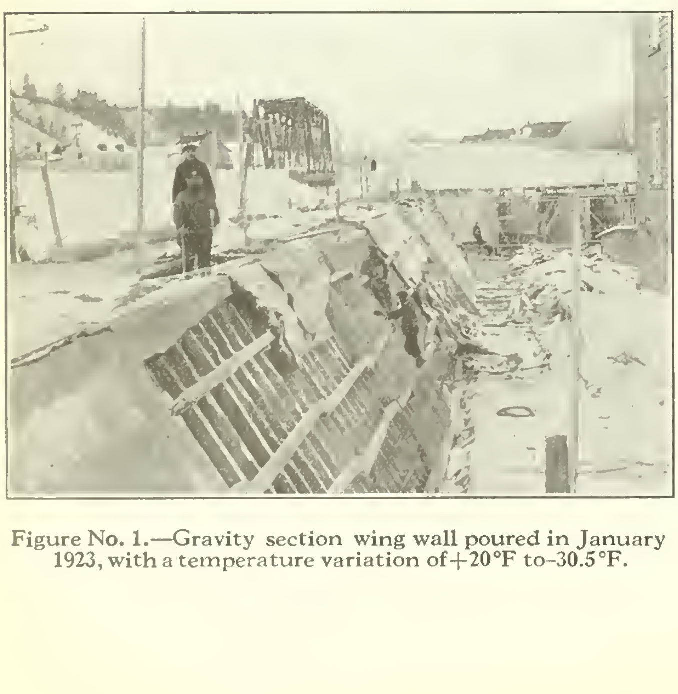


Figure No. 1.—Gravity section wing wall poured in January 1923, with a temperature variation of +20°F to -30.5°F.

(3) — The question of water supply must be given more serious consideration and all pipes, pumps, tanks, etc., protected from frost.

(4) — Hoisting engines, mixers and machinery generally must be more carefully housed, and steam pipes, valves and connections specially protected.

To offset these conditions, winter work offers the following advantages:

(1) — A much better selection of labour, and, hence, a smaller turnover, both made possible by the comparative inactivity in the construction industry.

(2) — At this season, low water prevails in rivers and lakes and, as the maximum discharge of an uncontrolled river may easily be a hundred or more times the minimum, this may greatly simplify the problem of unwatering. To take advantage of this, however, it will usually be necessary to complete the work to the "water line" before the spring floods.

(3) — Where the job is located some distance from a railway, particularly in undeveloped regions, it is not improbable that hauling costs may be reduced sixty (60%) per cent or more by doing the work in cold weather. On winter roads, distances, grades and surfaces may frequently be materially improved at little or no expense.

For a further discussion of winter conditions, the reader is referred to an article published in the *Engineering News-Record*, October 12th, 1922, page 600: "Lost time in Construction", by C. S. Hill.

Usual Method of Concreting in Winter

Concrete, in every way equal to the best summer product, may be poured under severe winter conditions provided the materials are heated before mixing, all ice and snow carefully removed from foundations and construction joints, and the green concrete protected. The

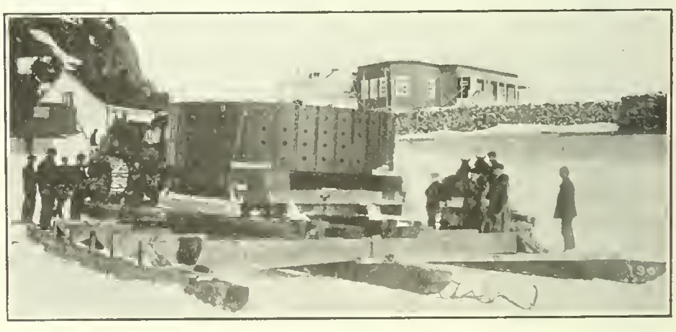


Figure No. 2.—Hauling generator parts on winter roads with tractor. The sleigh was designed to distribute the load while crossing some bad ice in the early spring.

methods employed will, of course, vary with the size and nature of the job, the method of doing the work and the severity of the weather. The usual practice to-day is to make stock piles of sand and gravel on top of a system of steam pipes. These pipes are usually one inch to one and one-half inches in diameter, and laid three or four feet apart. If these pipes have three-sixteenth inch holes drilled on twelve-inch centres, it will facilitate the work of shovellers, but these are not necessary where a "clam shell" is used. Where sand is handled by shovellers, it will probably be necessary in severe weather to heat the sand locally, by means of a flexible steam hose with a perforated nozzle, immediately before it is to be handled. The green concrete is covered with tarpaulins which should be sufficiently large not only to cover all exposed surfaces but to leave an air space around them. A steam pipe with an open end is inserted under the tarpaulins and allowed to remain there until about two hours after the concrete has taken its final set, unless another lift is to be poured before that. The water line is usually allowed to empty into an oil barrel at the mixer and is there heated by a steam jet operated by one of the mixer gang. Before pouring, the foundations and all construction joints are carefully gone over with a steam jet and all snow and ice removed.

Additional Methods Recommended

The method of heating just described requires that steam lines be laid to all parts of the job and that the location of these lines be changed frequently as the work progresses. Consequently, the tendency is to consider them as temporary, and they are frequently laid on top of the ground without any attempt being made to protect them either from radiation losses or damage. The writer is convinced that this is a mistake and that any reasonable expenditure on protection will prove a saving in the long run. The method advocated is to build "mains" to the various parts of the work. These mains to be buried in not less than one foot of earth or, where this is not practicable, to be covered with two feet of manure or loose earth and boxed in. Connections should be left on these "mains", at convenient points, from which short, temporary lines can be run from day to day as required. These connections should be housed and marked so that they can be easily located, even in deep snow. This will keep the length of exposed pipe at all times as short as practicable. Some definite member of the pipe-fitter gang should be made responsible for the daily inspection and repair of such exposed parts of the system. Failure of a steam line during concreting may easily cause the total loss of several hours pour and even necessitate the temporary shutting-down of the mixer.

Concrete may be placed either by buggies or chuting. The latter method is inferior unless kept up continuously

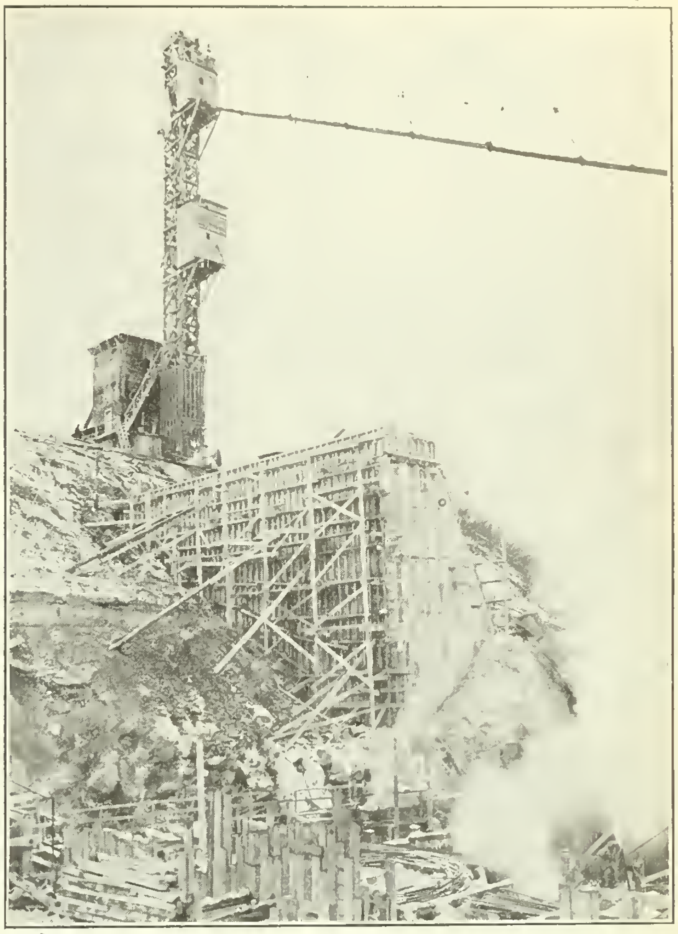


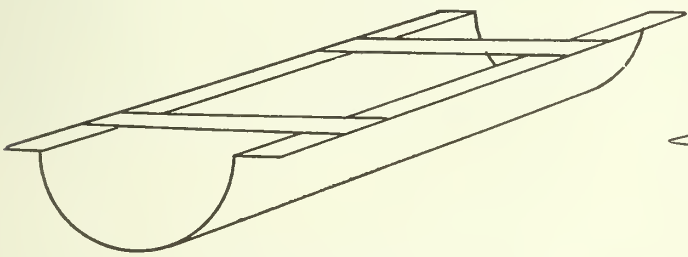
Figure No. 3.—Showing concreting tower and chutes and mixing plant housed for winter work.

as the chutes have to be cleaned after every shut-down and this is both a dangerous and expensive operation. A somewhat larger chute than that used in summer time and a curved cross strap instead of a flat one will be found decided improvements.

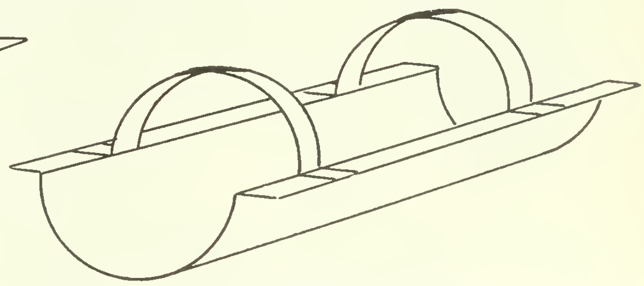
Effects of Frost on Concrete

There is, as yet, very little precise data on the effects of frost on concrete. The following interesting information was disclosed by experiments carried out at St. Joseph d'Alma last winter by the Quebec Development Company, and was furnished to the writer by H. G. Cochrane, A.M.E.I.C.:—

(1) — "Fresh concrete poured on top of concrete which has been frozen before setting, and is still in a frozen condition, makes a perfect bond."



(1) Present Chute.



(2) Suggested Chute.

Figure No. 4.

(2) — "In the case of test specimens subjected to "below zero" temperatures, those frozen before initial set takes place attain an average of 70 per cent of the strength of similar specimens cured under best conditions. Those frozen after initial set attain 80 per cent of strength of similar unfrozen specimens, and those frozen immediately after final set attain 95 per cent of strength of similar unfrozen specimens. It should be noted, however, that test specimens in cylinders lack hydrostatic pressure to re-consolidate them after the partially set particles of concrete are disrupted by the expansive force exerted by the freezing of the unabsorbed particles of water in the fluid or partially set concrete. In the case of a big mass, the superimposed concrete consolidates the previous pouring while the thawing process is going on, and the loss of strength is confined to the outside surfaces of the masonry block."

(3) — "Concrete subjected to a second freezing is seriously damaged."

(4) — "It was found that in many cases the unprotected portions of the concrete froze to a depth of from two to four inches over night, and to a depth of twelve inches over a period of two weeks." After covering with fresh concrete, the temperature in the frozen portion rose to 70° F. ± within a period of from twelve to twenty days, as also did the temperature of the fresh concrete immediately above the joint."

In an editorial of the *Engineering News-Record*, of April 3rd, 1924, page 555, entitled "A lesson in Cold Weather Concreting", it is stated that, "To have safe concrete the whole mix before dumping should be at least 60° in temperature". This article refers to comparatively thin reinforced sections and is no doubt sound practice for such work. The writer, however, knows of several cases where mass concrete has been placed in the forms at temperatures between 40° and 45° F. and, when suitably protected, has set up quite satisfactorily.

Cost of Heating Concrete in Winter

By costs of heating concrete are meant the additional cost of winter concreting over summer concreting. They should properly include not only the cost of protecting the concrete itself and heating the materials that go into it, but also the cost of cleaning mixers, chutes, buggies, tools, etc., and removing ice and snow from foundations and construction joints, as most of this work is done by steam. It is often difficult, if not impossible, on winter work, to distinguish between steam used for heating and steam used for power, as both are generally supplied from the same boilers. In the following figures an effort has been made to separate these two items.

During the winter of 1922-23, the writer was in charge of the construction of a dam and power house in the northern part of Quebec. Concreting was begun on the 18th of January, and carried out continuously, twenty-four hours a day, till April 27th, a period of exactly one hundred days. The temperatures during this time ranged from -30° F. to +70° F. The average was +14° F.; the average minimum was -0.5° F., and the average maximum +29.5° F. The greatest daily range was 62° F., the least, 5° F., and the average 28° F.

Between the above-mentioned dates, 25,309 cubic yards were poured at a cost, for heating, of $12,462.76, or approximately 50 cents a yard. These costs were made up as follows:—

Materials	$ 6,450.50	or	52 per cent
Labour	5,418.79	or	43 per cent
Overhead	593.47	or	5 per cent

The cost of coal delivered on the job, was $11.50 a ton, and the rate for common labour was 30 cents per hour.

Mr. G. B. Snow, A.M.E.I.C., reports the following conditions on the construction of a dam and power house for the town of Bagotville, built during the winter of 1923-24. The cost of heating concrete was $2.10 a cubic yard, for 2,200 cubic yards poured in a period of twenty-one days. During this time the lowest temperature recorded was -32° F. and the average +52° F. The cost of coal on the job was $16.00 a ton, and the wages of common labour 30 cents an hour. Mr. Snow, however, was unable to exclude all plant operation charges from this figure.

Address by President Arthur Surveyer, D.Eng., M.E.I.C.

Remarks Presented at the Annual Meeting after Election to the Presidency of the Engineering Institute of Canada, Tuesday, Jan. 27th, 1925.

Gentlemen:

In electing me to the office of president of *The Engineering Institute of Canada* you have conferred upon me the greatest honour which it was in your power to give and you have made me realize one of my greatest ambitions. In fact, what greater recompense can an engineer wish for than to receive the official recognition from his peers as indicated by his election to the presidency of *The Engineering Institute of Canada.*

It is a strange turn of the wheel of fortune which has led me to succeed in office the two men whom I have always regarded as my best friends in the profession.

Mr. Arthur St. Laurent, who was at the time of his death chief engineer of the Public Works Department, was my first chief after my graduation. I had the honour to serve under him for seven years and I can truthfully say that I owe to him the best of my engineering formation.

My relations with Mr. Francis began just as I was leaving the government service to open up an office in Montreal. I will never forget his cordial welcome to a newcomer nor the fact that during the thirteen years which followed the most cordial relations persisted between our two firms even when we were employed by opposing interests. It was Mr. Francis' enthusiasm for the Canadian Society of Civil Engineers which led me to take an active part in the affairs of *The Institute* and it is therefore to him that I owe the honour of having the privilege of addressing you to-day.

The Institute has had a very rapid growth in the last six years: the number of our members has increased from 3,000, in 1917 to over 5,000, in 1924. During this period our revenue has changed from $24,000 a year to over $80,000 a year and the number of our branches has augmented from 9 to 24 branches distributed all over the country.

You have noted in the report of the Finance Committee that our revenue has not quite kept pace with our expenditure, and that we are passing through what the psychologist would call the depressing period of the plateau. It will be one of the most important duties of the Council which you have just elected to devise ways and means to start us afresh in the upward slope of progress.

In looking to-day over the report of the various branches, I was very much impressed by the number of valuable papers which have been presented during the year, in all parts of Canada, and I could not help but revert to the old days when our contribution to the engineering literature was limited to the presentation of an occasional paper here in Montreal.

The creation of these branches has therefore led, not only to a greater solidarity amongst the members of the engineering profession, but it has also contributed to bring the public to a better realization of the variety and importance of the activities of the members of our *Institute.*

Another very important factor in the development of our Society was the founding of *The Engineering Journal.* This publication now comes to you every month containing not only the best technical articles on the questions of the day but giving you also the latest news concerning the activities of your fellow members and of the various branches. With *The Journal* we have become more human, we have developed an interest in our fellow engineers instead of concentrating on inanimate things and *The Institute* has benefitted by this evolution in our philosophy.

You have noted by the contents of the reports of our committees how during the past year the members of this *Institute* have again given evidence of their devotion to the public good by serving gratuitously on the *Institute's* Fuel Committee, the Dominion Fuel Board, the Committee on the Deterioration of Concrete in Alkali Soils, the Canadian Engineering Standards Committee and on the Canadian delegation to the World Power Conference. There is no doubt that the work of the members of *The Institute* on these committees has been very valuable to Canada and has also served to place the engineers in evidence, but I wonder, sometimes, if the fact of our devoting, without remuneration, so much of our time to the service of our country does not tend to cheapen the engineers in the eyes of our public men.

I could not close this brief review of last season's activities without referring more particularly to the Canadian participation at the World Power Conference held in London, last July. The members of *The Institute* submitted on this occasion a series of most meritorious papers which were published afterwards in a special number of *The Engineering Journal.* These sixteen studies constitute a magnificent exposé of the power situation in Canada and reflect great credit on their authors as well as on the whole *Institute.* But not only did our members contribute remarkable technical studies but fifteen of them also travelled to London in order to attend this conference and, by dividing up the work amongst themselves managed to take part in all the important discussions, thus adding, in every case, to their already excellent reputation. After the conference these men separated into two groups, one going to visit the power plants of Scandinavia and the other group travelling to France, Switzerland and Italy.

Where all have done so well it is difficult to single out anybody, but I think that I am only voicing the opinion of the delegates themselves when I say to you that Mr. Challies, our vice-president, and Mr. Keith, our secretary, deserve your special commendation for their work on this occasion. There is no doubt that the Canadian participation in the World Power Conference has led to a better realization, by foreign engineers, of the wealth of our power resources and also to a better appreciation, by them, of the competence and of the executive ability of our Canadian engineers.

THE

ENGINEERING JOURNAL

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The Headquarters Organization

The Council of *The Institute* is sorry to have to make the announcement that Mr. Fraser S. Keith, who has been Secretary of *The Institute* for the last eight years, has decided to resign the secretaryship, in order to accept a position as manager of the Department of Development of the Shawinigan Water & Power Company.

When Mr. Keith took the secretaryship, the Society was in a very difficult position and it is largely due to his energy and to his versatile ability that *The Institute* has been able to make such a remarkable showing during the last few years. The Council is pleased, however, to announce that Mr. Keith does not entirely sever his connection with *The Institute*, and that he will remain as Secretary to the Council in an advisory capacity in all matters pertaining to *The Institute* and more particularly in the questions affecting the *Journal*.

(Signed) ARTHUR SURVEYER,
President.

The Annual and Professional Meeting

The thirty-ninth annual general and general professional meeting of *The Institute*, the sessions of which occupied three days, January twenty-seventh, twenty-eighth and twenty-ninth, nineteen twenty-five, was held at the Windsor Hotel, Montreal, and will be remembered by all those members in attendance as one of the most interesting and enjoyable annual meetings of *The Institute*.

All those in attendance, particularly the visiting members from other branches, spoke very highly of the excellent programme and the carefully planned arrangements for the meeting, the details for which rested in the hands of the Annual Meeting Committee, composed of members of the Montreal Branch, who so unstintingly devoted their time and energy in making this meeting such an outstanding success.

The technical sessions, which included the reading of a number of papers and a lengthy discussion on the subject of engineering education on the first day of the professional meeting, and some interesting papers and discussions on winter construction at the joint session with the Association of Canadian Building and Construction Industries on the second day of the meeting, proved to be of the greatest interest.

In addition to these sessions, arrangements for the luncheons, the smoker and the dance left nothing to be desired by those who were able to attend these functions. As a fitting closing for the three days session, the members were given the opportunity of visiting a number of industrial and engineering works in the city. From the opening day to the final event on the programme, the meeting was one which was thoroughly enjoyed by all who were present.

Award of Institute Prizes

The reports of the various committees appointed to judge the papers eligible for the various prizes of *The Institute* were presented at the annual meeting and it is a pleasure to announce that in accordance with these reports the following prizes will be awarded:—

Gzowski Medal to D. W. McLachlan, M.E.I.C., for his paper, "The St. Lawrence River Problem", published in the March 1924 issue of *The Journal.*

Leonard Medal to W. L. Uglow for his paper, "The Undiscovered Mines of British Columbia", published in the October 1923 issue of the Bulletin of The Canadian Institute of Mining and Metallurgy.

Plummer Medal to Gordon Sproule, A.M.E.I.C., for his paper, "Metals in Engineering Service" published in the December 1923 issue of *The Journal.*

Students' Prizes to F. E. Hawker, S.E.I.C., for his paper, "Underground Electrical Conduits";

E. Gray Donald, S.E.I.C., for his paper, "Hydro-Electric Power Distribution";

H. Greenberg, S.E.I.C., for his paper, "Low Temperature Carbonization and Its Products";

H. M. Thompson, Jr.E.I.C., for his paper, "Mechanical Equipment used in Road Construction and Maintenance".

The Thirty-Ninth Annual Meeting

The annual general meeting of *The Institute* was held at the Windsor hotel, on Tuesday, January twenty-seventh, nineteen hundred and twenty-five. President Arthur Surveyer, D.Eng., M.E.I.C., opened the meeting at ten thirty a.m.

Reading of Minutes

It was moved by B. S. McKenzie, M.E.I.C., seconded by G. G. Murdoch, M.E.I.C., that the minutes of the thirty-eighth annual meeting as published on page eighty-five, in the February 1924 issue of *The Journal*, be taken as read and approved. Motion carried.

Appointment of Scrutineers

It was moved by Major C. M. McKergow, M.E.I.C., seconded by R. H. Mather, A.M.E.I.C., that Messrs. B. S. McKenzie, M.E.I.C., and W. D. Lawrence, M.E.I.C., be appointed scrutineers to report the result of the ballot. Motion carried.

Appointment of Auditors

It was moved by Sir Alex. Bertram, M.E.I.C., seconded by Brig.-Gen. C. H. Mitchell, M.E.I.C., that Messrs. Riddell, Stead, Graham and Hutchison, be appointed auditors for the ensuing year. Motion carried.

Report of Council

It was moved by E. G. Cameron, A.M.E.I.C., seconded by J. A. Grant, A.M.E.I.C., that the report of Council as published on page forty-five of the February issue of *The Journal*, be adopted. Motion carried.

Reports of Committees

Finance Committee: — It was moved by Sir Alex Bertram, M.E.I.C., seconded by Brig.-Gen. C. H. Mitchell, M.E.I.C., that the report of the Finance Committee as published on page forty-eight of the February issue of the *Journal*, be adopted. Motion carried.

Library and House Committee: — It was moved by Brig.-Gen. C. H. Mitchell, M.E.I.C., seconded by Sam G. Porter, M.E.I.C., that the report of the Library and House Committee, as published on page forty-seven of the February issue of *The Journal*, be adopted. Motion carried.

Legislation and By-laws Committee: — It was moved by K. G. Cameron, A.M.E.I.C., seconded by G. G. Ommanney, M.E.I.C., that the report of the Legislation and By-laws Committee, as published on page forty-seven of the February issue of *The Journal*, be adopted. Motion carried.

Board of Examiners and Education Committee: — It was moved by Major C. M. McKergow, M.E.I.C., seconded by R. H. Mather, A.M.E.I.C., that the report of the Legislation and By-laws Committee as published on page forty-seven of the February issue of *The Journal*, be adopted. Motion carried.

Code of Ethics Committee: — It was moved by R. O. Wynne-Roberts, M.E.I.C., seconded by R. F. Uniacke, M.E.I.C., that the report of the Code of Ethics Committee, as published on page fifty, of the February issue of *The Journal*, be adopted. Motion carried.

Students' Activities Committee: — It was moved by Professor T. R. Loudon, M.E.I.C., seconded by Doctor R. A. Ross, that the report of the Students' Activities Committee as published on page fifty, of the February issue of *The Journal*, be adopted. Motion carried.

Nominating Committee: — It was moved by K. B. Thornton, M.E.I.C., seconded by R. M. Hannaford, M.E.I.C., that the Nominating Committee—1925 as published on page fifty of the February issue of *The Engineering Journal*, be approved. Motion carried.

Gzowski Medal Committee: — It was moved by Brig.-Gen. C. H. Mitchell, M.E.I.C., seconded by Alex Gray, M.E.I.C., that the report of the Gzowski Medal Committee, as published on page fifty of the February issue of *The Journal*, be adopted. Motion carried.

Leonard Medal Committee: — It was moved by G. G. Ommanney, M.E.I.C., seconded by P. P. Westbye, M.E.I.C., that the report of the Leonard Medal Committee, as published on page fifty of the February issue of *The Journal*, be adopted. Motion carried.

Plummer Medal Committee: — It was moved by G. G. Ommanney, M.E.I.C., seconded by P. P. Westbye, M.E.I.C., that the report of the Plummer Medal Committee, as published on page fifty of the February issue of *The Journal*, be adopted. Motion carried.

Students' Prizes Committee: — It was moved by Major C. M. McKergow, M.E.I.C., seconded by F. W. Cowie, M.E.I.C., that the Students' Prizes Committee report, as published on page fifty of the February issue of *The Journal*, be adopted. Motion carried.

Honour Roll and War Trophies Committee: — It was moved by Brig.-Gen. C. H. Mitchell, M.E.I.C., seconded by Sir Alex Bertram, M.E.I.C., that the report of the Honour Roll and War Trophies Committee, as published on page fifty-one of the February issue of *The Journal*, be adopted. Motion carried.

International Co-operation Committee: — It was moved by R. O. Wynne-Roberts, M.E.I.C., seconded by J. H. Hunter, M.E.I.C., that the report of the International Co-operation Committee, as published on page fifty-one of the February issue of *The Journal*, be adopted. Motion carried.

Apprenticeship and Training of Engineers Committee: — It was moved by F. W. Cowie, M.E.I.C., seconded by Stanley Shupe, M.E.I.C., that the report of the Committee on Apprenticeship and Training of Engineers, as published on page fifty-one of the February issue of *The Journal*, be received and referred to Council for consideration, the discussion to be held over until the session on Engineering Education. Motion carried.

Fuel Committee: — It was moved by O. O. Lefebvre, M.E.I.C., seconded by G. G. Murdoch, M.E.I.C., that the report of the Fuel Committee, as published in the November and December 1924 issues of *The Journal*, pages 678 and 721, respectively, be adopted. Motion carried.

Deterioration of Concrete in Alkali Soils Committee: — It was moved by Fraser S. Keith, M.E.I.C., seconded by F. W. Cowie, M.E.I.C., that the report of the Deterioration of Concrete in Alkali Soils Committee, as published on page fifty-two of the February issue of *The Journal*, be adopted, and that felicitations of this meeting be conveyed to the Committee for the work they have accomplished. Motion carried.

Canadian Engineering Standards Committee: — It was moved by Sir Alex Bertram, M.E.C.I., seconded by J. A. Grant, A.M.E.I.C., that the report of the Canadian Engineering Standards Committee, as published on page fifty-four of the February issue of *The Journal*, be adopted. Motion carried.

Reports of Branches

Border Cities Branch: — On motion by A. J. M. Bowman, A.M.E.I.C., seconded by F. I. Ker, A.M.E.I.C., the report of the Border Cities Branch (February *Journal* page fifty-seven), was taken as read and received. Motion carried.

Calgary Branch: — On motion by Major C. M. McKergow, M.E.I.C., seconded by C. R. Young, M.E.I.C., the report of the Calgary Branch (February *Journal* page fifty-seven), was taken as read and received. Motion carried.

Cape Breton Branch: — On motion by K. G. Cameron, A.M.E.I.C., seconded by O. O. Lefebvre, M.E.I.C., the report of the Cape Breton Branch (February *Journal* page fifty-eight), was taken as read and received. Motion carried.

Edmonton Branch: — On motion by C. R. Young, M.E.I.C., seconded by W. H. Abbott, A.M.E.I.C., the report of the Edmonton Branch (February *Journal* page fifty-nine), was taken as read and received. Motion carried.

Halifax Branch: — On motion by S. Fortin, M.E.I.C., seconded by E. A. Ryan, A.M.E.I.C., the report of the Halifax Branch (February *Journal* page fifty-nine), was taken as read and received. Motion carried.

Hamilton Branch: — On motion by F. I. Ker, A.M.E.I.C., seconded by Sir Alex Bertram, M.E.I.C., the report of the Hamilton Branch (February *Journal* page sixty), was taken as read and received. Motion carried.

Kingston Branch: — On motion by J. A. Grant, A.M.E.I.C., seconded by E. G. Cameron, A.M.E.I.C., the report of the Kingston Branch (February *Journal* page sixty-one), was taken as read and received. Motion carried.

Lakehead Branch: — On motion by O. O. Lefebvre, M.E.I.C., seconded by J. H. Hunter, M.E.I.C., the report of the Lakehead Branch (February *Journal* page sixty-one), was taken as read and received. Motion carried.

Lethbridge Branch: — On motion by Sam G. Porter, M.E.I.C., seconded by Brig.-Gen. C. H. Mitchell, M.E.I.C., the report of the Lethbridge Branch (February *Journal* page sixty-two), was taken as read and received. Motion carried.

London Branch: — On motion by J. L. Busfield, M.E.I.C., seconded by P. L. Pratley, M.E.I.C., the report of the London Branch (February *Journal* page sixty-two), was taken as read and received. Motion carried.

Moncton Branch: — On motion by O. O. Lefebvre, M.E.I.C., seconded by R. O. Wynne-Roberts, M.E.I.C., the report of the Moncton Branch (February *Journal* page sixty-three), was taken as read and received. Motion carried.

Montreal Branch: — There was considerable discussion regarding the report of the Montreal Branch during which it was pointed out that the part of the report dealing with the Hudson's Bay and Port Nelson Railway, had been abstracted for the purpose of publishing the report in the advance proofs. It was moved by O. O. Lefebvre, M.E.I.C., seconded by J. H. Hunter, M.E.I.C., that the report of the Montreal Branch as published in the advance proofs should be amended to include the full report regarding the Hudson's Bay and Port Nelson Railway, as read by the mover. Motion carried.

Niagara Peninsula Branch: — On motion by E. G. Cameron, A.M.E.I.C., seconded by F. E. Sterns, A.M.E.I.C., the report of the Niagara Peninsula Branch (February *Journal* page sixty-five), was taken as read and received. Motion carried.

Ottawa Branch: — On motion by A. B. Lambe, A.M.E.I.C., seconded by J. W. Hayward, A.M.E.I.C., the report of the Ottawa Branch (February *Journal* page sixty-five), was taken as read and received. Motion carried.

Peterborough Branch: — On motion by F.R. Faulkner, M.E.I.C., seconded by H. W. McKiel, M.E.I.C., the report of the Peterborough Branch (February *Journal* page sixty-eight), was taken as read and received. Motion carried.

Quebec Branch: — On motion by O. O. Lefebvre, M.E.I.C., seconded by B. S. McKenzie, M.E.I.C., the report of the Quebec Branch (February *Journal* page sixty-nine) was taken as read and received. Motion carried.

Saguenay Branch: — On motion by K. B. Thornton, M.E.I.C., seconded by O. O. Lefebvre, M.E.I.C., the report of the Saguenay Branch (February *Journal* page sixty-nine), was taken as read and received. Motion carried.

Saskatchewan Branch: — On motion by D. W. McLachlan, M.E.I.C., seconded by K. B. Thornton, M.E.I.C., the report of the Saskatchewan Branch (February *Journal* page seventy), was taken as read and received. Motion carried.

Sault Ste Marie Branch: — On motion by J. W. LeB. Ross, M.E.I.C., seconded by R. O. Wynne-Roberts, M.E.I.C., the report of the Sault Ste Marie Branch (February *Journal* page seventy-one), was taken as read and received. Motion carried.

St. John Branch: — On motion by G. G. Hare, M.E.I.C., seconded by F. P. Vaughan, M.E.I.C., the report of the St. John Branch (February *Journal* page seventy-one), was taken as read and received. Motion carried.

Toronto Branch: — On motion by J. M. Oxley, M.E.I.C., seconded by T. R. Loudon, M.E.I.C., the report of the Toronto Branch (February *Journal* page seventy-two), was taken as read and received. Motion carried.

Vancouver Branch: — On motion by Brig.-Gen. C. H. Mitchell, M.E.I.C., seconded by F. W. Cowie, M.E.I.C., the report of the Toronto Branch (February *Journal* page seventy-two), was taken as read and received. Motion carried.

Victoria Branch: — On motion by J. H. Hunter, M.E.I.C., seconded by O. O. Lefebvre, M.E.I.C., the report of the Victoria Branch (February *Journal* page seventy-four), was taken as read and received. Motion carried.

Winnipeg Branch: — On motion by Alex Gray, M.E.I.C., seconded by A. B. Lambe, A.M.E.I.C., the report of the Winnipeg Branch (February *Journal* page seventy-five), was taken as read and received. Motion carried.

Members Attend Rotary Club Luncheon

Following the morning session of the annual general meeting, the members were given an opportunity, through the courtesy of the Rotary Club of Montreal to attend the Club's luncheon at which J. D. Craig, M.E.I.C., director-general of surveys gave a most interesting address on "Conditions in the Arctic", illustrating his remarks with motion pictures.

Invitation from Toronto Branch

During the afternoon session J. Morrow Oxley, M.E.I.C., chairman of the Toronto Branch, read to the meeting a letter addressed to the President and members of *The Institute* extending a cordial invitation to have the fortieth annual general and general professional meeting held in Toronto in January nineteen twenty-six. The invitation was accepted and approved by council.

Application for New Branch

The secretary announced the receipt of a formal application from members of *The Institute* in the St. Maurice Valley asking that a branch of *The Institute* be established in that district.

Officers for 1925

Prior to the presentation of the report of the scrutineers appointed to examine the ballot for the election of officers, President Surveyer called upon Brig.-Gen. C. H. Mitchell, M.E.I.C., to preside while the report was being received.

On presentation of the scrutineers' report the following elections to office were confirmed:

PRESIDENT

Arthur Surveyer, M.E.I.C.

VICE-PRESIDENTS

Zone a	A. S. Dawson, M.E.I.C.
Zone c	K. B. Thornton, M.E.I.C.

COUNCILLORS

Victoria Branch District	G. B. Mitchell, M.E.I.C.
Lethbridge Branch District	H. W. Meech, A.M.E.I.C.
Edmonton Branch District	R. W. Ross, A.M.E.I.C.
Winnipeg Branch District	E. V. Caton, M.E.I.C.
Lakehead Branch District	H. M. Lewis, A.M.E.I.C.
Sault Ste Marie Branch District	C. H. E. Rounthwaite, A.M.E.I.C.
London Branch District	H. A. Brazier, M.E.I.C.
Border Cities Branch District	W. H. Baltzell, M.E.I.C.
Niagara Peninsula Branch District	F. S. Lazier, M.E.I.C.
Hamilton Branch District	W. F. McLaren, M.E.I.C.
Toronto Branch District	H. K. Wicksteed, M.E.I.C.
Peterborough Branch District	R. L. Dobbin, M.E.I.C.
Kingston Branch District	W. P. Wilgar, M.E.I.C.
Montreal Branch District	Geo. R. MacLeod, M.E.I.C.
	J. T. Farmer, M.E.I.C.
	O. O. Lefebvre, M.E.I.C.
	J. H. Hunter, M.E.I.C.
Quebec Branch District	L. C. Dupuis, A.M.E.I.C.
Saguenay Branch District	G. E. LaMothe, A.M.E.I.C.
Moncton Branch District	C. S. G. Rogers, A.M.E.I.C.
St. John Branch District	G. G. Murdoch, M.E.I.C.
Halifax Branch District	A. R. Chambers, M.E.I.C.

Installation of Newly-Elected President

Following the presentation of the scrutineers' report Brig.-Gen. C. H. Mitchell, M.E.I.C., called upon Past-President Colonel W. P. Anderson, M.E.I.C., and R. O. Wynne-Roberts, M.E.I.C., to escort the newly-elected President, Doctor Arthur Surveyer, M.E.I.C., to the chair. Doctor Surveyer spoke briefly in accepting the office of President, and expressed his great appreciation of the high honour which had been conferred upon him.

Correspondence

Messages were received from a number of presidents and secretaries of American Engineering Societies and from the President of the Canadian Institute of Mining and Metallurgy, expressing regret at being unable to attend the annual meeting of *The Institute*.

Votes of Thanks

On motion by Colonel W. P. Anderson, M.E.I.C., seconded by J. W. LeB. Ross, M.E.I.C., a hearty vote of thanks was extended to the retiring officers, members of the Montreal Branch, and to all who had assisted in making the annual general and general professional meeting a success.

The Smoker

On the evening of Tuesday, January twenty-seventh, a smoker was held in the Windsor Hotel, at which a varied and highly entertaining programme was provided.

First Session of General Professional Meeting

On Wednesday, January twenty-eighth the first session of the professional meeting was opened at ten a.m., the entire day being devoted to the presentation of papers and discussions on the subject of engineering education. The papers presented on this occasion were as follows:—

"The Study of Engineering Education" — H.P. Hammond, "Engineering Education from the standpoint of the Universities" — Professor C. J. Mackenzie, M.E.I.C.,, "Some Thoughts regarding Engineering Education", Professor H. M. MacKay, M.E.I.C., "The Value of an Engineering Education from a Manufacturer's Viewpoint", — W. M. Cruthers, A.M.E.I.C., "Engineering Education — An Engineering Society Viewpoint", Fraser S. Keith, M.E.I.C.

In addition, there were read at the meeting discussions which had been received from Professor Peter Gillespie, M.E.I.C., Professor N. C. Pitcher, Professor R. S. L. Wilson, A.M.E.I.C., Professor, I. F. Morrison, Professor Charles A. Robb, M.E.I.C., and Professor R. W. Boyle, M.E.I.C., who were unable to attend the meeting.

Resolution following Engineering Education Discussion

Following the discussion on Engineering Education which occupied the entire day of Wednesday, the twenty-eighth, a number of representatives of the various engineering universities of Canada met to consider the question with a view to bringing about definite action on

ARTHUR SURVEYER, D.Eng., M.E.I.C.,
President 1925

the part of *The Institute.* As a result of this meeting the following resolution was put to the meeting at the morning session of January twenty-ninth, and carried unanimously:

> RESOLVED that this meeting of *The Engineering Institute of Canada* record its appreciation of the fact that the subject of Engineering Education has been given prominence by the Council, resulting in a discussion during one day of the professional meeting.
>
> And, to the end that further action in dealing with the subject of Engineering Education be given the consideration its importance warrants by *The Institute,* this meeting recommends that the Council at its next meeting appoint a committee to ensure the co-operation of *The Institute* with the Society for the Promotion of Engineering Education.
>
> And that this committee be composed of corporate members who are not engaged in teaching.

Luncheon

Visiting members were the guests of the Montreal Branch at a luncheon on January twenty-eighth. At this luncheon Dr. W. L. McDougald, chairman of the Montreal Harbour Commission was the guest of the Montreal Branch, and following the luncheon gave a brief address. In the afternoon the discussion on engineering education was continued.

Dance and Supper

The dance and supper was held on the evening of January twenty-eighth in the Ball Room of the Windsor Hotel and proved a most enjoyable affair.

Second Professional Session

The second session which was held on Thursday, January twenty-ninth was devoted to a discussion of winter conditions, the subject being introduced by three papers, viz: "Pouring Concrete in Zero Weather", by C. N. Shanly, M.E.I.C., "Building Construction under Winter Conditions", by C. D. Harrington, and "Strengths of Various Concrete Mixtures", by E. Viens, A.M.E.I.C.

Joint Luncheon

Following this session a joint luncheon with the Association of Canadian Building and Construction Industries was held in the Rose Room, Windsor Hotel. This gathering was addressed by Mr. O. B. Towne of New York City.

Visits to Works of Interest

In the afternoon the members were divided into parties in order to visit various industrial and engineering works in the city.

Among the plants visited were the following:
Montreal City Water Works and Filtration Plant,
Northern Electric Company,
Automatic Exchange, Bell Telephone Company of Canada,
Frontenac Breweries.

Annual Meeting Registration

At Montreal

1 Stirling, L. B., Montreal.
2 Uniacke, R. F., Ottawa.
3 Baxter, John, Montreal.
4 Trotter, H. L. Montreal.
5 Templeman, E. E., Montreal.
6 Barr, Shirley, Montreal.
7 Nowlan, B. C., Montreal.
8 Wynne-Roberts, R. O. Toronto.
9 Haultain, H. E. T., Toronto.
10 Kemp, J. C., Montreal.
11 Grant, Alex J., St. Catharines, Ont.
12 Heward, F. S. B., Montreal.
13 Hogarth, C. E., Hamilton.
14 Blair, D. E., Montreal.
15 Geiger, D. G., Montreal.
16 Grant, L. F., Kingston.
17 McDonald, C. K., Montreal.
18 Massue, Huet, Montreal.
19 Van Scoyoc, H. S., Montreal.
20 Moynes, G. C., Toronto.
21 Keith, Fraser S., Montreal.
22 Oxley, J. Morrow, Toronto.
23 Cameron, K. G., Montreal.
24 Monsarrat, C. N., Montreal.
25 Abbott, W. H., Montreal.
26 MacLeod, G. R., Montreal.
27 Cousineau, A., Montreal.
28 Sheppard, Norman E. D., Montreal.
29 Mitchell, C. H., Toronto.
30 Meyers, A. J., Campbellford, Ont.
31 McKenzie, B. Stuart, Montreal.
32 Challies, J. B., Montreal.
33 Thornton, K. B., Montreal.
34 Johnston, J. T., Ottawa.
35 Pearce, Walter R., St. John, N. B.
36 Sunstrum, A., Mattawa, Ont.
37 Neilson, Stanley A., Montreal.
38 Westbye, P. P., Peterborough.
39 Johnson, Hammond, Montreal.
40 Roche, I. F. R., Montreal.
41 Mackenzie, W. L., St. Catharines, Ont.
42 Burnett, J. A. Montreal.
43 Thompson, T. C., Montreal.
44 Young, A. A., Winnipeg, Man.
45 Boisseau, L. G., Montreal.
46 Mather, R. H., Montreal.
47 Harcourt, R. H., Port Colborne, Ont.
48 Harvie, T. W., Montreal.
49 Fleming, Robert, Toronto.
50 Sauer, M. V., Toronto.
51 Killaly, A. L., Peterborough, Ont.
52 Holgate, Henry, Montreal.
53 Lewis, H. M., Port Arthur, Ont.
54 Sterns, Frank E., St. Catharines, Ont.
55 Lamb, H. M., Montreal.
56 Thompson, Frank B., Toronto.
57 Hannaford, R. M., Toronto.
58 Howard, Major Stuart, Montreal.
59 Lesage, T. W., Montreal.
60 McGorman, S. E., Walkerville, Ont.
61 Caron, J. G., Montreal.
62 Kirkpatrick, E. C., Montreal.
63 Vollmer, G. F., St. Catharines, Ont.
64 Cameron, E. G., St. Catharines, Ont.
65 Beer, A. Netlam, Montreal.
66 Turnbull, W. J., Montreal.
67 Ommanney, G. G., Montreal.
68 Marryat, G., Hastings, Ont.
69 Wall, A. S., Montreal.
70 Hazen, H. T., Montreal.
71 Blaiklock, M. S., Montreal.
72 McKergow, Chas. M., Montreal.
73 Pratley, P. L., Montreal.
74 Sangdahl, G. S., Montreal.
75 Mullen, C. A., Montreal.
76 Osborne, G. H. Montreal.
78 Lawrence, W. D., Montreal.
79 Ryan, E. A., Montreal.
80 Bertram, Alex., Montreal.
81 Perry, K. M., Montreal.
82 Jennings, A. E., Toronto.
83 Thomson, Lesslie R., Montreal.
84 Loudon, Thos. R., Toronto.
85 Anderson, D., Montreal.
86 Goodrich, C. M., Walkerville, Ont.
87 Duggan, G. H., Montreal.
88 Seens, John W., Montreal.
89 Lloyd, Herbert M., Vancouver, B.C.
90 Pitts, G. M., Montreal.
91 Surveyer, Arthur, Montreal.
92 Cowie, Frederick W., Montreal.
93 Brough, F. S., Montreal, Que.
94 Allingham, Ralph, Grenville, Que.
95 Johnson, Phelps, Montreal.
96 Svenningson, S., Montreal.
97 Russell, J. P., Toronto.
98 Openshaw, J. E., Montreal.
99 Villemaire, Alex. Pembroke, Ont.
100 Cameron, J. S., Montreal.
101 Cole, G. Percy, Montreal.
102 Miller, J. L., Pembroke, Ont.
103 Stuart, H. B., Toronto.
104 Shupe, Stanley, Kitchener, Ont.
105 Murdoch, G. G., St. John, N. B.
106 Hare, G. G., St. John, N. B.
107 Nicol, J. A. M., Toronto.
108 Dallyn, F. A., Toronto.
109 Thomson, W. Chase, Montreal.
110 Gray, A., St. John, N. B.
111 Wilson, L. R., Montreal.
112 Hogg, T. H., Toronto.
113 Carlos, H. C. Don, Toronto.
114 Jennings, R. B., Montreal.
115 Williamson, F. Stuart, Montreal.
116 Grieve, John, New York.
117 Porter, S. G., Lethbridge, Alta.
118 Hunter, Jas. H., Montreal.
119 Gates, J. W., Montreal.
120 McLachlan, D. W., Ottawa.
121 Lefebvre, O. O., Montreal.
122 Robertson, James M., Montreal.
123 Lambe, A. B., Ottawa, Ont.
124 Brown, E., Montreal.
125 Deubelbeiss, H. S., Montreal.
126 Kirkpatrick, H. T., Montreal.
127 Craig, J. D., Ottawa.

128 Dobbin, R. L., Peterborough, Ont.
129 Smallhorn, E. R., Montreal.
130 McAllister, W. J., Montreal.
131 Ker, F. I., Hamilton.
132 Chalmers, J., Montreal.
133 Morkill, J. T., Sherbrooke, Que.
134 Wilford, F. R., Lindsay, Ont.
135 MacAfee, R. E., Montreal.
136 Weir, James, Montreal.
137 Norrish, B. E., Montreal.
138 Carneil, Carlo, Montreal.
139 Henry, R. A. C., Montreal.
140 Adams, W. D., Montreal.
141 Cowan, L., Montreal.
142 Fortin, S., Montreal.
143 Combe, F. A., Montreal.
144 Bowman, A. J. M., Windsor, Ont.
145 Décary, A. R., Quebec, Que.
146 Dansereau, J. L., Montreal.
147 Duchastel de Montrouge, J. A., Quebec, Que.
148 Walker, W., Montreal.
149 Hervey, C. L., Montreal.
150 Macdougall, Geo. D., Montreal.
151 Friedman, F. J., Montreal.
152 Drysdale, W. F., Montreal.
153 Shearwood, F. P., Montreal.
154 Wolff, Martin, Montreal.
155 Jarman, P. E., Westmount.
156 Thompson, Geo. W., Westmount.
157 Haanel, B. F., Ottawa.
158 Moore, Ernest V., Montreal.
159 Mattice, E. S., Montreal.
160 Keefer, T. C., Ottawa.
161 McLeod, K., Montreal.
162 Morgan, N. L., Montreal.
163 Eardley-Wilmot, T., Ottawa.
164 Clarson, A. S., Montreal.
165 Ghysens, A., Montreal.
166 Ketterson, A. R., Montreal.
167 Hunter, H. G., Montreal.
168 Motley, P. B., Montreal.
169 Pringle, J. B., Montreal.
170 Costigan, James B., Montreal.
171 Bowman, A. A., Montreal.
172 Marshall, N. J., Toronto.
173 Forrest, B. J., Montreal.
174 Benett, C. M., Montreal.
175 Thompson, H. G., Montreal.
176 Bird, F. G., Ottawa, Ont.
177 Cleaton, R. E., Montreal.
178 Gilmour, W. A., Montreal.
179 Roper, W. P., Montreal.
180 Boyer, A., Montreal.
181 Walley, C. S., Winnipeg.
182 Rannie, J. L., Ottawa, Ont.
183 Anderson, Wm. P., Ottawa.
184 Forward, E. A., Montreal.
185 Wood, John H. G., Montreal.
186 Hayward, J. W., Ste Anne de Bellevue, Que.
187 Lamb, H. J., Toronto.
188 Connell, C., Ottawa.
189 O'Sullivan, Eugene, Montreal.
190 Meek, V., Ottawa.
191 Ewart, J. A., Ottawa.
192 Ewart, H. E., Ottawa.
193 Porter, C. G., Montreal.
194 Beaubien, de Gaspé, Montreal.
195 Dickson, G. H., Montreal.
196 Armstrong, C. J., Brig.-Gen., Montreal.
197 Trimble, A. V., Toronto.
198 Burge, W. R., Toronto.
199 Bovard, W. O., Montreal.
200 Harrison, T. F., Kingston.
201 Patterson, A. L., Montreal.
202 Campbell, N. M., Montreal.
203 McMaster, A. W., Montreal.
204 Poe, Alex. S., Montreal.
205 Brisbane, John S., Montreal.
206 Stott, J. D., Montreal.
207 Engel, N. L., Montreal.
208 Saunders, C. S., Montreal.
209 Gregory, P. S., Montreal.
210 Reid, W. M., Montreal.
211 Roland, J. W., Montreal.
212 Ross, A. H., Montreal.
213 Pearce, K. K., Montreal.
214 Gaskill, Frank, St. Catharines, Ont.
215 Cate, C. L., Montreal.
216 Des Lauriers, L. W., Montreal.
217 Swan, R. G., Montreal.
218 Grove, H. S., Montreal.
219 Bunting, W. R., Montreal.
220 Vallee, I. E., Quebec.
221 Terreault, H. A., Montreal.
222 Marrotte, L. H., Montreal.
223 Chabot, Arthur, J., Montreal.
224 Gardner, W. McG., Montreal.
225 Creighton, C. P., Montreal.
226 Denis, V., Montreal.
227 Finlayson, A. W., Montreal.
228 Jamieson, R. E., Montreal.
229 Ross. J. W. LeB., Sault Ste Marie, Ont.
230 McNiven, J. J., Montreal.
231 Faulkner, F. R., Halifax, N.S.
232 McCrory, J. A., Montreal.
233 McKiel, H. W., Sackville, N.B.
234 French, R. DeL., Montreal.
235 Dawson, H. W., Montreal.
236 Swabey, H. W. B., Montreal.
237 Booker, G. E., Montreal.
238 Sullivan, J. G., Winnipeg, Man.
239 White, R., Montreal.
240 Hawker, F. E., Montreal.
241 McMulkin, A. F., Montreal.
242 Hughes, J. W., Montreal.
243 Bond, F. L. C., Montreal.
244 Cooper, F. W., Montreal.
245 Bickerdike, R., Montreal.
246 Anglin, J. P., Montreal.
247 Smith, K. H., Halifax, N.S.
248 Bonneville, S., Montreal.
249 Denis, Leo. G., Montreal.
250 Baldwin, R. A., Toronto.
251 Staveley, W. D., Montreal.
252 Wilkinson, J. B., Port Hope.
253 Adams, Walter C., Montreal.
254 Desbaillets, C. J., Montreal.
255 Chadwick, D. M., Montreal.
256 Fairbairn, J. M. R., Montreal.
257 Johnston, W. J., St. John, N.B.
258 Mackay, H. M., Montreal.
259 Scott, C. N., Montreal.
260 Wing, D. O., Montreal.
261 Holloway, E. S., Matane, Que.
262 White, J. M., Montreal.
263 Keefer, Charles H., Ottawa.
264 Wood, Chas. O., Ottawa.
265 Comeau, J., Montreal.
266 Miller, J. J., Montreal.
267 Wood, Robt., Montreal.
268 Peters, A. W., Montreal.
269 Cuthbert, A. D. W., Quebec, Que.
270 Murray, W. P., Montreal.
271 Kennedy, H. C., Montreal.
272 Lordly, H.R., Montreal.
273 Henry, A. R., Montreal.
274 Freeland, J. A., Montreal.
275 Evans, W., Montreal.
276 Mitchell, R. W., Montreal.
277 Fry, J. D., Montreal.
278 Macphail, J. B., Montreal.
279 Busfield, J. L., Montreal.
280 Blaiklock, H. M., Montreal.
281 Elmslie, G. A., Montreal.
282 Mahaffy, H. L., Montreal.
283 Kelsey, E. S., Montreal.
284 Henham, Robt., Ottawa.
285 Gray Donald, E., Montreal.
286 Macallum, A. F., Ottawa.
287 Bannatyne, N., Montreal.
288 Carron, J. F. L., Montreal.
289 McCurdy, L. B., Ottawa.
290 Bowman, F., Montreal.
291 Wardwell, W. H., Montreal.
292 Davis, Frank L., Montreal.
293 Hughes, Major-Gen. Garnet, London, England.
294 Wass, S. B., Toronto.
295 Kilbourne, A. B., Montreal.
296 Heckle, G. R., Montreal.
297 Lawson, J. E., Niagara Falls, Ont.
298 Morse, John, Montreal.
299 Burns, R. P., Montreal.
300 Moulton, R. H., Montreal.
301 Thompson, J. W., Montreal.
302 Ellis, J. A., Montreal.
303 Brown, C. B., Montreal.
304 Tagge, A. C., Montreal.
305 Chambers, Hugh, Montreal.
306 Doran, H. T., Montreal.
307 Mechin, F. C., Montreal.
308 Wilson, S. H., Montreal.
309 Ross-Ross, Donald, Montreal.
310 Lynde, C. J., Montreal.
311 Ketchen, W. A., Montreal.
312 Roper, H. B., Montreal.
313 Bennet, G. A., Montreal.
314 Massey, A. W. K., Montreal.
315 Duff, W. A., Montreal.
316 Hawley, G. P., Cedars, Que.
317 Shector, S. S., Montreal.
318 Allen, J. M., Montreal.
319 Spencer, R. A., Montreal.
320 Peden, Alexander, Montreal.
321 Hughes, Brig.-Gen. H. T., Poperinghe, Belgium.
322 Simpson, P., Montreal.
323 Robertson, Murray, Montreal.
324 Hertzberg, H. F. H., Ottawa, Ont.
325 Harrington, Major, Ottawa, Ont.
326 Barcelo, J., Montreal.
327 Cruthers, W. M., Peterborough, Ont.
328 Bell, G. E., Toronto.
329 Manning, P., Peterborough, Ont.
330 Smith, D. F., Sutton, Que.
331 Gilmour, W. A. T., Montreal.
332 Seton, B. W., Montreal.
333 Morris, C. A., Frankford, Ont.
334 Stewart, D., Montreal.
335 MacKintosh,James, Peterborough, Ont.
336 Sproule, Gordon, Montreal.
337 Arkley, L. M., Kingston, Ont.
338 Dingman, R. E., Montreal.
339 McNaughton, A. G. L., Ottawa.
340 Turner, E. O., Fredericton, N.B.
341 Campbell, C. F., Montreal.
342 Brett, J. F., Montreal.
343 Farrar, N., Montreal.
344 Frigon, A., Montreal.
345 Disney, C. P., Toronto.
346 Wardleworth, T. H., Montreal.
347 Dawson, H. J., Kingston.
348 Balfour, R. H., Montreal.
349 Dawson, R., Montreal.
350 Hinchliffe, J. E., Montreal.
351 Parker, J. B., Montreal.
352 Webster, J. S., Montreal.
353 Weames, A. J., Montreal.
354 Riva, R. H., Montreal.
355 Schmidlin, E., Kingston, Ont.
356 Reid, K., Montreal.
357 Balleny, J. L., Montreal.
358 Prudham, W. M., Montreal.
359 Vessot, C. U., Montreal.
360 Dunbar, John R., Hamilton.
361 Vernot, Geo. E., Montreal.
362 Jubien, Ernest B., Montreal.
363 Estey, C. A., Montreal.
364 Fuller, R. J., London, Ont.
365 Vennes, H. J., Montreal.
366 Kelly, Albert J., Montreal.
367 Stewart, Wm. A., Montreal.
368 Brock, R. W., Vancouver.
369 Brodie, Le Sueur, Montreal.
370 Crawford, A. W., Ottawa.
371 Bell, F. Jno., Toronto.
372 Webster, R. C. P., Ottawa.
373 Townsend, C. J., Toronto.
374 Winter, F. E., Montreal.
375 Rutherford, J. F., Hampstead, Que.
376 Anderson, J. W., Ottawa, Ont.
377 Christie, C. V., Montreal.
378 Schippel, W. H., Outremont.
379 McMillan, R. E., Annex.
380 Archambault, Jules, Outremont.
381 Stansfield, Alfred, Montreal.

382 Anglin, D. G., Montreal.
383 Hamilton, R. M. P., Montreal.
384 Rinfret, Guy, Shawinigan Falls, Que.
385 Pigot, C. H., Quebec, Que.
386 Gill, L. W., Hamilton, Ont.
387 Bennet, W. H., Westmount, Que.
388 Wilgar, W. P., Kingston, Ont.
389 Camsell, Charles, Ottawa.
390 Harkom, J. F., Montreal.
391 Currie, A. W., Montreal.
392 Milligan, F. S., Windsor, Ont.
393 Wallace, G. A., Montreal.
394 Warren, G. M., Montreal.
395 Boulton, B. K., Quebec, Que.
396 Sise, P. F., Montreal.
397 Galbraith, John S., Toronto.
398 Hercovitch, Chas. Montreal.
399 Aykroyd, M. J., Montreal.
400 Ford, W. B., Hamilton.
401 Corriveau, R. deB., Ottawa.
402 Bremner, Douglas, Montreal.
403 Price, T. C., Quebec.
404 Wallace, R. H., Montreal.
405 Lafrenière, T. J., Montreal.
406 McNab, A. H., Montreal.
407 Bertrand, J. N. T., Isle Verte, Que.
408 Hotchkiss, C. P., Ottawa.
409 Hillman, D., Montreal.
410 Goulet, Sifroy, Peterborough.
411 Grandmont, B., Three Rivers, Que.
412 McIntire, E. J., Sandwich, Ont.
413 Ramsay, R., Montreal.
414 Agar, G., Montreal.
415 Wilson, E. P., East Angus, Que.
416 Porter, John Bonsall, Montreal.
417 Mackenzie, A. M., Montreal.
418 Reid, A. M., Montreal.
419 Dorrance, F. Y., Montreal.
420 Frith, G. H., Montreal.
421 Holland, J. E., Montreal.
422 Medbury, C. F., Montreal.
423 Simpson, P., Montreal.
424 Pozer, C. E., Swastika, Ont.
425 Harkness, A. L., Montreal.
426 Cartmel, W. B., Montreal.
427 Ross, F. M., St. John, N.B.
428 Underhill, G. G., Windsor Mills, Que.
429 Dodd, G. J., Montreal.
430 Bladen, J. B., Montreal.
431 Foss, R. H., Montreal.
432 Taylor-Bailey, W., Montreal.
433 Vaughan, H. H., Montreal.
434 Neicher, Paul, Chicago, Ill.
435 Findlay, R. H., Montreal.
436 McMillan, H. W., Montreal.
437 Logan, R. S., Jr., Montreal.
438 Bates, H. E., Grand Mere, Que.
439 Ouimet, S., Montreal.
440 Newill, George E., Montreal.
441 Elderkin, K. O., Kenogami, Que.
442 Grenon, J. F., Chicoutimi, Que.
443 Mulligan, C. A., Montreal.
444 Campbell, A., Montreal.
445 Rutherford, A. S., Montreal.
446 Armstrong, John E., Montreal.
447 Wilson, Norman D., Toronto.
448 Bunnell, A. E. K., Toronto.
449 Boulton, C. A., Montreal.
450 Stephen, Chas., Montreal.
451 Lalonde, J. A., Montreal.
452 Flood, John N., St. John, N.B.
453 Shotwell, J. S. S., Ottawa.
454 Darling, E. H., Hamilton, Ont.
455 Mason, H. Neville, Toronto.
456 Winslow, K. M., Montreal.
457 McRae, J. P., Toronto.
458 Adams, F. P., Brantford, Ont.
459 Vaughan, F. P., St. John, N.B.
460 Ellis, F. J. Iroquois Falls, Ont.
461 Waring, J. A. W., St. John, N.B.
462 Thomas, G. N., Toronto.
463 Gale, G. Gordon, Ottawa.
464 Viens, E., Ottawa.
465 Evans, H. G., St. John, N.B.
466 Ross, Thomas. D., Montreal.
467 Donnelly, H. H., St. Vincent de Paul, Que.
468 McCannell, F. R., Milton, Ont.
469 Lefebvre, H., Montreal.
470 Cameron, J. F., Paris, Ont.
471 Heckle, G. R., Montreal.
472 Gale, A. V., Hull, Que.
473 Brown, J. A. W., Hamilton, Ont.
474 Fitzsimons, Robt., Hamilton, Ont.
475 Carswell, J. B., Toronto.
476 Valiquette, Henri, Shawinigan Falls, Que.
477 Lindsay, C. R., Shawinigan Falls, Que.
478 Ross, J. G., Montreal.
479 Pepper, A. H., Westmount, Que.
480 Scovil, S. S., Ottawa.
481 Simpson, P., Montreal.
482 Rolph, H., Montreal.
483 Towne, O. B., New York City.
484 Walker, R. M., Montreal.

PERSONALS

J. E. Gibault, A.M.E.I.C., has been transferred by the Canadian National Railways from Quebec to the Department of Economics in Montreal.

A. G. Barrett, S.E.I.C., who graduated from Queen's University in 1921, in civil engineering, is with the Canadian Johns-Manville Company, at Asbestos, Quebec.

H. V. Ellegett, S.E.I.C., of Bowmanville, Ontario, is with MacGregor and MacIntyre Steel Company of Toronto, and is at present engaged in their templet shop.

Hugh C. Carter, A.M.E.I.C., formerly acting director of pub ic works, Belize, British Honduras, and consulting engineer Belize Electric Light and Ice Company has been confirmed in office as director of public works.

A. G. Dalzell, M.E.I.C., who has resigned his position as consultant to the Vitrified Clay Pipe Publicity Bureau, Toronto, announces that his present address is 93 Macpherson Avenue, Toronto.

P. Philip, M.E.I.C., deputy minister and chief engineer of public works, British Columbia government, was elected by acclamation, president of the Association of Professional Engineers of British Columbia for 1925.

John R. Kaye, S.E.I.C., of Halifax, who graduated in mechanical engineering from McGill University in 1924 has been appointed to the staff of the Calgary Power Company at Seebe, Alta.

Robt. G. Watson, A.M.E.I.C., formerly mechanical superintendent for the Nova Scotia Steel and Coal Company, Limited, of Wabana, Newfoundland, has been appointed chief engineer of the St. John Dry Dock and Shipbuilding Company at St. John, N.B.

E. M. C. Goodwin, Jr.E.I.C., is with the Carolina Power Company, Raleigh, N.C. Mr. Goodwin was formerly with the Riordon Pulp Corporation at Temiskaming, Quebec, and has been in North Carolina for the past year and a half.

J. Tomkins, S.E.I.C., has been appointed assistant engineer to the technical director of the Riordon Pulp Corporation at Hawkesbury, Ontario. Mr. Tomkins has been located with this company during the past year at their Kippewa mill at Temiskaming, Quebec.

C. N. Wylde, S.E.I.C., has joined the engineering staff of the Dryden Pulp and Paper Company, Limited, at Dryden, Ontario. Mr. Wylde, until accepting his new position, was with Messrs. Sir W. G. Armstrong-Whitworth & Company at Longueuil, Quebec. Mr. Wylde graduated from McGill University with the class of '23.

G. M. Tripp, A.M.E.I.C., general superintendent, British Columbia Electric Railway Company, Victoria, B. C., and a director of the Vancouver Island Power Company, has been elected to the 1925 Council of the Association of Professional Engineers of the Province of British Columbia.

E. F. Cooke, A.M.E.I.C., who, previous to his duties necessitating his removing to Bowser, B. C., was a very active member of the Victoria Branch, has resigned his position as engineer for the Thomson and Clark Timber Company, and, accompanied by Mrs. Cooke, has left for an extended holiday in the Old Country, travelling via the Panama canal.

E. T. Spidy, A.M.E.I.C., late superintendent Dominion Engineering Works, Montreal, has been appointed pro duction engineer of the New Zealand Railways, Wellington, New Zealand. Mr. Spidy resigned his position with the Dominion Engineering Works last October to return to New Zealand, his natvie land, after a sojourn in Canada extending over the past fifteen years.

A. A. Paoli, A.M.E.I.C., formerly sales engineer with the Canadian Ingersoll-Rand Company at Sydney, Nova Scotia, has been appointed branch manager at

Winnipeg, Manitoba. Mr. Paoli is a native of Charlottetown, Prince Edward Island and is a graduate of Queen's University, where he received his degree of B.A., in 1915, and B.Sc., in 1922. In 1915 he was awarded the Rhodes Scholarship for Prince Edward Island.

G. R. Pratt, A.M.E.I.C., fuel engineer for the government of Alberta announces that the new address of the Coal Truth Office of the Mines Branch of the provincial government has been changed to 205 Curry building, Portage avenue, Winnipeg, Manitoba, following a fire which destroyed the former office, as a result of which Mr. Pratt lost most of his records and data. Members wishing future publications should communicate with Mr. Pratt submitting their present address.

George J. Nelson, A.M.E.I.C., of Montreal, has taken over the practice of R. S. Kelsch, M.E.I.C., consulting and designing engineer, who has gone south for the winter. Mr. Nelson was born in Montreal, on November 18th, 1876, and graduated in electrical engineering from McGill University in 1900. Mr. Nelson has had extensive experience in the work, the charge of which he has now assumed, and was associated with Mr. Kelsch as early as 1905 in connection with the Kaministiquia Power Company's development at Fort William, Ontario.

Max V. Sauer, M.E.I.C., formerly hydraulic engineer with Canadian Vickers Limited, has been transferred to Toronto, and is chief engineer of the hydraulic department of the recently incorporated Vickers and Combustion Engineering Limited which is a consolidation of the Canadian Vickers Limited and the Combustion Engineering Corporation Limited. Prior to joining the staff of the Canadian Vickers Limited, Mr. Sauer was with the Hydro-Electric Power Commission of Ontario, in connection with the design and construction of the Queenston-Chippawa Power Development, where he occupied a prominent position.

D. E. Blair, A.M.E.I.C., becomes General Superintendent of Montreal Tramways Company

D. E. Blair, A.M.E.I.C., superintendent of rolling stock of the Montreal Tramways Company has been appointed general superintendent of the company.

Mr. Blair was born at St. Thomas, Montmagny, Quebec, in July 1877, his early education being received at the Quebec High School. In 1897 he graduated from McGill University in electrical engineering and in the same year he entered the services of the Quebec District Railway as mechanical and electrical engineer and remained with that company and its successor, The Quebec Railway Light, Heat and Power Company until March 1903, when he was appointed assistant general superintendent with the Montreal Street Railway and later was superintendent of rolling stock with the same company and its successor, The Montreal Tramways Company, from which position he has just been promoted.

Mr. Blair was elected an Associate Member of *The Institute* on January 14th, 1904.

M. P. Blair, M.E.I.C., elected to Victoria City Council

M. P. Blair, M.E.I.C., director, Ryan McIntosh Timber Company, and a member of the executive of the Victoria Branch of *The Institute*, has been elected to the Victoria city council by a two to one majority. Mr. Blair has had considerable experience in municipal work having had charge of the construction of the water works, sewer and pavement systems for Kennilworth and Edgewater near Chicago, and later being for many years engineer for the city of St. Boniface, Man.

Strangely enough, Mr. Blair's decision to become a candidate was made only a few minutes before attending the luncheon at which Major Geo. A. Walkem, M.E.I.C., after presenting the branch charter to the Victoria Branch, urged the members to take greater interest in public affairs and whenever possible to stand for election to public office. Mr. Blair's election will undoubtedly prove a benefit both to the city of Victoria and to the engineering profession.

T. H. Wilson, A.M.E.I.C., Alderman of St. Boniface, Manitoba

T. H. Wilson, A.M.E.I.C., is one of the members of the Winnipeg Branch who believes that engineers should take an active part in the public life of the country. He was re-elected at the recent elections as an alderman of the city council of St. Boniface, after four years service

D. F. BLAIR, A.M.E.I.C.

T. H. WILSON, A.M.E.I.C.

on that body. At the inaugural meeting he was reappointed chairman of the Public Works Committee, and appointed the city's representative on the Greater Winnipeg Water District Board. He is also vice-president of the St. Boniface Board of Trade, and a member of the executive of the Young Men's Section of the Greater Winnipeg Board of Trade. Mr. Wilson was born at St. Peters, Jersey, Channel Islands, in 1887, and received his early education at the Birmingham Municipal Technical School and Handsworth Technical School, and his first-class diploma in mechanical engineering (ordinary grade) at the City and Guilds Institute of London, England. In addition he received certificates in mathematics, from the Board of Education, London, England. For some years Mr. Wilson has been connected with the Canadian National Railways, as engineer in charge of records and estimates.

W. Hamilton Munro, M.E.I.C. appointed to Board of Directors

W. Hamilton Munro, M.E.I.C., University of Toronto (Science) '04, has been appointed a member of the Board of Directors of the new company which will represent in Canada the combined interests of Vickers Limited, London, England, and of International Combustion Engineering Corporation, New York. The company was recently incorporated under the name of Vickers and Combustion Engineering Limited, with head office in Toronto. Sir A. Trevor Dawson of London is Chairman, and A. J. T. Taylor of Vancouver and Toronto is President and Managing Director. Mr. Munro, (an old boy of Peterborough, Ontario), is also in charge of Vickers hydro-electric department, and will act as resident director in England for the new company.

Armand C. Crépeau, A.M.E.I.C., Represents County of Sherbrooke

Armand C. Crépeau, A.M.E.I.C., has been elected Conservative member of the Quebec Legislature representing the county of Sherbrooke in the bye election held on November fifth, 1924. Mr. Crépeau was born at St. Camille, Wolfe county, Quebec, on November 4th, 1884, and was educated at St. Charles College, Sherbrooke, Quebec, and at the Seminary of Philosophy, Montreal and L'Ecole d'Arpentage of Laval University, Quebec. He was admitted to practice land surveying in 1909 and civil engineering in 1917, and has been engaged mostly in private practice in land surveying and civil engineering.

A. C. CRÉPEAU, A.M.E.I.C.

At present he is consulting engineer for eleven towns in the Eastern Townships, and among the special works of which he has acted as engineer-in-charge for the city of Sherbrooke, is the Two-Miles Falls power development at Weedon. Mr. Crépeau has been a member of the board of directors of the Corporation of Quebec Land Surveyors since 1922, and is president of the St. Francis Water Power Company and the Beauce Electric and Power Company. In 1923 he was elected alderman of the city of Sherbrooke, by acclamation.

F. L. Wanklyn, M.E.I.C., retires from the C.P.R.

F. L. Wanklyn, general executive assistant of the Canadian Pacific Railway, has retired from that position, his retirement dating from January 1.

Apart from his work with the Canadian Pacific Railway, Mr. Wanklyn was well-known as a member of the first Board of Control, of Montreal, with which body he served from 1910 to 1912. Also, during the war period, he was appointe done of two fuel controllers for the province of Quebec.

Mr. Wanklyn was born on February 25th, 1860, at Buenos Aires, Argentine Republic. He was educated at Marlborough College, England, and, having decided on engineering as a profession, studied under the late Charles Sacre, of Manchester.

His first position of importance was in Italy. He became resident engineer of the Tramways and General Works Company's lines, Lombardy, and subsequently he acted as general manager and engineer of the Lombardy Roads Railway Company. Coming to Canada, Mr. Wanklyn was appointed assistant mechanical superintendent and manager of the locomotive works for the Grand Trunk Railway.

In 1897 he became general manager of the Toronto Street Railway. Then he entered the service of the local tramways organization as manager and chief engineer of the Montreal Street Railway, remaining in that capacity until 1903. Since that time he has been connected with the Canadian Pacific Railway, except during the periods when he assumed public service. Mr. Wanklyn is a governor of the Royal Victoria and Alexandra Hospitals. was elected a Member of *The Engineering Institute* on January 20th, 1887. He was a member of Council in the year 1909 and was a member of the Fuel Committee whose report was recently presented before the annual meeting of *The Institute.*

K. B. Thornton, M.E.I.C., appointed Assistant General Manager, Montreal Tramways Company

K. B. Thornton, M.E.I.C., formerly chief engineer and operating manager of the Canadian Light, Heat and Power Company and chief engineer and general manager of the Quebec and New England Hydro-Electric Corporation, has been appointed assistant general manager of the Montreal Tramways Company, the appointment being effective as from January 1st, 1925.

Mr. Thornton has long been interested in the power situation in the Montreal district. As early as 1893, he was connected with the Royal Electric Company and the Montreal Light, Heat and Power Company and for twelve years was intimately associated with the construction, operation and other engineering details of the power systems of these two companies. From 1905-1911, he was with the operating department of J. G. White & Company of New York, occupying the following positions;—1905-06, resident engineer and manager, Nassau Light and Power Company, Roslyn, Long Island, New York; 1906, assistant manager, operating department, J. G. White & Company, New York City; 1908-09, resident engineer and acting manager, Portland Electric Company and affiliated companies, Portland, Maine; in 1910, he was appointed advisory engineer to the Canadian Light and Power Company, Montreal, and the following year became chief engineer and general manager of that company and also of the Montreal Public Service Corporation, in this capacity having full charge of the operating organization of both companies and of all design for new construction and plant extension. Mr. Thornton has also been acting as consulting engineer to the Montreal Tramways Company.

Mr. Thornton joined *The Institute* as a Student on January 4th, 1894 and was transferred to Associate Member on March 16th, 1899 and to Member on November 23rd, 1920. During the years 1921, 1922 and 1923, he was on the Council of *The Institute* and his election as vice-president, representing zone "c", was announced at the annual meeting in Montreal last month.

W. A. McLean, M.E.I.C., joins firm of R. O. Wynne-Roberts & Son

W. A. McLean, M.E.I.C., the former deputy minister of highways of Ontario has joined the firm of R. O. Wynne-Roberts and Son, Toronto. The new name of the firm will be Wynne-Roberts, Son, and McLean. Mr. McLean is well known in engineering circles throughout Canada, having been prominently associated with the very large programme of highway construction in Ontario and having occupied office in various representative societies in Canada and North America including that of Councillor of *The Engineering Institute of Canada*. The records of Mr. McLean's activity and ability should be a good omen of his future career, and his many friends in Canada will wish him every success in his new enterprise.

Mr. McLean's early association with the engineering profession was in the City Works Department of St. Thomas where he gained experience in sewerage, water supply, paving and similar branches of city work. In 1896, he entered the employ of the Ontario Government in the office of the instructor in road making. With the growth of the provincial road programme, Mr. McLean received a series of logical promotions, and became executive head as deputy minister of the newly created Department of Public Highways in 1917. Until that time the work had largely consisted in organizing county roads systems of leading market roads, advising as to their improvement, and carrying out the inspection upon which substantial provincial subsidies were paid. In 1920, Mr. McLean was required to create an organization to construct and maintain a system of nearly 2,000 miles of provincial highways of the most modern type. This organization was established in a very brief period, efficiently supervising an expenditure of from $10,000,000, to $16,000,000. on provincial highways alone. The type and methods of construction followed has attracted the wide spread and favourable attention of the engineering profession.

During his tenure of office under the Ontario government, Mr. McLean brought out an excellent series of specifications for roads and pavements of all types, of bridges in steel, and in reinforced concrete. His organizing ability as displayed on the provincial highway system has been extended to, and has beneficially influenced in a marked degree township and county road management generally, with the result that the good roads of Ontario are not limited to trunk lines, but serve in suitable degree all rural communities.

Mr. McLean served on the Council of *The Institute* for three years, 1919 to 1921. He is a member of the Institution of Civil Engineers (Great Britain), is an Ontario Land Surveyor, and a Registered Professional Engineer of the Province of Ontario. He has also been president of the Canadian Good Roads Association, and was honoured with the presidency of the American Road Builders Association, the leading highway organization of the United States.

ELECTIONS AND TRANSFERS

At the meeting of Council held on January 27th, 1925, the following elections and transfers were effected:

Members

KRIBS, Gordon, elect'l. engr., New Brunswick Power Commission, St. John, N.B.

STEINMAYER, Otto C., B.S. (Univ. of Ill.) supt., timber preservation, Canada Creosoting Co. Ltd., Toronto, Ont.

TAYLOR, Alfred James Towle, president and managing director, Combustion Engineering Corporation, Ltd., Toronto, Ont.

Associate Members

DOYE, Marius, chief of engrg. plant and asst. gen. supt., Port Alfred Pulp and Paper Corporation, Port Alfred, Que.

GODIN, Charles, C. E. (Ecole Polytech.), engr., Trussed Concrete Steel Company, Montreal, Que.

KEATING, Reginald Victor Hamilton, Ontario Paper Co. Ltd., Thorold, Ont.

McGIE, William Robertson, B.A.Sc., (Univ. of Tor.), chief engr., Ford Motor Company of Canada, Walkerville, Ont.

Juniors

BAIRD, Earle Meharg, B.A.Sc. (Univ. of Tor.), asst. engr., Scarboro Twnp. Engrg. Dept., Scarboro Jct., Ont.

EAGER, Norman Herbert Aldwyn, B.Sc. (McGill Univ.), M. C. E. (Cornell Univ.), designer and estimator, Canadian Vickers, Limited, Montreal, Que.

LUCAS, Leslie, supt. of power plant, transmission lines and substations, Great Northern Power Co. Ltd., Elk Lake, Ont.

McINTOSH, Duncan Neil, B.A.Sc. (Univ. of Tor.), instr'man., dftsman., etc. for G. R. Marston, A.M.E.I.C., Simcoe, Ont.

PETFORD, Herbert Stanley, B.Sc. (McGill Univ.), of 337 Maplewood Avenue, Montreal, Que.

Affiliates

BIGGAR, Oliver Mowat, K.C., B.A. (Univ. of Tor.), chief electoral officer for Canada and Government Counsel, Ottawa, Ont.

BURGE, William Robert, sales manager for Ontario, Canadian Allis-Chalmers Co. Ltd., Toronto, Ont.

Transferred from the class of Associate Member to that of Member

VINET, Eugene, B.Sc. (McGill Univ.), asst. to vice-president, Middle West Utilities Co. of Chicago, Chicago, Ill.

Transferred from the class of Junior to that of Associate Member

BRINKMAN, Francis Leslie, B.Sc. (Queen's Univ.), supt. and partner, C. O. Wood, A.M.E.I.C., contracting engineer, Ottawa, Ont.

COWLEY, Arthur Thomas Noel, B.Sc. (McGill Univ.), squadron leader, R.C.A.F., acting controller of civil aviation, Dept. National Defence, Ottawa, Ont.

Transferred from the class of Student to that of Junior

BOWN, Charles Roy, B.Sc. (McGill Univ.), dftsman., Canadian Mead Morrison Co. Ltd., Welland, Ont.

BUNTING, William Russell, B.A.Sc. (Univ. of Tor.), power apparatus specialist, Montreal district sales office, Northern Electric Company, Montreal, Que.

MAWHINNEY, James Garnet, B.Sc. (Univ. of Man.), transitman, mtce. of way, C. B. & Q. Rly., Oak Park, Ill.

WONHAM, Walter Richard, B.Sc. (McGill Univ.), Shawinigan Water & Power Company, Montreal, Que.

Hydro-Electric Progress in Canada during 1924

The Dominion Water Power and Reclamation Service of the Department of the Interior of Canada has prepared a review of hydro-electric and water-power development in Canada in 1924, which shows that the year has been one of pronounced activity for that industry throughout the Dominion. Not only was a substantial increase recorded in the total installation but many large projects were advanced to such a state that a further extensive increase will be effected during the year 1925. More than 300,000 h.p. were added during the year bringing the total installation in the Dominion to a figure of 3,569,275 h.p. while with the installations nearing completion this figure will be increased by more than 600,000 h.p. during 1925.

Practically every province is represented in the year's activities, and the review clearly shows the tendency towards the increase in the size of individual developments and the speed of construction which are the loading features of present day practice.

Among the projects which are briefly recorded are those of the British Columbia Electric Railway Company and the West Kootenay Power and Light Company in British Columbia; the City of Winnipeg in Manitoba; the Ontario Hydro-Electric Power Commission, the Hollinger Consolidated Gold Mines, the Canadian Niagara Power Company and the Backus Brooks Company in Ontario; the St. Maurice Power Company, the Montreal Light, Heat and Power Consolidated, the Northern Canada Power Company, the Ottawa River Power Company, the Southern Canada Power Company and the Duke Price Power Company in Quebec; and the Nova Scotia Power Commission in Nova Scotia.

Copies of this bulletin may be obtained free of charge on application to the Director of Water Power and Reclamation, Ottawa, Canada.

EMPLOYMENT BUREAU

Situations Vacant

Electrical Designer

Electrical designer wanted with experience in general layout work on large hydro-electric stations. Apply box No. 127-V.

Engineering Agency Partner

Owner of engineering agency in Montreal is open for negotiations for silent partner who is willing to invest small capital or engineer who would consider purchasing business. Apply box No. 128-V.

Mechanical Engineer

Mechanical engineer, recent graduate required by a large electrical manufacturing concern for work on factory methods and manufacturing problems. Please state in first instance, education, full qualifications, references, salary required, age and when available. Apply box No. 129-V.

Sales Engineer

Sales engineer required for selling hydraulic and steam turbines also heavy electrical apparatus Apply by letter to F. Jno. Bell, Royal Bank Building, Toronto.

Situations Wanted

A.M.E.I.C., with eighteen years' experience in railway and highway engineering, both field and office, desires office position preferably in the West. Apply box 166-W.

Electrical Engineer

Technical graduate, electrical engineering, Mem.A.I.E.E., A.M.E.I.C., having had a very broad experience and have been in charge of all kinds of electrical construction, maintenance, and operation of hydro-electric plants, substations, industrial plants and transmission lines. Can produce results. Prefer Western Canada or Western States. Apply box No. 167-W.

Electrical Engineer

Electrical engineer, graduate 1923 in electrical and hydraulic engineering, age 24, single, Canadian, desires a position with a reputable Canadian or English firm interested in the management and engineering problems of public utilities, would preferably locate in Canada, but willing to consider South America. Broad experience in maintenance and operation of gold mine equipment. One year General Electric Co.'s Test. At present employed on transmission investigations. Available on reasonable notice. Apply box No. 168-W.

Electrical Engineer

Graduate 1923, B.A.Sc., University of Toronto. Two years experience before graduation, on electrical construction and maintenance of power stations and substations. One year and four months experience on electrical design of substations and industrial plants. Position as assistant engineer with public utility corporation desired. Salary to start not important. Commence in one month. Box. No. 169-W.

Articled to Land Surveyor

Graduate wishes to become articled to a land surveyor, preferably with headquarters at Toronto. Remuneration secondary consideration. Apply ox No. 170-W.

ANNOUNCEMENT OF MEETINGS

Further information may be secured from the secretaries of the various branches, whose addresses may be found under "Officers of Branches" on page 44 of *The Journal.*

OTTAWA BRANCH:—

Secretary-Treasurer, F. C. C. Lynch, A.M.E.I.C.

Feb. 10th. Address on "The 1923 Cruise of the Arctic" by J. D. Craig, M.E.I.C., and F. D. Henderson.

Feb. 19th. "Power". A descriptive movie film prepared by the Wagner Electric Corporation covering the history of power from early days to present time. The film to be interpolated by remarks from John Murphy, M.E.I.C.

MONTREAL BRANCH:—

Secretary-Treasurer, E. A. Ryan, A.M.E.I.C.

Feb. 12th. Address on "Pulp and Paper" by J. N. Stephenson.

Feb. 19th. Address on "Maintenance of Way on the Lehigh Valley Railroad" by C. R. Moore.

Feb. 26th. Address on "The Diesel and Semi-Diesel Oil Engine" by R. T. Griffith.

Mar. 5th. Address on "Invisible Radiations" by Dr. L. E. Parizeau.

Mar. 12th. Address on "Improvements in Design and Appearance of Highway Bridges" by C. J. Desbaillets, M.E.I.C.

Mar. 19th. Address on "Air Preheaters" by A. J. T. Taylor.

Mar. 26th. Address on "Reconditioning Frogs and Rails by Oxy-Acetylene Under Traffic" by G. P. MacLaren.

April 2nd. Address on "Underground Electrical Work-City of Montreal" Dr. L. A. Herdt, M.E.I.C.

April 9th. Address on "Financial Aspect of the Decongestion of Traffic in Montreal" by S. Ouimet, A.M.E.I.C.

April 16th. Address on "Consideration of Rainfall and Run-off in Connection with Sewer Design" J. G. Caron.

April 23rd. Address on "Transformers" by C. E. Sisson, M.E.I.C.

VICTORIA BRANCH:—

Secretary-Treasurer, E. P. Girdwood, M.E.I.C.

Feb. 11th. Address on "Bridges of British Columbia", by A. L. Carruthers, M.E.I.C.

Feb. 19th. Address on "Manufacture of Pulp and Paper", by Robert Bell-Irving, A.M.E.I.C.

Mar. 11th. Address on "Comparative Geography, etc., as Applied to Transportation", by G. G. Aitken.

Mar. 25th. Address on "Problems of Town Planning", E. G. Marriott, A.M.E.I.C.

April 8th. Address on "Dominion Drydock", by J. P. Forde, M.E.I.C.

WINNIPEG BRANCH:—

Secretary-Treasurer, P. Burke-Gaffney, A.M.E.I.C.

Feb. 19th. Address on "Hot Treatment of Loco. Steels, Showing Application of Micro Photography", by James Gilcrist, and A. C. Turtle, A.M.E.I.C., Canadian Pacific Railway Company.

Mar. 4th. Address on "Steam Storage and Steam Accumulators", by A. J. T. Taylor, Vickers and Combustion Engineering Limited, Toronto, Ont.

Mar. 18th. Address on "New Koppers Gas Plant", by Hugh McNair, Winnipeg Electric Railway.

April 1st. Address on "Central Steam Heating", by N. W. Calvert, and J. W. Sanger, A.M.E.I.C.

April 15th. Address on "Application of Compressed Air to Industry", (Moving Picture). Ingersoll-Rand Company.

May 6th. Annual Meeting — Report of Committees.

LONDON BRANCH:—

Secretary-Treasurer, E. A. Gray, A.M.E.I.C.

Feb. 18th. Presentation of Branch Charter, by Vice-President, J. B. Challies, C.E., M.E.I.C.

ST. JOHN BRANCH:—

Secretary-Treasurer, W. J. Johnston, A.M.E.I.C.

Feb. 19th. Address by E. G. Evans, M.E.I.C., on "The Teredo".

Mar. 19th. Address by H. G. Acres, D.Sc., M.E.I.C., on "Deterioration of Turbine Runners".

April 16th. Address by H. O. McInerney, K.C., on "Law of Contracts as it Affects Engineers".

Details of Dates and Subjects to be announced later:—

A visit to the Admiral Beatty Hotel, under the direction of John B. Stirling, A.M.E.I.C.

Illustrated Lecture, "The Mount Royal Hotel", by Walter J. Armstrong, M.E.I.C.

Address on "Engineering Education" by W. E. Wickenden, Society for the Promotion of Engineering Education.

Address by Prof. Hammond, Polytechnique Institute, Brooklyn, N.Y.

A meeting during the winter to be held at Fredericton, N.B.

CALGARY BRANCH:—

Secretary-Treasurer, G. P. F. Boese, A.M.E.I.C.

Feb. 23rd. East Kootenay Power.

Mar. 9th. Annual Meeting.

Mar. 23rd. Prize Competition.

Abstracts of Papers read before the Branches

The Yukon of '97 and Now

W. L. Bramley,
Niagara Peninsula Branch, at Thorold, January 9th, 1925

In the fall of 1896 about half a dozen men went into "The Yukon", wintered on Bonanza creek and came out in the spring with one million dollars in gold, and the rush was on. The population of the territory, was then no greater than one hundred men. The spring of '97 saw a great gathering at the Chilcoot and White passes eager to rush into the unknown. Before anyone was permitted to enter, he had to have with him 1,100 pounds of 'grub', enough to last a year. This had to be packed over the Chilcoot pass, which was so steep that steps had to be cut in the snow for 500 feet, or one could take the longer way round and enter by the White pass, over which it was possible to take pack animals. The speaker chose the latter, taking with him an ox as beast of burden. As has been said, the Chilcoot pass was steep. It was also very narrow, a mere cleft in the mountain range. Here a party of 267 men were caught under an avalanche and buried under 30 feet of snow. Not one escaped alive.

Those who made the crossing safely built themselves boats on the shores of lake Linderman and floated behind the breaking ice down the Yukon river, 800 miles to Dawson. Some lucky ones dug a fortune out of the gravel of Bonanza and nearby creeks and with it returned to civilization and a life of ease; others got 'Grub Ore' a plenty but no great fortune and stayed on, gradually extending their activities farther afield, along the lines of the rivers and streams. Gold, silver, copper and lead were found in great quantities, 380 million dollars worth of gold having been taken out of the Yukon in less than thirty years. The known deposits of placer gold are now practically exhausted, and until about three months ago, no gold quartz of any account had been discovered. Ore cannot be mined economically in the Yukon which carries less than $100 to the ton, so great are transportation and other costs.

Placer gold is to be found in the lower four feet of gravel next above bed-rock. This gravel may be under from thirty to sixty feet of 'muck'. Shafts are sunk through the ever-frozen over-burden, the 'pay-gravel' is tunnelled out and piled until spring when washing commences. The speaker had with him two hastily constructed models of types of automatic dams used in places where the ground was not perpetually frozen. He explained how, by their help, the muck was washed away and the pay-dirt exposed. They were known as the Windowblind gate and the Squaw dam.

At present Mr. Bramley is engaged in silver mining at Mayo lake, 500 miles south-east of Dawson. He takes out high-grade ore only, teams it over forty miles of mountainous country to the head waters of the Stewart river. Here it is taken by boat to Dawson, transhipped to river steamer, brought down the river 1,800 miles to tide-water where it is again transhipped to ocean freighter and taken to San Francisco for smelting, at a cost en route of close to $100 per ton.

An interesting story was told which illustrates well the ebb and flow of fortune among the early gold-hunters of Dawson. A miner, known to Mr. Bramley, having staked a piece of ground on Bonanza creek, being rather disappointed in his prospect and desirous of trying somewhere else, offered the plot to a Swede at whatever price the Swede could or would pay for it. All the Swede had was $700. The owner took the $700 and felt pleased at the bargain. Next morning the other, feeling that he had been foolish, tried to get his money back. His efforts were in vain, — a bargain was a bargain. He had to make the best of a bad job. The result, however, was that the Swede, at the end of two years, came out of the Yukon with over a million dollars taken from the land that had been literally forced upon him. So far as the Swede is concerned, this is not the end of the story, unfortunately. He is now piling slabs in a Vancouver lumber yard. The million has been dissipated.

On one occasion, as the speaker was out alone on the hills, many miles from nowhere, he saw from the brink of a ravine a prospector working near the creek, attempting to move a huge boulder that lay across a tunnel which he was trying to drive into the hill side. The stone had been loosened, and the miner was in imminent danger of being crushed beneath it. As Mr. Bramley approached, the other, unaware of his presence, was talking aloud. The first words that were audible to the listener were, 'Oh God !' if you make this stone to fall on me, please kill me outright, Don't maim me."

What seemed to the writer the most remarkable facts brought by Mr. Bramley had nothing to do with gold or snow. In digging at Bonanza, in the early days, he unearthed, at a depth of about 60 feet, some splendid fossil remains, mammoth tusks nine feet in length and huge teeth of ivory, and again the head skeleton of a mammoth which the speaker asserted would not fit under the average ceiling. In the same vicinity, and at a depth that would show that they were of the same or greater age than the stratum of gravel that contained them, he dug out two curiously shaped disks of pottery, about twelve inches in diameter at the base, six inches deep, like truncated cones. In the centre of the top plane a hole, some three inches in depth, showed a spiral groove on the inside, exactly similar to the thread of a modern screw. All these valuable remains, in the scurry and lust for gold, were thrown away and lost.

The Yukon of to-day is not what it was in the palmy days following the great gold rush of the nineties. Dawson City's lights are dimmed for a time. It has shrunk to the proportions of a village of 700 inhabitants. A railway crosses the Rockies to White Horse Rapids. Small river steamers ply to and fro on the Yukon river and its larger tributaries. Great wealth still remains for the miner of silver and lead and probably lode gold. The first ore concentrator in the territory is now being built on the Stewart river. Some day the Yukon will again come into its own. Better transportation facilities will make possible the development of mines now uneconomical but which are rich in comparison with the big mines of Ontario.

The Winnipeg River Watershed

J. W. Sanger, A.M.E.I.C.
Winnipeg Branch, December 18th, 1924.

Mr. Sanger introduced his subject by considering the particular advantage that the Winnipeg river is to the city of Winnipeg as its source of power.

"The utilization of electrical energy in the province of Manitoba", said Mr. Sanger, "has developed so rapidly during the last fifteen years that the conservation of the sources of energy that lie within the commercial range of Winnipeg must receive constant attention. As a source of power the Winnipeg river will always be of supreme importance to the city of Winnipeg and up to the present time no other source of power has suggested itself as a serious competitor.

Statistics indicate an annual increase in demand for electrical energy in Winnipeg of 12 per cent. This means that the rate of consumption of electrical energy would be doubled every six years. Winnipeg is faced, if these estimates are correct, with a complete exhaustion of hydraulic power sites in the province of Manitoba, within the next ten years, or, at the most, within twelve years. The combined load this year, 1924, on the two hydro-electric power systems is, up to date, 180,000 h.p., and as the maximum output of the Winnipeg river under ideal methods of conservation and regulation will not exceed 600,000 h.p., it is not difficult to see how quickly we are approaching the day when the demand will exceed the supply.

It is only by the harmonious efforts of international and interprovincial bodies, together with the unselfish support of public and private corporations, that Manitoba can secure for itself the maximum that engineering science can offer".

Winnipeg River Basin

From that point Mr. Sanger went on to describe the basin of the Winnipeg river, — that it forms part of the Nelson River drainage system, — the Nelson river eventually discharges the combined run-off of the Winnipeg, Red and Saskatchewan rivers after their uniting in the central reservoir lake Winnipeg. "The entire watershed is very sparsely populated and a large portion offers little opportunity for agricultural settlement. A considerable portion of the forest cover is too small to possess great timber value. In the sheltered valleys the timber is better developed and is of considerable commercial value.

The great extent of the forest cover exercises a most beneficial influence on the run-off from the basin. This is particularly noted when comparison is made between conditions on the prairie as compared with conditions forty miles east at the Winnipeg river. The snow will have completely disappeared from the prairie while the snow is still lying deep on the forest area.

Muskegs have received but little notice as regulators of run-off, whereas they are very important, at least in this watershed. To the forest, muskegs, small streams, and lakes the Winnipeg river owes its almost unequalled natural regulation; its normal yearly flood seldom exceeding three or four times its minimum.

The Winnipeg river has a characteristic formation expanding, as it does, into deep lake-like expanses with little or no current, and again narrowing at congested channels forming rapids and falls over granite ridges. These submerged ridges at the critical points along the river, combined with the deep ponds which are already in existence immediately above, supply unequalled sites for the development of power."

Effect of Low Temperature

Considering the value of the Winnipeg river for hydro-electric development the conditions resulting from low temperatures receive consideration. "The influence of temperature on the run-off of the Winnipeg river during the winter season cannot be definitely stated. The continuous discharge records are more or less influenced by storage in the larger and smaller lakes. This militates against securing records showing the direct relation between temperature range and river discharge. As is usual, of course, the results of minimum flow are experienced during the winter. The extreme low flows which are experienced in other rivers in this region are prevented by the excellent natural reservoir system that is provided for the better regulation of the Winnipeg river.

Apart from the influence on the run-off of low temperature, is the question of ice troubles in plant operation. The troubles experienced in the past, with the operation of power undertakings in northern latitudes, were for a long time considered a necessary evil beyond hope of remedy other than the yearly employment of local help in blasting and ice-cutting operations. It was noticed that certain plants were comparatively free from ice troubles. This provided an incentive to closer study of causes and processes of ice formation.

As a result of that study and the application of the conclusions reached together with the fact that the successful uninterrupted operation of the plant of the city of Winnipeg Hydro-Electric System at Pointe du Bois on the Winnipeg river has been maintained, it is assured that no ice troubles of a serious nature need be anticipated for future developments on the same river. With regard to ice troubles it may be generally stated that highly efficient hydraulic development work is preventative of them. By that it is meant; if the available head of a river is kept to a practical maximum by the elimination of rapids and high velocity sections then the consequent rapid formation of sheet ice will prevent other ice troubles.

Although, on the Winnipeg river ice forms to an average depth of 24 inches, ice jams of a dangerous kind are not experienced at the spring break-up. The forest cover and the muskegs hold back the winter precipitation until the ice has time to melt and rot".

Rainfall Records

The relation between precipitation and run-off are interesting. Records tend to show that out of an average precipitation of twenty-four inches, six or seven inches finds its way into the main river channels at the outlets of the individual watershed areas. The difference between 24 inches and 6 or 7 inches must take the form of evaporation. Records taken at Kenora indicate that the evaporation from the surface of the Lake of the Woods, — and by deduction from the surface of all lakes in this area, — approximates the precipitation thereon. The lakes therefore may be considered as functioning purely as reservoirs and not as part of the catchment basin. Very little is yet known of the rate of evaporation from land areas covered with different classes of vegetation. Without doubt muskegs are very efficient in conserving the precipitation.

Control Flow for Maximum Power

It is obviously necessary to improve on the irregular natural flow of the Winnipeg river in order that the maximum possible power may be obtained. It is noted that a regular flow of 20,000 second-feet is recommended by the International Joint Commission and the Dominion Water Power Branch as economically feasible. Any control of outflow, whatever, results in higher than natural lake levels at all seasons of the year, unless the discharge capacity of the outlet is increased over the natural size control of the outflow from a lake, with a view to its equalization, presupposes the storage of flood water.

The true ideal in artificial regulation demands an irregular flow which will coincide with the irregular demand for power. The demand for power from the Winnipeg river is greatest when nature is placing the greatest restriction on the flow. The accomplishment of the true ideal regulation would therefore demand an inordinately large reservoir system. The true ideal could not be approached practically.

Discussion on Mr. Sanger's Paper

At the conclusion of Mr. Sanger's address the meeting was opened for discussion. In doing that the chairman drew attention to some of the economies in the use of the potential power of the Winnipeg river, Some of these, he said, might have been effected had it been possible to foresee the growth in demand while others might yet be taken advantage of, although at some primary sacrifice. To raise a question and direct the discussion he suggested the possibility of scrapping the city hydro plant and the Winnipeg Electric Pinawa plant, both to be superceded by the development at Bird River falls of 150,000 h.p.

E. V. Caton, M.E.I.C., manager, electric utility, Winnipeg Electric Railway Company, congratulated the speaker of the evening on the scope and detail of his address. He felt that the real economic use of hydro-electric power was in the production of goods; in other words, in being used to increase the wealth of the community and provide a pay roll, and not to provide luxuries, which, however desirable, were not, in any way, increasing the prosperity of the community. He emphasized that he did not wish to suggest the elimination of cooking and domestic load, but he did not think that the growth of a load, which confined almost entirely to such demand, necessarily indicated a healthy condition. The effect of the forest fires in reducing the run-off deserved thought. Any planning for the future should bear in mind the reduction in available power that might result from the destruction of the forests.

Mr. Caton went on to congratulate the Dominion Government Water Power Branch. That department's work had been invaluable in its extent, and the dependence that could be placed on the accuracy of its particular deductions reflected great credit on the ability of the individual engineers, of which it is composed. He drew attention to the fact that our chairman, Mr. McLean, now deputy minister of public works of the province of Manitoba, had been in charge of the preliminary surveys of the Winnipeg river. He gave it as his opinion that it was largely due to Mr. McLean that surveys had been brought to final completion.

F. H. Martin, M.E.I.C., consulting engineer, Winnipeg, followed Mr. Caton. Mr. Martin had noticed a reference to the Pinawa plant of the Winnipeg Electric Railway Company. In the light of the years of experience since the Pinawa plant had been commenced, and in the light of the knowledge of the conditions and potentialities of the Winnipeg river that had been acquired in the interval, and in the light of the growth in demand for electric power, it was perhaps possible to criticize some features of that plant. Mr. Martin assured the audience that no apology for the plant was necessary. He reviewed its history from the inception of the idea that prompted its building.

At the time the site of the Pinawa plant was reported on and selected by the Winnipeg Electric Railway interests, the maximum demand for power that Winnipeg would make in a period of twenty years was estimated to be 4,000 h.p. The report that decided on the selection of the Pinawa site over the alternative Great Falls site was based on observations made in the winter when ice conditions were abnormal. The actual head available at Pinawa was found to differ from the then observed head. Since then the available head has been raised by a diversion dam resulting in a 40,000 h.p. plant instead of 4,000 h.p. as originally intended.

Mr. Martin's opinion differed from that of Mr. Caton concerning the value of domestic load. It was Mr. Martin's opinion that domestic load was desirable when surplus power existed and that other sources of power will become available as those now in sight are put into use. He mentioned economical central station development through the use of pulverized lignite fuel. He referred to the economical generation of steam in the city of Winnipeg hydro steam heating plant, in that connection.

Mr. Martin agreed with the previous speakers that ice troubles in connection with the Winnipeg river developments were obviated by the creation of good ponds; the formation of frazil ice was thereby prevented.

C. H. Attwood, A.M.E.I.C., district chief engineer of the Dominion Water Power Branch, followed Mr. Martin. Definite comparison was made by Mr. Attwood between the uncontrolled flows of the Red and Assiniboine rivers with the naturally and artificially controlled flow of the Winnipeg river. The conclusion that frazil ice was eliminated by large pond areas was confirmed by Mr. Attwood. Reference was made to actual winter observations of the Nelson river. It was noted that where the river flows out from Cross lake no frazil ice appears, whereas below the rapids, further down frazil ice in large quantities was found. The frazil ice forms in the open water, caused by rapids and falls, flows downstream and collects under the immediately succeeding ice sheet. It was noted on the Nelson river that the frazil ice accumulations collected to depths of forty feet or more, depending upon the rate of the current. The greatest packing of ice accumulations under the ice sheet was found in quiet water in the bays.

Reference was made to observations of the Bow River development, where troubles from the formation of ground ice and frazil ice had been experienced. Mention was made also of conditions on the Peace river during spring break-up. At times of early flood water conditions in that river the flood waters flowing over the top of the solid ice cover and the ice eventually breaking from its anchorage caused huge masses of ice to rise and flow downstream. If obstructions were encountered by these moving masses of ice large blocks up-ended, causing tremendous ice-jams in the river.

C. H. Blanchard, A.M.E.I.C., district engineer, Department of Public Works, followed Mr. Attwood. Mr. Blanchard reverted to

Mr. Sanger's and Mr. Caton's mention of forest fires. A question was asked as to the effectiveness of the air patrol in fighting fires. Mr. Attwood answered the question in the affirmative, that the air patrol was effective. Mr. Attwood's answer was agreed with by J. W. Porter, M.E.I.C., who instanced the prompt appearance of the air patrol when brush was being burned at Minaki.

H. A. Bowman, A.M.E.I.C., chief engineer, Reclamation Branch, Department of Public Works, congratulated Mr. Sanger on his address and moved the vote of thanks, which was tendered.

Mr. Sanger acknowledged his indebtedness to government reports for material. He had co-ordinated that material with information from personal observation and experience and had made the deductions and reached the conclusions of his paper.

Ontario Forestry Branch Air Service

Captain Maloney,
Sault Ste. Marie Branch, December 19th, 1924

In a brief introduction Capt. Maloney indicated the tremendous expansion of the British Air Service during the war and the organization of the Canadian Air Board, whose chief work was the protection of the forests. In 1921, federal government machines did some experimental work along the lines of the Canadian Government Railways. Further work was done on a small scale in 1922 and work by a commercial organization was done in 1923 including about 1,400 hours of flying.

In 1924, the Ontario Government formed the Ontario Forestry Branch Air Service with a personnel of 34, and 13 flying boats of the H.S.2.L type originally built for the United States Government. Northern and western Ontario was divided into two divisions viz: Eastern, with headquarters at Sudbury including the section from Parry Sound to Cochrane to Longlac; and Western section with headquarters at Sioux Lookout including from Longlac to the Manitoba boundary, an area of about 55,178 square miles. Supply stations for the eastern division were at Timagami, Como and Amyot, and the western division stations at Orient Bay, Fort Frances, Port Arthur and Minaki.

Some of the characteristics of the H.S.2 L. type flying boats are:—Weight loaded 3½ tons; horse-power 360; carrying capacity 4; speed 60 m.p.h.; flying time 4½ hours; range of glide one mile for each 1,000 feet elevation; visibility on a clear day would be about 25 miles while on an exceptionally clear day it might be 50 miles at 5,000 feet elevation; four hours flight on a day of fairly good visibility would give an area patrolled of 13,500 square miles.

It was assumed that by canoe patrol 75 per cent of fires started would either not be detected or would burn themselves out or be put out by rain. With 640 fires reported by the air patrol it may be inferred that even if the fires not detected were the smallest ones, the result would be much more serious with canoe patrol alone. In one instance, Capt. Maloney told his audience, the fire had been reported and a few men with equipment landed within few hours and the fire extinguished, many hours before canoe transportation could have placed them at the scene of the fire.

When the fire hazard was low the Air Service was engaged upon survey and reconnaissance work of which a moderate amount was done in 1924. This is an important part of the work and a considerable amount of success has been achieved in the way of mapping timber lands, as has been noted in the technical press.

BRANCH NEWS

Winnipeg Branch

P. Burke-Gaffney, A.M.E.I.C., Secretary-Treasurer.
James Quail, A.M.E.I.C., Branch News Editor.

A regular meeting of the Winnipeg Branch was held on the evening of December 18th, when D. L. McLean, A.M.E.I.C., chairman, occupied the chair. He expressed pleasure at being present at a meeting after his long enforced absence. He thanked the members for their kindness in remembering him, saying that consistent kindness shown during a long tedious convalescence was the kind that could not be forgotten by the recipient.

J. W. Sanger, A.M.E.I.C., chief engineer of the Winnipeg Hydro-Electric System, was introduced by the chairman as speaker of the evening. Mr. Sanger's subject was announced as "The Winnipeg River Watershed".*

Calgary Branch

G. P. F. Boese, A.M.E.I.C., Secretary-Treasurer.
W. St. J. Miller, A.M.E.I.C., Branch News Editor.

On January 12th, the annual dinner of the branch was held in the Elizabethan rooms of the Hudson's Bay Company's store. It was conceded on all sides that this ranked as one of the most successful affairs of its kind that has yet been staged by the branch, and while our worthy secretary worked hard behind the scenes, the success was largely due to the efforts of members of the branch who reside at Brooks, Alberta, together with their friends. These people came up in a body and gave us a display of talent varied to suit everyone's taste that for such an occasion would be hard to surpass.

The spread of eatables and drinkables was good indeed, but even the latter might have been a trifle flat had it not been followed by such a programme of hilarity. "The gang" was right there with the goods, so to speak, under the able chairmanship (pro. tem.) of A. Griffin from Brooks. Wesley Crook, Jr.E.I.C., made an ideal "crook" in his get-up as a street faker ! S. H. Frame, A.M.E.I.C., C. A. Pope, A.M.E.I.C., and C. C. Elliott, A.M.E.I.C., were excellent and well supported by their friends in putting over their serio-comic aggregate, both vocal and instrumental. To Major F. G. Cross, A.M.E.I.C., must be given the credit for being an able organizer and versatile artist, for he was back of it all, and some of us know well what that kind of work entails. His charcoal sketches, done together with a friend, were clever and amusing.

During the evening Chairman R. S. Trowsdale, A.M.E.I.C., referred with considerable pride to the notable achievement gained by "Fred" Cross in his success as winner of both of the first prizes for the war memorial and records competitions open to all members of *The Institute*. The chairman's further remarks were to the point in his references to engineering progress and achievements in recent years, and he foresaw a still more rapid advance in the near future. He also stated that it was such get-together meetings as these that helped to promote a feeling of better fellowship amongst engineers.

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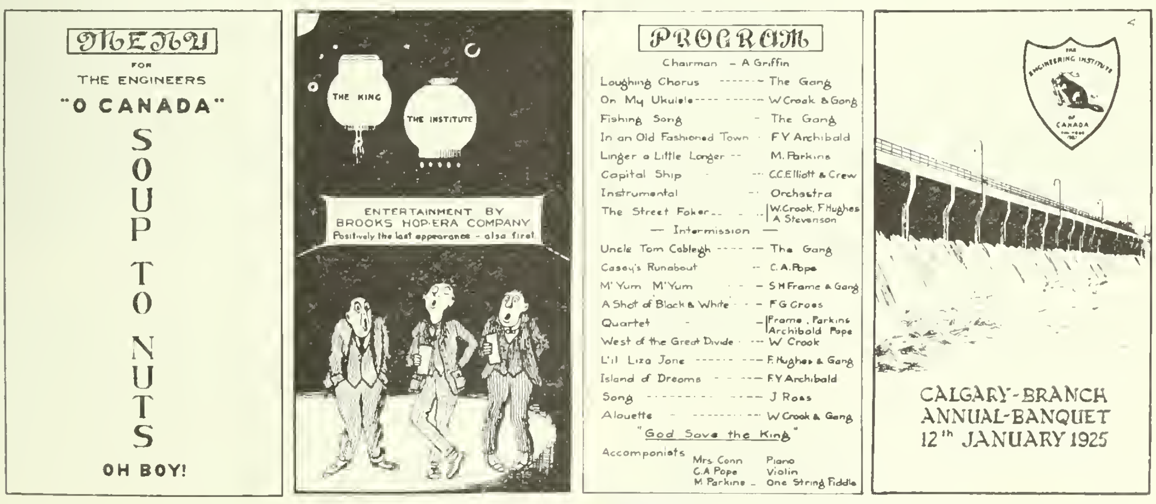
* An abstract of this paper appears on another page of this issue.



Calgary Branch Annual Dinner Menu and Programme

Following the toast to the King, R. M. Dingwall, A.M.E.I.C., proposed *The Institute* and related several "true" Scotch stories, concluding with "here's tae us and wha's like us" or words to that effect. P. Turner Bone, M.E.I.C., seconded with a few apt remarks.

At the conclusion of the entertainment and following some complimentary remarks from the chair, P. J. Jennings, M.E.I.C., proposed in suitable terms a hearty vote of thanks to the visiting members and their friends.

A feature of the evening was the cleverly designed menu and programme — a rendition of subtle art and ingenuity at the hands of Major Cross.

Toronto Branch

J. H. Curzon, A.M.E.I.C., Secretary-Treasurer.
J. A. Knight, A.M.E.I.C., Branch News Editor.

Due to the holiday season the Toronto Branch has very little to report. On Monday, January 12th, at 12.30 p. m., we held a luncheon in the King Edward hotel, addressed by Dr. W. F. Durand, president of the American Society of Mechanical Engineers.

The Engineering Profession

Mr. Durand chose as his subject "The Engineering Profession, its Antiquity and its Obligations". The other technical societies of the city were invited, and a very representative assembly of engineers were present to hear Dr. Durand. The speaker traced the profession from the dawn of history to the present day, and also stated what he considered engineers owed to posterity. Dr. Durand quoted a definition of the engineers, which suits the general public very well, — "An engineer is a man who does the things that ordinary engineers are expected to do." Dr. Durand stressed the need of engineers in executive positions making quick decisions, but also pointed out the definition of a great man as laid down by Theodore Roosevelt which was, "A great man should be right 51 per cent of the time" would hardly hold good for a great engineer where accuracy is so necessary and so much depends on the correctness of design. His closing remarks were that we of the engineering profession, which is the oldest in the world, have received a lot from the past and must pass this knowledge on to the future generations much enriched by our efforts.

Quebec Branch

Louis Beaudry, S.E.I.C., Secretary-Treasurer.

The experience of preceding years has shown that luncheon meetings are more convenient to the members than the evening meetings. So, for the present year, two luncheons each month will be held instead of one luncheon and one evening meeting as in the past years. Special evening meetings will be held when the addresses require illustrations. The enlargement of the Chateau Frontenac being completed, the management of this hotel is now able to accommodate us for any of our meetings.

Exploitation of Forests

On Monday, January 12th, G. C. Piché, A.M.E.I.C., chief of the Provincial Forestry Service, was the speaker at a luncheon-meeting held at the Chateau Frontenac. Mr. Piché, at first, said a few words on the Forestry Engineering School of Laval University, which was the first to give the title of Forestry Engineer. Describing the duty of the forestry engineer, Mr. Piché stated that he should first be well acquainted with the nature of the forest in which he intends to work. He should have an accurate knowledge of the topography of that section of the country, using different instruments for this purpose as; surveyor's compass, planetable, transit, level, etc. He should study the health of the trees, the time of the growing, to determine the cutting operation.

The speaker likened the forest tree to an ordinary individual, saying that there is always a continual battle for life going on in the forest; the tree that is unable to attain a certain height through adverse surrounding does not receive the benefit of the sun, while if there should be lack of space at the base of the tree, it is unable to extend its roots. This, he said, is overcome when the underbrush is cleared away by the forester thereby cultivating the forest. This action tends to increase the average yield. Insects and mushrooms too, Mr. Piché said, are a great menace to the production of the forest. It is the practice to segregate these areas from the trees that are in "good health" after much the same manner as a man suffering from a contagious disease would be quarantined.

Mr. Piché was introduced to the gathering by our chairman, A. R. Décary, M.E.I.C., and at the conclusion of his address, he was accorded a hearty vote of thanks which was moved by Major Jules Duchastel de Montrouge, M.E.I.C.

Sault Ste. Marie Branch

W. S. Wilson, A.M.E.I.C., Secretary-Treasurer.

The annual meeting of the Sault Ste. Marie Branch was held on December 19th, at the Y.W.C.A., following a dinner enjoyed by members and guests, including Major Clayton and Capt. Maloney of the local post of Ontario Forestry Branch Air Service.

The chairman, Le Roy Brown, A.M.E.I.C., presided and called upon the secretary to read the minutes of the previous meeting, which were adopted. The reports of the Entertainment Committee and the Legislation and Remuneration Committees were read and adopted. The report of the Membership Committee was not available.

The scrutineers chosen at the last meeting to count ballots for election of the executive for 1925 announced their finding as follows:

Chairman, Wm. Seymour, M.E.I.C.
Vice-Chairman, C. H. Speer, M.E.I.C.
Committeemen, A. E. Pickering, M.E.I.C., (2 years).
Dr. C. V. Corless, M.E.I.C., (1 year).

As retiring chairman, Mr. Brown gave a brief resume of the year's activities, noting particularly the visit of Major Geo. A. Walkem, M.E.I.C., and the presentation of the branch charter and the appreciation of the executive and the branch of the work of C. H. Speer, M.E.I.C., of the Papers Committee. Nominations for auditors for 1925 resulted in the election of Messrs. Rounthwaite and Smallwood.

The chairman then called upon Captain Maloney to give an address on the work of the Ontario Forestry Branch Air Service* which was done with ability and was much appreciated by the members of the branch.

On motion of G. H. Kohl, A.M.E.I.C., a hearty vote of thanks was tendered to Capt. Maloney for the extremely interesting talk. This was followed by informal discussion and the meeting then adjourned.

Edmonton Branch

W. R. Mount, A.M.E.I.C., Secretary-Treasurer.

On December 12th, a large number of members with their friends listened with much interest to an address by Mr. Chard, provincial freight and traffic supervisor for Alberta.

The speaker went back to the early days of rate fixing explaining how some were arrived at and how others must have just grown. The several classifications of the present structure were gone into together with the purpose of various other rates. Mr. Chard gave some reasons why rates were apparently so high in Alberta, i. e., from far easterly and Pacific coast points, when compared with other parts of the Country. Alberta cities are seemingly too far west to feel much benefit from the "290 mile constructive rate" *on freight* coming from the east and so close to the easterly limits of the mountain differential rate that that rate is felt at almost full force.

The Crows Nest Pass agreement, its inception and present status was defined, and many members who were not already familiar with this much talked of agreement were enabled to more clearly understand same. Many instances of rate anomolies were quoted and some details given.

When moving a vote of thanks, Col. B. J. Saunders, M.E.I.C., was able to compare notes with 30 years ago in the West, and R. S. L. Wilson, A.M.E.I.C., summed up by seconding the vote.

Chairman Kells Hall, A.M.E.I.C., expressed the appreciation of all present before adjourning the meeting.

London Branch

E. A. Gray, A.M.E.I.C., Secretary-Treasurer.
R. I. Olmsted, A.M.E.I.C., Branch News Editor.

A special meeting of the London Branch was held in the office of the Department of Public Works, January 9th, 1925, at 4.45 p.m. The hour of meeting was unusual for the branch, but was arranged owing to various social events on that date.

Grading Aggregates and Proportioning Water for Concrete

Chairman Buchanan introduced the speaker, E. Viens, B.A., A.M.E.I.C., director of the laboratory for testing materials, Department of Public Works, Ottawa. Mr. Viens' lecture was confined to the subject of concrete, dealing particularly with the grading of aggregates and amount of water used in the mix. Mr. Viens had numerous analyses of gravel and sand samples taken from locations throughout Canada. These analyses showed the strength derived from the ungraded aggregate and the increased strength resulting from the proper grading of same, and proved conclusively what can be done to increase the strength of concrete by scientific grading of the aggregate. He also pointed out what can be accomplished by rigid inspection of concrete construction.

St. John Branch

W. J. Johnston, A.M.E.I.C., Secretary-Treasurer.

Again the citizens of St. John, showed their interest in the meetings of the St. John Branch when many attended a meeting on January 15th, and learned of "The Progress of the Admiral Beatty Hotel" as told by R. H. Macdonald, vice-president of Ross and Macdonald, architects, Montreal. The address was of timely interest as all the citizens are interested in St. John's new eight-storey hotel under construction. The need of this has long been felt to accommodate tourist and auto traffic during the summer, and during the winter the trans-Atlantic passenger traffic using this Canadian sea-port.

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* An abstract of this paper appears on another page of this issue.

Border Cities Branch

F. Jas. Bridges, A.M.E.I.C., Secretary-Treasurer.

The annual meeting of the Border Cities Branch was held Friday evening December 12th, in the Prince Edward Hotel, Windsor.

This was a dinner meeting and after a bounteous feed was tucked away by all present, the chairman, J. E. Porter, A.M.E.I.C., called for the reading of the minutes of the previous meeting. Following this, on the call for any new business, the secretary commented on the present branch by-laws with particular reference to the form of nominating and election of officers. This, he stated, seemed to be rather out of date inasmuch as all nominating and voting must be done at the annual meeting, thereby not granting any such privileges to the non-resident members of the branch. He felt that these members were entitled to some recognition and that a form of letter nomination and ballot ought to be adopted. This brought forth considerable discussion pro and con, the result of which was a motion put by J. E. Porter, A.M.E.I.C., and seconded by W. J. Fletcher, A.M.E.I.C., that the matter of revising the by-laws be left to a by-law committee to be chosen by the chairman for next year.

The chairman then called for the reports of the various officers and committees. The secretary read his report and also that of the treasurer. The chairman then gave a brief account of his office during the year, touching on the splendid co-operation of the different officers and committees of the year and he also dwelt on the time worn topic, that is of the evident lack of interest and enthusiasm shown by engineers when it comes to turning out to meetings. Reports of the Advertising, Membership and Papers and Entertainment committees were tabled. The reports of the different officers and committees were adopted as read.

Election of Officers

Following this the annual nomination and election of officers took place. The nominations for chairman were J.C. Keith, A.M.E.I.C., A.J.M. Bowman, A.M.E.I.C., W. Fletcher, A.M.E.I.C., and J. E. Porter, A.M.E.I.C., the latter withdrawing. Upon voting J. Clarke Keith, A.M.E.I.C., was elected. The nominations for vice-chairman were L. McGill Allan, A.M.E.I.C., and A. J. M. Bowman, A.M.E.I.C. Upon voting A. J. M. Bowman, A.M.E.I.C., was elected. F. Jas. Bridges, A.M.E.I.C., was nominated secretary-treasurer and as nominations were then voted closed he was elected. The three committee men elected were L. McGill Allan, A.M.E.I.C., W. J. Fletcher, A.M.E.I.C., and F. H. Kester, A.M.E.I.C.

Upon the completion of the elections the retiring chairman called upon J. Clarke Keith, A.M.E.I.C., chairman elect to take the chair.

A discussion then ensued regarding the advisability or otherwise of holding a ball this year. Due however to the lamentable lack of interest shown in the replies to the questionnaires sent out by the Entertainment Committee and also by the marked degree of discourtesy shown by the majority of the members in not even deigning to return the questionnaires, it was decided to drop the idea for this year.

The annual eruption then broke forth when several members, "faithful old reliables", deplored the utter lack of interest and co-operation so evident of many resident members of the Branch who had not shown enough interest in their profession to attend even one meeting during the year.

Niagara Peninsula Branch

R. Hogg, Jr.E.I.C., Branch News Editor.

A business meeting of the branch was held in Thorold on January 9th, with Chairman E. P. Johnson, A.M.E.I.C., in the chair.

The secretary submitted an annual report covering the year's activities, and the present membership and financial standing of the branch. Despite the loss of several members, during the past year, through the closing down of the Chippawa canal construction, a net gain of eight in membership is recorded.

Several members are much concerned over the injustice of the interpretation put upon the super-annuation act by the government, in that it bars from participation under the act, on some slight technicality, government engineers employed on the Welland ship canal. The introduction of this subject at the meeting gave rise to much discussion and a demand that every means be employed to force the government to deal fairly with these men. It was pointed out that the super-annuation scheme was self-supporting, also that some of those affected have been in government employ for as long as twenty years, and only during the last few years have they come under the prevailing rates schedule with respect to salary. The fact that they are at present paid under the prevailing rates schedule is supposed to be the ground for the governments ruling, although such has not been specifically stated. A motion was put to the meeting, amended and carried, by virtue of which a committee of two, F. S. Lazier, M.E.I.C. and E. G. Cameron A.M.E.I.C., will take the matter up with the council of *The Institute*, and for this purpose will attend the annual meeting at Montreal at the expense of the branch. The formation of a Membership Committee, a Proceedings Committee and a Fuel Committee completed the business of the evening.

The chairman then introduced W. L. Bramley of the Yukon, who spoke on "The Yukon of '97 and now".*

Mr. Bramley is spending a few months in Thorold after an uninterrupted sojourn of no less than twenty-seven years in the Yukon. He entered that country in 1897, fired by the tales of immense wealth to be had for the taking in the Klondyke region. Mr. Bramley did not make a speech. A speech was beyond the power of one who, for so long, had spent most of his time alone on the trail, or on the mountains where no trail existed. By dint of questions many interesting and some remarkable facts were learned.

Montreal Branch

E. A. Ryan, A.M.E.I.C., Secretary-Treasurer.
Ed. Prévost, Jr.E.I.C., Branch News Editor.

The Canadian Patent Act as affecting Engineers

On November 20th, Russell Smart, M.E.I.C., of Ottawa, a practising barrister of note as well as an engineer, gave an interesting talk on the Canadian Patent Act of 1923, and its bearing on the work of engineers.

The lecturer explained the difficulty arising in clearly defining an invention, for it involves not only the unquestioned settlement that the subject matter must be new, but also, in Canada, that it must be new all over the world and not "known to others".

The most important point in applying for a patent is a complete and definite specification, which explains to a certain extent the invention itself. The latter is also of considerable help in showing the monopoly to be granted. When duly issued, a patent grants to its owner a privilege lasting 18 years. Following United States practice, if many persons apply simultaneously for the same patent, the law provides for an arbitrator to decide who was the first inventor of the article, with the alternative of appeal to the Exchequer Court.

An interesting state of things was disclosed when Mr. Smart said that about 70 per cent of the patents granted in Canada were to United States inventors. A clause, to protect Canadian interests, specifies however, that within four years after granting the patent over 50 per cent of the product must be manufactured in Canada.

A lively discussion followed Mr. Smart's address, at the conclusion of which a vote of thanks was tendered by the chairman W. C. Adams, M.E.I.C.

Features of Montreal's New 20,000,000-gallon Reservoir

This important link in the extension of the aqueduct in Montreal was very ably explained on November 27th, by J. F. Brett, A.M.E.I.C., designing engineer of the Montreal Water Board. The new filtered water reservoir is situated on the property of the city in Verdun, and lies between the open canal and the filtration plant. It covers an area of 5 acres and is designed for 12½ feet of water under normal conditions. Its construction was carried out very economically notwithstanding adverse soil conditions, and the unit cost of $26,000 per million gallons was favorably commented on during the discussion.

This reservoir is to take care of the reasonably large fluctuations in pumping, but to cope with any abnormal demand of water, an emergency connection with the aqueduct has been provided. Numerous lantern slides were used to supplement the speaker's remarks.

The merits of Prof. Abrams', M.E.I.C., theories on reinforced concrete were the topic of some of the discussion. Messrs. C. M. Morssen, M.E.I.C., of the Atlas Construction Co., E. G. M. Cape, M.E.I.C., who built the reservoir, A. C. Tagge, M.E.I.C., of the Canada Cement and C. J. Desbaillets, M.E.I.C., chief engineer of the Montreal Water Board, brought forward interesting points of view. A hearty vote of thanks was conveyed to Mr. Brett by R. deL. French, M.E.I.C., consulting engineer, who presided.

Recent Developments in the Design of Fluid Flow Meters

A paper, describing various types of flow meters, was read before the branch on December 4th, by A. Craignon of the Canadian General Electric Co.

The speaker, who has done a vast amount of experimental work in the laboratories of the General Electric Company discussed the uses of different types of instruments and made known the theoretical principles involved in their operation. Numerous exhibits were presented as also slides illustrating tests, designs, adaptations, etc. The meeting was under the chairmanship of J. T. Farmer, M.E.I.C.

Cost of Electric Power

On Dec. 11th, P. T. Davies of the Southern Canada Power Company contributed a paper on the cost of electric energy. Mr. Davies divided the subject under three headings; cost of (a) production, (b) transmission, (c) distribution.

Many factors have to be considered in arriving at a figure on production cost. The topography and geology of the country, proximity to good roads or railroads, cost of materials and cost of money. In the last item, the speaker referred to the conditions under which the bonds are placed on the market.

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* An abstract of this paper appears on another page of this issue.

Cost of transmission is governed mostly by the price of materials. One dollar per horse power per mile is an average figure given by the lecturer for this.

Cost of distribution is the hardest to determine owing to the complexity of factors. Generally speaking it is of the order of $200. per horse power.

The discussion was opened by Dr. R. A. Ross, M.E.I.C., who emphasized the difficulty in arriving at unit costs which one would feel confident in applying. G. E. Templeman of The Electrical Commission of Montreal, quoted prices of materials from his own list to show how closely they agreed with those given by Mr. Davies. In the course of his remarks, the speaker said that electric service in rural districts is a paying proposition where fifteen modern farms can be counted to the mile. This condition does not exist in Canada, and in the United States only on part of the Pacific coast where irrigation of land is an important matter.

Mr. Woodyatt, general manager of the Southern Canada Power also spoke.

The Branch Annual Meeting

The branch held its annual meeting on December 18th. After the reading and adoption of reports from various committees, with pertinent comments on each, O. O. Lefebvre, M.E.I.C., retiring chairman, reviewed the principal activities and achievements during the year.

His address showed that the past year has been a prosperous one in many ways. It has seen the inauguration of a municipal section with Geo. R. MacLeod, M.E.I.C., as chairman, and also the issuance of the final report of the Fuel Committee-headed by F. A. Combe, M.E.I.C. The Hudson's Bay Railway question was carefully studied and discussed at largely attended meetings. The branch was fortunate in having as guests two distinguished engineers, Messrs. C. H. Mitchell, M.E.I.C., A. Pillsbury, both members of the St. Lawrence Deep Waterway's Board. Mr. Lefebvre extended to them a most hearty welcome, to which they replied in well chosen words.

The following members have been elected to the Executive Committee for the coming year:

J. L. Busfield, M.E.I.C., chairman (by acclamation).

C. J. Desbaillets, M.E.I.C., vice-chairman.

F. C. Laberge, M.E.I.C., P. L. Pratley, M.E.I.C., and J. Robertson, M.E.I.C. The last three replace F. A. Combe, M.E.I.C., D. C. Tennant, M.E.I.C., and A. C. Tagge, M.E.I.C., whose two-year term had expired. Others remaining as members for one year are: W. C. Adams, M.E.I.C., C. V. Christie, A.M.E.I.C., and P. S. Gregory, A.M.E.I.C.

In his address, J. L. Busfield, M.E.I.C., stated that his policies will be inspired by the efforts that met with such success under the retiring chairman's administration, in the hope that at the end of 1925 his own report may compare favourably with the one read this evening.

C. J. Desbaillets. M.E.I.C., fully endorsed the chairman's views and assured those present of his willingness to do everything in his power to promote the interests of the branch.

Peterborough Branch

P. Manning, A.M.E.I.C., Secretary-Treasurer.
W. E. Ross, A.M.E.I.C., Branch News Editor.

Annual Banquet

The scribe wishes to state that the account of the Annual Banquet, which appeared in the December issue of the Journal *was written by a "layman", Mr. F. H. Dobbin.*

Mr. Dobbin, although not a member of The Institute *has always taken a keen interest in our affairs and is a regular and welcome guest at our meetings. It occurred to the winter that it would be an excellent idea to have the account of the Annual Banquet written by a non-member and guest and Mr. Dobbin very kindly consented to act as reporter for this occasion, but modestly omitted to take credit, or to do more than briefly mention his own contribution to the evening's list of speeches.*

At the regular meeting of the branch, held December 11th, the members and friends of the Branch had the novel experience of taking a trip through Canada's Arctic territory without any of the discomforts incidental to such a journey.

The Arctic Expedition of 1923

This was made possible by the kindness of J. D. Craig, D.L.S., M.E.I.C., of the Department of the Interior, Ottawa, who brought to Peterborough six reels of wonderful films illustrating the Arctic Expedition of 1923, of which he was in command.

The speaker was introduced by A. L. Killaly, A.M.E.I.C., in a few well chosen sentences, after which Mr. Craig modestly stated that he did not intend to give an address as he was "merely sent out by the department to talk a little about the films as they were shown, as they have, as yet, no titles or sub-titles."

As a preliminary to the films, Mr. Craig indicated, with the aid of two maps thrown upon the screen, the extent of this little-known portion of Canada and gave a few figures regarding the exports, after which the films were run through.

These films form practically a complete photographic record of the voyage of the C.G. S.S. Arctic, Capt. J. E. Bernier commander, and of the expedition from the time of leaving Quebec city in July to the return in September to the same port.

The route followed was from Quebec to Gaspé Inlet, thence to Belle Isle, Labrador, from where they proceeded to Godhavn on the Greenland coast, then through Glacier strait to Craig harbour in Baffin Land. They then crossed again to Greenland to call at Etah, going north from there to Cape Sabine and reaching a point 72° 48′ north, but were unable to make a landing so turned south to Craig harbour and then to Beechey island, the headquarters of Sir John Franklin in 1846. From Beechey island the expedition passed through Lancaster sound to Button point, where witnesses for the trial of the Eskimo, Nukoodlah, were picked up and taken to Pond's inlet, where the trial was held and which was the last post visited before the homeward journey commenced.

The films depicted all the events of the journey and were made still more realistic and interesting by the very able description given by Mr. Craig during their showing.

The speaker gave short, but comprehensive accounts of the various places visited, the character and habits of the natives and of the work being carried on, by the Canadian government in Baffin Land and Labrador, and by the Danish government in Greenland.

At Godhavn, the expedition met the Danish explorer Rasmussen and at Etah the American explorer MacMillan.

A portion of the pictures show the ruins of Franklins' huts at Beechey island, the ruins of the boat left there for his use by search parties, and the Franklin cenotaph. Another film includes scenes at the trial of the Eskimo, Nukoodlah, on a charge of murder, before L. A. Rivet, K.C., of Montreal; also the construction of a police post at Pond's inlet.

At the close of the evening E. R. Shirley, M.E.I.C., chairman of the branch conveyed the thanks of the members to Mr. Craig for his most interesting and enjoyable discourse and for the opportunity afforded the branch of seeing and hearing about the activities of the far north.

Radio for Emergency Communicatian

On January 8th, another regular meeting of the branch was held in the Chamber of Commerce, at which meeting F. Keith D'Alton, B.A.Sc., gave a paper on "Radio for Emergency Communication".

Mr. D'Alton who is a graduate of S.P.S. Toronto is not unknown in Peterboro as he took the Student Engineers Course at the Canadian General Electric Company's plant here after graduation, later joining the staff of the Hydro-Electric Power Commission of Ontario, with whom he is now assistant laboratory engineer; and is in charge of the radio equipment used on the various sections of the H.E.P.C. systems. Mr. D'Alton's paper which was the same as that given before the London Branch on November 26th, and of which a résumé was given in the *Journal* for January was illustrated throughout with lantern slides and diagrams and proved most interesting.

After the paper the speaker answered a number of questions asked by the members, which indicated the general interest taken in the paper and the subject.

The meeting was under the chairmanship of A. B. Gates, A.M.E.I.C., and at the close E. R. Shirley, M.E.I.C., chairman of the branch moved a hearty vote of thanks to Mr. D'Alton.

Vancouver Branch

P. H. Buchan, A.M.E.I.C., Secretary-Treasurer.

E. I. C. Student's Prize Essay Competition

During the discussion of E. F. Carter's paper on "Grain Elevators and Grain Elevator Construction" at our general meeting of November 13th last, very great surprise and pleasure was aroused by two offers of cash prizes for students' essays on "Cargo Handling" from visitors at the meeting.

H. H. Broughton, M.Inst.M.E., consulting engineer, Vickers Limited, after having held the attention of the audience with some very interesting and amusing comments on the paper, digressed upon the subject of students' prizes and their value in encouraging the study of the practical problems of our national development by student engineers. As an expression of his personal approval of the work the executive of the Vancouver Branch had been doing during the past year in respect of the "Walter Moberly Memorial Prize" and the "A. D. Swan Special Book Prize", he stated that it gave him very great pleasure to donate fifty dollars to the Branch, to be awarded as a cash prize to the Student member of the branch who could write the best essay on "Handling of Bulk Cargo".

Before the hearty applause which greeted Mr. Broughton's generous offer had subsided, the meeting received a second surprise from another visitor, Mark R. Colby, president of the Colby Steel and Engineering Company, Seattle, Wash., who stated in very frank terms his appreciation of Mr. Broughton's attitude in this matter, and offered to supplement Mr. Broughton's donation with twenty-five dollars cash for the same worthy object.

James Muirhead, M.E.I.C., chairman, expressed the hearty appreciation of the branch for the generous support given by Mr. Broughton and Mr. Colby to our efforts in respect of Students' prizes; and in accepting their donations, he promised that the matter would receive the careful consideration of the executive at an early date.

The branch executive discussed this question at a meeting on December 10th, last, and came to the decision that a first and second prize would offer the greatest inducements to our Students to enter the proposed competition. Accordingly, the following circular was mailed to the Students of the Vancouver Branch on December 31st.

E.I.C. Students' Prize Essay Competition

First Prize — $50.00 - - Second Prize — $25.00

Competition closes March 31st, 1925.

"The above prizes have been donated by Mr. H. H. Broughton of Vancouver, consulting engineer, Vickers Limited, and Mr. M. R. Colby, of Seattle, president of the Colby Steel and Engineering Company, for the purpose of stimulating interest, particularly among student engineers in the problems involved in the economical handling of bulk materials such as grain, timber, ore, coal, oil, rock, gravel, etc., through the port of Vancouver.

"The conditions of the competition are as follows:

"1. The competition is open to Students of *The Engineering Institute of Canada*, who are either resident or district members of the Vancouver Branch.

"2. Competitors will be required to write an essay of approximately 5,000 words on "*Handling of Bulk Cargo*," well illustrated with sketches, drawings and photographs. Good magazine cuts, if neatly trimmed and mounted, will be accepted in lieu of actual photographic prints. Essays should be typed on white foolscap, double spaced, with 1½ inch left hand margin.

"3. In the marking of essays, other things being equal, due consideration will be given to correctness of spelling and composition, choice of English, general arrangement of matter and neatness.

"4. The competition will close on March 31st, 1925. Essays must be in the hands of the secretary-treasurer, Vancouver Branch, *The Engineering Institute of Canada*, 930 Birks Building, Vancouver, B.C., on or before the above date.

"5. The first prize will be fifty dollars ($50.00), cash, and the second prize, twenty-five dollars ($25.00).

"Issued by authority of the Executive Committee, Vancouver Branch, *The Engineering Institute of Canada*.

P. H. Buchan, A.M.E.I.C.,
Secretary-Treasurer.

930 Birks Building, Vancouver, B.C., January 1st, 1925."

As about fifty copies of the above circular were mailed, the Executive has hopes of a considerable number of entries for this most attractive competition.

Annual General Meeting

The annual general meeting of the Vancouver Branch was held in the auditorium of the Vancouver Board of Trade on December 18th, 1924, at 8.15 p. m. Thirty-eight members were present, which was a marked improvement on the attendance of the past two years at annual meetings. Jas. Muirhead, M.E.I.C., branch chairman, presided over the meeting.

The business part of the meeting was largely devoted to the hearing of reports and the election of officers. The chair appointed Chas. Brakenridge, M.E.I.C., and E. C. W. Lamarque, as scrutineers, who duly reported the result of the letter ballot as soon as the count was completed. At the close of the meeting, the secretary-treasurer wired the results to headquarters, for insertion in the January number of the *Journal*, which was on the eve of going to press.

Members of the branch are urged to read the Branch report for the year 1924, published on page 72 of this issue, because in it they will find an epitomized account of our transactions during the past year, including the question of branch quarters, library, and the disposal of the Moberly Fund. The treasurer's statement indicates an improved condition in our finances, which should afford our members same satisfaction and encouragement.

The latter part of the meeting was devoted to an illustrated lantern lecture by Herbert Vickers, M.E., M.Sc., Ph.D., head of the Department of Mechanical and Electrical Engineering, University of British Columbia, entitled "A Short Talk on Radio Communication". Long before the speaker had concluded his address, the audience became thoroughly convinced that Dr. Vickers' possesses a knowledge of the intricacies of "radio" which cannot do otherwise than prove his value as an addition to the scientific brains of our province. His remarks clearly demonstrated to the uninitiated, what a vast realm of new ideas and discoveries lies before those who are equipped with the knowledge necessary to undertake the investigations that will eventually lead to the perfection of this wonderful science; and as the speaker described the different kinds of apparatus and their functions in the transmitting and receiving of "radio" energy, it became easy to imagine the fascination which grips the experimenter in the unexplored regions of our scientific world

Town Planning Institute of Canada, Vancouver Branch

The annual meeting of the Vancouver Branch, "Town Planning Institute of Canada" was held at the University Club, on Thursday, December 11th, 1924.

The meeting was preceded by an informal dinner, those present being Dr. L. S. Klinck, president of the University of British Columbia, E. G. Baynes, W. Elgie Bland, Chas. Brakenridge, M.E.I.C., city engineer of Vancouver, F. E. Buck, Horace McFraser, W. B. Greig, A.M.E.I.C., municipal engineer of Point Grey, H. S. Griffith, E. B. Hermon, Thos. Killin, E. C. W. Lamarque, T. D. M. Latta, H. L. McPherson, resident engineer, Provincial Government Subdivision, West Point Grey, W. H. Powell, M.E.I.C., Arthur G. Smith, W. G. Swan, M.E.I.C., F. C. Underhill, J. T. Underhill, J. Alexander Walker, A.M.E.I.C., J. B. Winter, A. S. Wootton, M.E.I.C., engineer, Parks Board, Vancouver and W. Brand Young, A.M.E.I.C.

Ernest A. Cleveland, M.E.I.C., supervising engineer of the new Government Subdivision at West Point Grey and Councillor J. A. Paton of the municipality of Point Grey were guests of the branch. W. H. Powell, M.E.I.C., acted as chairman.

The result of the ballot for the election of officers during the year 1925 was as follows:

Chairman: G. L. Thornton Sharp.
Vice-Chairman: Arthur G. Smith.
Secretary-Treasurer: J. Alexander Walker, A.M.E.I.C.
Directors: John Elliott, W. B. Greig, A.M.E.I.C.
Ex-Officio Member of Council: Prof. Frank E. Buck.

During the past year the branch was represented on the joint Committee of cities and municipalities which had the task of framing the proposed Town-Planning Act. At the request of the committee, the bill was sponsored by the branch at the recent session of the provincial legislature at Victoria, but owing to the lack of support of the various civic bodies concerned, legislation did not follow, and the measure was laid over for one year.

Ottawa Branch

F. C. C. Lynch, A.M.E.I.C., Secretary-Treasurer.

Concrete Work

The Ottawa Branch of *The Engineering Institute of Canada* held a meeting in the University Club on the evening of December 18th when three short addresses were delivered on the subject of concrete. The meeting took the form of a general stock taking of the subject and, some discussions interesting to the engineers engaged in concrete work were listened to.

E. Viens, A.M.E.I.C., of the Public Works Department, Ottawa, spoke on the manufacture of concrete and pointed out the defects sometimes experienced in concrete work, because of inexperienced and unskilled workmen having done it. He said that Canada was well supplied with the raw material for making Portland cement. In Nova Scotia, and all the provinces there was more or less a scattered supply of the materials needed.

Alan K. Hay, A.M.E.I.C., of the Ottawa Suburban Roads Commission, spoke of the uses of concrete in road constructions and pavements, as well as its improved uses in the building of culverts and bridges today.

Howells Frechette, M.Sc., of the Mines Branch, Department of Mines, spoke on the requirements for making cement, stressing the importance of the local market for the product and the advantage of good transportation facilities to the establishment of the business. The gathering was presided over by K. M. Cameron, M.E.I.C. At the conclusion of the meeting light refreshments were served.

Wembley Exhibition

Vivid glimpses of the great British Empire Exhibition at Wembley were afforded the members of the Ottawa branch of *The Engineering Institute of Canada* at the luncheon January 8th in the Chateau Laurier. Fraser S. Keith, M.E.I.C., of Montreal, secretary of *The Institute*, was the guest of honour and the chief speaker, and his address was an interesting word picture of some of the main features of the Wembley Exhibition illustrated with excellent colored lantern slides which portrayed the outstanding features with singular effect. The speaker also interspersed his address with a number of humorous allusions which greatly pleased his hearers.

Mr. Keith was a member of the Canadian delegation to the World Power Conference last summer at Wembley, and he paid high tribute to the contributions made to the work of that conference by some Ottawa members, including J. B. Challies, M.E.I.C., John Murphy, M.E.I.C., G. Gordon Gale, M.E.I.C., and B. F. Haanel, M.E.I.C., Mr. Keith said that no other branch of *The Institute* did more at the power conference than did the Ottawa Branch.

A particularly interesting feature of Mr. Keith's address was the number of excellent pictures giving glimpses of the famous doll's house of Queen Mary, which revealed some very striking details of this ingenious conception.

J. L. Rannie, M.E.I.C., chairman of the Ottawa Branch of *The Engineering Institute of Canada*, presided at the luncheon, and, introducing the speaker, he paid high tribute to his work for that *Institute.*

Notes from the Branch Annual Meeting

A. F. Macallum, M.E.I.C., city commissioner of Works, was elected chairman of the Ottawa Branch, *Engineering Institute of Canada*, at the annual meeting in the Daffodil Tea Rooms, January 8th. Mr. Macallum succeeds J. L. Rannie, M.E.I.C., of the Geodetic Survey, the popular 1924 chairman who handed over the reins of office last night. The annual meeting of the society was a most enthusiastic one with about 100 members present to enjoy the fine programme and hear reports of a year of progress and good work.

F. C. C. Lynch, A.M.E.I.C., was re-elected secretary. New members elected to the management committee were Messrs. J. D. Craig, M.E.I.C., J. Albert Ewart, A.M.E.I.C., and S. J. Fisher, M.E.I.C. Members of the 1924 committee who continue in office for another year are R. J. Durley, M.E.I.C., and General A. G. L. McNaughton, A.M.E.I.C.

Despite several deaths within the society's membership and many removals the secretary was able to report a net gain of 44 in the membership. The Ottawa Branch is one of the most flourishing branches of the society in Canada having a total membership of 452.

An attempt is to be made to secure permanent club quarters for the society during this year. Messrs. G. Gordon Gale, M.E.I.C., L. H. Cole, M.E.I.C., and C. R. Coutlee, M.E.I.C., were named a committee to endeavour to co-operate with other scientific societies in the city with a view to obtaining quarters for a library and club. It was also decided to have lectures of a semi-scientific nature at the regular luncheons.

Fraser S. Keith, M.E.I.C., secretary of *The Institute*, presented the Ottawa Branch with its charter which it had not previously received although it has been an active society since 1909. Mr. Rannie accepted the framed scroll in the name of the branch.

In the chairman's annual address a year of unusual progress was gone over in retrospect. One of the unusual departures was the admittance to membership of many of the senior officers of the Royal Canadian Air Force. There was ample reason to believe that the prestige and consequent influence of the profession is being heightened as a result of the activities of *The Institute*, stated the chairman. He expressed the deepest regret felt by all members over the deaths of the following members during the year, Messrs. W. C. Way, W. A. Bowden, J. St. V. Caddy, Dr. E. G. Deville, J. H. Rheaume, L. J. R. Steckel, Lieut.-Col. F. O. Hodgins and R. F. H. Bruce.

On behalf of the members, O. S. Finnie, M.E.I.C., made a suitable presentation to the retiring chairman, J. L. Rannie, M.E.I.C. The press was warmly thanked for the reports of the various activities of the branch.

The entertainment during the evening was of high order. Several songs by N. T. Allen were loudly applauded. He was accompanied at the piano by R. L. Condy. Mr. Dick Finnie gave a fine exhibition of sleight-of-hand work.

Cape Breton Branch

D. W. J. Brown, Jr.E.I.C., Secretary-Treasurer.

The regular monthly meeting of the Cape Breton Branch was held in the rooms on Tuesday, January 13th, at which an illustrated talk was given on the "Uses of Electricity in Coal Mining" by C. H. Wright, M.E.I.C., past-chairman of the Halifax Branch, and district manager at Halifax for the Canadian General Electric Company.

Uses of Electricity in Coal Mining

The lecture covered very fully the types of motors used particularly in the coal mining industry for general purposes, ventilating fans, hoisting, cutting and locomotive underground haulage special interest being aroused in the new super-synchronous motor lately developed, whereby the stator can revolve during the starting period, allows rotor to start with full load coupled up and with 100% pull-in torque. When the stator is revolving at synchronous speed a brake is gradually applied and as it (the stator) slows down, the rotor, keeping in step, picks up speed until eventually when the former is fully braked to rest, the rotor is up to synchronous speed. In the discussion which followed, it developed that the only apparent advantage of this new type over the ordinary synchronous motor was a question of compactibility — the cost still remaining in favor of the standard type. The cycles of operation of the two types were practically the same (a) applying current to bring up to synchronous speed the stator in the one case and the rotor in the other, each having no load other than its inertia and (b) braking the stator in the former as against throwing in a clutch in the latter case. The question of variable speed also occasioned considerable discussion, as well as that of the so-called "Explosion Proof" motors.

The slides used had been specially brought up to date by the C. G. E., for this lecture, to whom the thanks of the Branch are due. A unanimous vote of thanks to Mr.Wright brought the evening to a close.

The weather man was most unkind to us on the night of meeting; a very stormy and disagreeable night indeed; and for this reason the attendance was small. In fact no members from the neighbouring miningtowns could be present. It was decided, therefore, that a meeting be held at Glace Bay on the following evening in order to give every member an opportunity to hear the lecture. The Dominion Coal Company kindly gave the use of their Official Club for this purpose. A general invitation was extended to all the officials of the local Coal Mining Companies, which resulted in an attendance of upwards of one hundred, making the meeting a most successful one. Unfortunately Mr. Wright could not remain over for this second meeting, but the lecture was read by E. L. Ganter, A.M.E.I.C., local representative of the C. G. E.

The next meeting of this branch will take place on Tuesday, February 10th, at which D. W. McDonald, superintendent, Sydney & Louisburg Railway, will read a paper in connection with railroad operation. At the March meeting (the 10th) E. L. Martheleur, M.E.I.C., chief electrical engineer, British Empire Steel Corporation, will read a paper on the selection and fitness of correct type of motors for various definite duties.

Moncton Branch

M. J. Murphy, A.M.E.I.C., Secretary-Treasurer.

The Moncton Branch was addressed on the evening of January 14th, in the City Hall, Moncton, by Professor Roy Fraser of Mount Allison University, Sackville, N.B. The subject of his address being "Biology and Public Water Supply".

Biology and Public Water Supply

In opening his subject the speaker sought to dispel the common belief that bacteria are the deadly enemy of mankind. On the contrary if bacteria failed in their work not only would growth and life cease, but even if it could proceed for a brief period the supply of raw material would soon be used up. It is only through decay that dead matter is made fit to support new growth and the processes of decay are brought about entirely by bacteria. So then if we had not the countless myriads of bacteria to work for us the world would shortly be a mass of dead and inert material. While we have, then, bacteria of a deadly nature, in the main they are our friends as they are the prime agents in the processes of life and growth.

Bacteriology and biology as sciences really began when the Hollander, Leeuwenhoek, (born 1632 died 1723) with a crude microscope looked through the previously unopened door of the world of bacteria. His researches were submitted to the Royal Society of Arts where his discoveries lay dormant for a long time but eventually came to light.

Important however as was Leeuwenhoek's work, it is to Pasteur that the world owes its deepest debt of gratitude. The speaker classed him as mankind's greatest benefactor in that his discoveries led to the control of diseases and epidemics. A monument to Pasteur's memory should be erected by all communities where men gather together to live, as he is their great protector.

A brief description of the disease content of water followed and the methods of analysis were outlined with emphasis laid upon the precautions that should be taken in collecting samples for analysis. The guarding of the water supply the speaker felt was a fundamental duty on the part of all municipalities not only from the humane but also from the economic standpoint as contamination of water supply can be as deadly or as wasteful as war itself.

An interesting feature of Professor Fraser's address was the projection upon the screen of pictures of living bacteria. This was done by a combined use of microscope and lantern with adaptations of his own invention.

Samples of cultures of bacteria were passed among the audience who were also permitted to inspect living germs under the microscope.

Victoria Branch

E. P. Girdwood, M.E.I.C., Secretary-Treasurer.

The Victoria Branch opened its winter programme on January 15th, with a meeting, at the Victoria College. It is the intention of the branch to have visits to the different municipal, and private plants in the district, of engineering interest, throughout the season, and have papers on technical engineering subjects, followed by general discussions which proved popular in the last season.

Water Powers

The provincial government of British Columbia has lately issued a book on Water Powers of British Columbia which reflects great credit on the Department of Lands, The Hon. T. D. Pattullo, Minister of Lands, Geo. R. Naden, Deputy Minister, E. A. Cleveland, M.E.I.C., Comptroller of Water Rights. The outstanding feature to an observer is the great amount of new data and increase in the number of water power sites available.

Preliminary Notice

of Applications for Admission and for Transfer

January 19th, 1925.

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in February 1925.

FRASER S. KEITH, Secretary.

*The professional requirements are as follows:—

A Member shall be at least thirty-five years of age, and shall have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office, or a term of instruction in a school of engineering recognized by the council. The term of twelve years may, at the discretion of the council, be reduced to ten years in the case of a candidate for election who has graduated from a school of engineering recognized by the council. In every case the candidate shall have held a position in which he had responsible charge for at least five years as an engineer qualified to design, direct or report on engineering projects. The occupancy of a chair as a professor in a faculty of applied science or engineering, after the candidate has attained the age of thirty years, shall be considered as responsible charge.

An Associate Member shall be at least twenty-seven years of age, and shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years. The occupancy of a chair as an assistant professor or associate professor in a faculty of applied science of engineering, after the candidate has attained the age of twenty-seven years, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council, shall be required to pass an examination before a board of examiners appointed by the council. The candidate shall be examined on the theory and practice of engineering with special reference to the branch of engineering in which he has been engaged. This examination may be waived at the discretion of the council if the candidate has held a position of professional responsibility for five or more years.

A Junior shall be at least twenty-one years of age, and shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the council, if the candidate for election has graduated from a school of engineering recognized by the council. He shall not remain in the class of Junior after he has attained the age of thirty-three years.

Every candidate who has not graduated from a school of engineering recognized by the council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects: geography, history, (that of Canada in particular), arithmetic, geometry, euclid (books I, IV and VI), trigonometry, algebra up to and including quadratic equations.

A Student shall be at least seventeen years of age, and shall present a certificate of having passed successfully an examination equivalent to the final examination of a high school or the matriculation of an arts or science course. He shall either be pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall not remain in the class of student for more than two years after graduation; or he shall be receiving a practical training in the profession, in which case he shall pass an examination equal to that prescribed for admission to the grade of Junior in the foregoing section and he shall not remain in the class of Student after he has attained the age of twenty-seven years.

An Affiliate shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience, qualify him to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

ALLISON—LAURIE MacCALLUM, of 134 Henry Street, Halifax, N.S. Born at Halifax, N.S., May 16th, 1892; Educ., 1910-11, Dalhousie Univ. (Science); 1911-12, surveys, N.S. Road Commission; 1912-13, rodman and instr'man., and 1913-14, dftsman. on constrn., Dartmouth Deans Branch Line, Dept. Rlys. and Canals; 1914-18, overseas;1918-20, returned to position with Dept. Rlys. and Canals, acting as direct assistant to the engineer in charge W. A. Hendry, A.M.E.I.C., 1920-21, field dftsman. and office asst. to Russell Yuill, A.M.E.I.C., St. Lawrence Improvement survey, Dept. Rlys. and Canals; 1921-22, asst. engr., 1922-24, res. engr., N. S. Prov. Highways Board; Sept. 1924 to date, junior engr., Dept. Public Works, Halifax, N.S.

References: R. W. McColough, J. L. Allan, L. H. Wheaton, G. C. Reid, R. Yuill, O. S. Cox., C. B. McDougald, W. P. Morrison.

BRISTOL—WESLEY MALCOLM, of Halifax, N.S. Born at Madoc, Ont., Feb. 4th, 1880; Educ., Grad., S.P.S., Toronto, 1905; one year, 1904-05, ap'tice, Westinghouse Elec. Mfg. Co., East Pittsburg, Pa.; Employed as sales engr. for Canadian Westinghouse Co. for about 15 years. Present position, district sales manager, for maritime provinces.

References: C. A. Fowler, O. S. Cox, W. F. McKnight, C. H. Wright, K. L. Dawson, A. P. Theuerkauf.

BROWN—JAMES SUTHERLAND, Colonel C. M. G., D.S.O., of Ottawa, Ont. Born at Simcoe, Ont., June 28th, 1881; Educ., Matric. Simcoe Grammar School, 1900. 1901-03, read work prescribed by Univ. of Toronto, and student at law (article clerk) Various courses at Royal Schools of Instruction, including the long course at the R.M.C. in 1905. Commissioned to the Permanent Force from the N.P. Active Militia, June 1906. Attended Staff College at Camberley, England, graduating in 1914 as a "p.s.c."; Associated with various classes of engr. work as commissioned officer of the Permanent Force. Military Topographer. Staff work in connection with defence schemes, fortresses, mobilization and concentration and war organization; the military survey of Canada; collection, collation and distribution of military intelligence, including topographic and natural resources; At present, Director Military Operations and Intelligence, Dept. National Defence, Ottawa.

References: A. G. L. McNaughton, J. D. Craig, H. F. H. Hertzberg, J. R. Akins, A. C. Caldwell.

CRATCHLEY—REGINALD HENRY, of 626 Selkirk Street, Fort William, Ont. Born at Stroud, Gloucestershire, England, Nov. 1st, 1896; three years tech. training, Stroud Tech. Sch. 1917-18, R. A. F. School of Aeronautics for Officers, 1920-21, Univ. Corres. College, Cambridge, Eng. 1910-14, pupil in all depts., of workshops and drawing office, Messrs. G. Waller & Son, Stroud, Eng.; 1915-19, military service, 2nd Lieut. R.A.F.; 1919-21, designing jigs, tools and automobile details, Hampton Engrg. Co., Stroud; 1921-22, steam pump design and jigs, Whitehead Torpedo Works, Weymouth, Eng.; One year, corres. clerk, (temporary), with Ministry of Pensions and Labour, England; At present dftsman. on grain elevator work, C. D. Howe & Co., Port Arthur, Ont.

References: G. H. Burbidge, R. B. Chandler, W. H. Souba, M. W. Jennings, G. Blanchard.

DAVIS—GEORGE H., of 180 Halmer Road, Toronto, Ont. Born at Toronto, Ont., Feb. 28th, 1881; Educ., one term, S.P.S., Toronto; two terms, Toronto Tech. Sch., Private study; 1905 to 1918, with C.P.R. as follows: 1905-06, rodman, etc., prelim. and final location, Georgian Bay & Seaboard Rly.; 1906-07, rodman, leveller, dftsman., prelim. location, Campbellville Lake Ontario & Western Rly.; 1907-09, dftsman., instr'man., etc., constrn., Georgian Bay & Seaboard Rly, including Port McNicoll terminal, docks, and elevators; 1909 (Oct.-Dec.), dftsman. for divn. engr. of constrn. Toronto; 1909-10, dftsman. for dist. engr., Ontario District; 1910-12, in charge constrn. double track work, Lambton to mileage 10 Galt subdivision, and constrn. of Mimico cut-off; 1912, asst. engr. of terminals, 1912-13, divn. engr., Toronto terminals, 1913-15, asst. dist. engr., Ontario district, 1915 (Feb.-May), divn. engr., Toronto terminals, 1915-18,asst. dist. engr., Quebec district; At present,asst. dist. engr., Ontario district, C.P.R., Toronto, Ont.

References: B. Ripley, J. M. R. Fairbairn, J. W. Orrock, P. B. Motley, A. C. Mackenzie, J. E. Armstrong, J. E. Beatty.

DICKENS—HARRY B., of 342-A Oakwood Avenue., Toronto, Ont. Born at Nottingham, England, May 17th, 1892; Educ., surveying and mapping, I.C.S.; 1907-08, map dfting., Geo. Gibbons & Co., Leicester, England; 1913-15, surveyor and asst. mgr., Amiri Tin Mine, Nigeria, West Africa; 1915-19, active service in Cameroons and Nigeria; 1921, dftsman., Underwriters' Survey Bureau, Toronto; 1923, instr'man. in charge survey dfting., Frank Barber & Associates, Ltd., Toronto; 1924, instr'man., East York Township; At present dftsman., York Township.

References: F. Barber, F. B. Goedike, O. M. Falls, W. C. Lumbers, J. H. Curzon, J. McAdam, C. S. Whitney.

DORAN—HENRY T., of 24 Springfield Avenue; Westmount, Que. Born at Stellarton, N. S., Feb. 9th, 1882; Educ., mech. course, I.C.S., elect'l. course, N.S. Tech. Coll., mining course, Dalhousie Evening School; ap'ticeship. in mach. shop of Acadia Coal Co. Ltd.; 5 years, machinist and mech. dftsman., and 13 years as chief dftsman., chief engr. and later as gen. mech'l. supt. of the New Glasgow plant, Nova Scotia Steel & Coal Co. Ltd.; 2 years, supt. of shell forging, Leaside Munitions Co. Ltd., Leaside, Ont.; 2 years, chief engr., Canadian Electric Steel Co. Ltd.; At present, sales engr. Dominion Flow Meter Co. Ltd., Montreal, Que.

References: H. D. Chambers, J. S. Cameron, N. M. Campbell, D. H. McDougall, A. L. Morgan, R. E. Chambers.

HODGSON—SYDNEY SCARTH, of Esquimalt, B.C. Born at London, England, Sept. 22nd, 1887; Educ., 1904-09, ap'ticeship to Vauxhall & West Hydraulic Engrg. Co. Ltd., London & Luton, marine and hydraulic engrs., and attending evening classes at Polytechnic; 1909-12, marine engr., Bushnall Steamship Lines Ltd.; 1912, obtained Board of Trade Marine Engr's. cert. and proceeded to South Africa. Employed in various capacities in engrg. dept. of subsidiary companies of "Consolidated Goldfields of South Africa", including from 1913-17, erection and charge of heavy workshop machinery, and shop foreman; from 1917-20, in charge of power station containing Babcox & Wilcox water tube boilers and Parsons Turbo-Alternators, from 1920-23, in charge of drawing office and all constrn. work consisting of extension to battery house and stamp batteries, Crowe-Merrill Vacuum de-aerating plant and new mechanical mine haulage plant, making own plans for all above work; July 1923 to date, engaged on design and general layout of pumping plant, bldgs., etc., for New Esquimalt Dry dock, B.C., local manager for Hodgson, King & Marble, Vancouver.

References: J. P. Hodgson, W. O. Marble, J. P. Forde, E. E. Brydone-Jack, G. B. Mitchell.

JAMIESON—WILLIAM, of Powell River, B.C. Born at Liverpool, England, Feb. 17th, 1875; Educ., Engrg. diploma, Liverpool Univ., 1895. Articled pupil to city engr. of Liverpool, 1892-97. Assoc. Member Inst. C.E. 1901. Assoc. Member Inst. E.E. 1909; 1897-98, asst. engr., sewerage dept., Liverpool Corpn.; 1898-1901, asst. engr. to consltg. engr., sewerage and waterworks, Westminster, S.W.; 1900, with British troops in South Africa; 1901-04, res. engr. for the British Electric Traction Co. Ltd.; 1904-05, constrn. engr., Bruce Peebles & Co. Ltd., of London and Edinburgh; 1905-10, supt. engr., and agent with full P.A. for concessionaire in China, Shanghai Tramways, foreign concession and for contractors French Concession Tramways; 1910-23, in British Columbia as follows: engrg. staff, Kettle River Valley Rly; waterworks engr. and supt., district of North Vancouver; mill constrn., Vancouver Portland Cement Works, Tod Inlet; engrg. staff, Pacific Great Eastern Rly.; acting res. engr., Link River Dam & Penstocks, Ocean Falls; locating engr., Houghton Constrn. Co.' logging rly., North Bentick Arm; supt., Mandey Rowland & Co., pipe line and intake for water supply, Port Mellon; res. engr., The Taylor Engrg. Co., Dolly Varden Rly., Alice Arm; surveys and prelim. works for proposed rolling mill at Dulwanit and concrete road constrn., Charleston, Wash., U.S.A.; At present engineering staff, Powell River Pulp & Paper Co., and in charge of inspection work on extension of Powell River Dam.

References: J. S. Connell, A. K. Robertson, F. P. Wilson, A. McCulloch, J. McHugh, J. T. Farmer.

JOHNSTONE—RALPH GEORGE, of Halifax, N.S. Born at Halifax, Dec. 3rd, 1900; Educ., B.Sc. (E.E.), N.S. Tech. Coll., 1924; road constrn., Prov. Highways Board, Nova Scotia; At present, elect'l. dept., Newfoundland Power & Paper Co., Cornerbrook, Nfld., in charge of elect'l equipment for new plant now under constrn.

References: W. F. McKnight, F. R. Faulkner, D. W. Munn, W. G. Hardy, C. Bang.

LOCKE—THOMAS JOHNSON, of 109 Oxford Street, Halifax, N.S. Born at Lockeport, N.S., Sept. 8th, 1872; Educ., B.A. Acadia Univ., 1891; 1891-94, with Dr. Martin Murphy, M.E.I.C., in office of prov. engr., at Halifax; 1894-98, res. and divn'l. engr. Coastal Rly. at Yarmouth, N.S., etc.; 1898 to date, with Dept. Public Works, Canada, as res. engr., Halifax, later dist. engr., Halifax & Shelburne, and from Oct. 1923 to date, dist. engr. for Nova Scotia, at Halifax.

References: C. E. W. Dodwell, W. P. Morrison, F. R. Faulkner, F. W. W. Doane, C. H. Wright.

McLELLAN—HAROLD ELMER, of Montreal, Que. Born at Souris, P.E.I., June 24th, 1893; Educ., B.Sc. McGill Univ. 1919; Summers 1915-17, (16 mos. in all), rodman, car ferry terminals, Port Borden, P.E.I., Dept. of Rlys. and Canals; 1918 (May-Sept.), inspr. on reinforced concrete constrn., laying out and supervising work and preparing estimates; 1920-23, inspr. and transitman under harbour engr., Can. National Rlys. at Port Borden, P.E.I. and Cape Tormentine, N.B.; Dec. 1923 to date, engr. in charge of laboratory conducted by the Committee on the Combustibility of Roofing Materials, Dominion Fire Prevention Assn., Montreal, Que.

References: H. M. MacKay, R. DeL. French, F. B. Fripp, C. S. G. Rogers, A. Scott.

SCOTT—JAMES STANLEY, of 92 Driveway, Ottawa, Ont. Born at Quebec, Que., Feb. 18th, 1889; Educ., Private tuition. R. A. F. Staff College, Andover, England. Course, R. M. C. Kingston; asst. engr. with Laurentide Power Plant; March 1916, granted commission, Royal Flying Corps, August 1916, Captain, June 1917, Major, Sept. 1918, Lieut.-Col.; Nov. 1919, appointed supt., Certificates Branch and Controller Civil Aviation, Air Board; August 1921, appointed Wing Commander, C.A.F.; August 1922, in command, Camp Borden; 1922 (Oct.-Dec.), Kingston; 1923-24, staff college, England; May 1924, acting director, R.C.A.F., Ottawa.

References: G. Roy, D. R. Cameron, A. C. Caldwell, E. W. Stedman, A. G. L. McNaughton, E. Forde.

FOR TRANSFER FROM CLASS OF ASSOCIATE MEMBER TO MEMBER

CAMERON—DONALD ROY, of Ottawa, Ont. Born at London, Ontario, Jan. 14th, 1888; Educ., B.A. McGill Univ. 1909. B.Sc.F. Univ. of Toronto, 1914; 1911, in charge forest surveys and explorations, Lesser Slave Lake country; 1912-22, district forest inspector, in charge of administration and protection in rly. belt of B.C. 1920 inaugurated use of aircraft in forestry work in B.C.; Nov. 1922 transferred to head office of Dominion Forest Service, Dept. of the Interior. At present alternating with Mr. E. H. Finlayson as acting director.

References: C. Camsell, F. H. Peters, J. L. Rannie, B. F. Haanel, J. McLeish.

FOR TRANSFER FROM STUDENT TO HIGHER GRADE

CULPEPER—BERNARD ARMEL, of Port Arthur, Ont. Born at Barbados, B.W.I., Jan. 4th, 1896; Educ., B.Sc. (E.E.), McGill Univ. 1923. British Assn. Medal; 1914-17, asst. and partner with J. G. Wilson, land surveyor, Barbados, 1915, Govt. Land Surveyor's Cert., Barbados; 1917-19, 2nd Lieut., Imperial Army; 1920 (May-Sept.), instr'man., river survey, Spanish River Pulp & Paper Co.; 1923 (June-Dec.), steel detailing, mill bldgs., and transmission towers, Canadian Bridge Co., Walkerville, Ont.; 1924 (Jan.-Apr.), and Sept. 1924 to date making and checking drawings for grain elevators, C. D. Howe & Co., Port Arthur, and April to Sept. 1924, inspr. and asst. to engr. in charge of constrn. of grain elevator for same company.

References: H. M. MacKay, R. B. Chandler, M. W. Jennings, W. H. Souba, E. Brown, C. D. Howe.

CUNNINGHAM—A. IRWIN, of Three Rivers, Que. Born at Montreal, Que., March 23rd 1893; Educ., B.Sc. (Civil), McGill Univ. 1914; Summers—1911-13, leveller, C.P.R., 1914, instr'man., Paper mill constrn., Bathurst Lumber Co., 1915, surveys and design car sheds, G.T.R., Port Huron, Mich.; 1915-19, overseas, Capt., Can. Seige Art'y.; 1919-22, field engr., St. Maurice Lumber Co., paper mill, Three Rivers, Que.; 1922-23, field engr., power house, Sherman Island hydro-electric divn., Glen Falls, N.Y., for Parklap Constrn. Corpn.; 1923-24, res. engr., feeder dam hydro-electric divn. during constrn., Moreau Manufacturing Corpn., Glen Falls, N.Y.; August 1924 to date, in charge of constrn., St. Maurice Lumber Co., paper mill, Three Rivers, Que.

References: A. H. White, H. Holgate, J. J. O'Sullivan, F. W. Taylor-Bailey, L. E. McCoy, F. O. White, E. G. M. Cape.

DUNCAN—JAMES EDGAR, of 3210 W. Arthington Street, Chicago, Ill. Born at Vankleek Hill, Ont., April 7th, 1897; Educ., B.Sc. (E.E.), Univ. of Man., 1923; 1916-19, overseas; From graduation to date, with Western Electric Company, Hawthorne, Ill., 1923-24, equipment engr. on panel machine switching system, 1924-25, development engr. on magnetic materials investigation.

References: R. W. Boyle, E. P. Fetherstonhaugh, R. S. L. Wilson, C. A. Robb, N. M. Hall.

STROYAN—PHILIP BATEMAN, of 4312 Dundas Street, Vancouver, B.C. Born at Derby, England, Dec. 17th, 1900; Educ., B.A.Sc., Univ. of B.C., 1924; Summers, 1921-22, Vancouver water works; R. R. location, Capilano Timber Co.; 1923, transitman and dftsman., Vancouver Hydro-Electric Investigation; June 1924 to date, dftsman., Sydney E. Junkins Co., Vancouver, B.C.

References: J. B. Riddell, J. R. Grant, W. H. Powell, A. Lighthall, E. G. Matheson.

Engineering Index

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A

ABRASIVE WHEELS

BALANCE. Grinding Wheel Balance, H. Darbyshire. Eng. Production, vol. 7, no. 146, Nov. 1924, pp. 319-324, 6 figs. Notes on dynamic balance; balancing a wheel; internal grinding wheels; balanced wheels for surface grinding; grinding copper; difficulty of grinding tubing; wheel crumbling; sizing devices, etc.

AERODYNAMICS

WATER-CHANNELS FOR RESEARCH. The Case for the Revival of the Water Channel, N. S. Norway. Roy, Aeronautical Soc. — Jl., vol. 28, no. 167, Nov. 1924, pp. 647-652. Discusses ways in which improvement in design of airplanes may be effected; in author's belief, water channel is most suitable means of carrying out study of flow about machine.

AIR

DUSTS AND SMOKES DETERMINATION. The Use of Owens' Jet Dust Counter and of Electric Precipitation in the Determination of Dusts, Fumes, and Smokes in Air, P. Drinker and R. M. Thompson. Am. Soc. Heat. and Vent. Engrs.—Jl., vol. 30, no. 11, Nov. 1924, pp. 695-710, 14 figs. Classification of dusts, fumes, and smokes is suggested and is based on size of particles and methods by which they are liberated into air. Describes Owens jet dust counter, and discusses its usefulness in general dust problems. Discusses electric precipitation in its theoretical and practical aspects as applied to small precipitators for determination of dusts, fumes, and smokes in air. Describes method of mounting transparent celluloid foils on which particles have been precipitated.

AIR COMPRESSORS

STEAM-DRIVEN. Two-Stage Steam-Driven Air Compressor. Engineering, vol. 118, no. 3072, Nov. 14, 1924, pp. 690-692, 3 figs. Plant constructed by Browett, Lindley & Co., consists of vertical compound steam engine above which cylinders of 2-stage air compression are mounted.

AIRPLANE ENGINES

ACCESSORIES. Airplane Engine Accessories (Les accessoires des moteurs d'avions), J. A. Lafranc. Nature, no. 2639, Nov. 1, 1924, pp. 275-285, 13 figs. Discusses transmission of power to airscrews, two-and four-blade screws, motor starting, cooling and mounting of engines, and fuel feeding.

OIL CLEANING. An Effective Method of Cleaning Engine Oil, G. D. Angle. Aviation, vol. 17, no. 24, Dec. 15, 1924, pp. 1398-1399, 3 figs. Results obtained on W1A engine, making use of centrifugal cleaning principle; advantages of use of oil plugs.

AIRPLANE PROPELLERS

THEORY. Aerodynamics of Driving Screws (Zur Aerodynamik der Treibschraube), H. B. Helmbold. Zeit. für Flugtechnik u. Motorluftschiffahrt, vol. 15, nos. 13-14 and 15-16, July 26 and Aug. 26, 1924, pp. 150-153 and 170-173, 5 figs. Discusses profile and movement of propeller in air current; develops formulas for velocity, etc., and applies them to calculation of efficient propellers; performance loss through profile resistance; frictionless propeller; design of propeller and development of theory.

AIRPLANES

FOCKE-WULF. The Focke-Wulf Cabin Plane. Aviation, vol. 17, no. 23, Dec. 8, 1924, p. 1371, 2 figs. Machine is equipped with 75-hp. Siemens-Halske engine and carries 3 passengers besides pilot; it is a cantilever monoplane with wing built in single piece; fuselage is built entirely of wood.

HOLLAND H-1. The "Holland" Light 'Planes. Flight, vol. 16, no. 46, Nov. 13, 1924, pp. 722-724, 4 figs. Principal characteristics of Holland H-2. Brief description of Holland H-1, a two-seater tractor biplane, fitted with a 35-hp. 3-cycle Anzani engine; span 25 ft. 6 in., length 21 ft., wing area 150.6 sq. ft.

MARTIN. The Martin Model 70 Commercial Biplane. Flight, vol. 16, no. 43, Oct. 23, 1924, p. 685, 1 fig. Particulars of machine designed for either cargo or passenger carrying; fitted with 200-hp. Wright model E4 engine, has speed range of 45-112 m.p.h., with pay load of 750 lb., and cruising range of 550 miles; span 38 ft., overall length 27 ft., height 12 ft.

METAL. Metal Construction for Aviation (Le costruzioni metalliche in aviazione), R. Giacomelli. Ingegneria, vol. 3, no. 10, Oct. 1, 1924, pp. 348-356, 41 figs. Discusses wing construction; all-metal construction in Germany, France and other countries, including Junkers, Dornier, Rohrbach, Levasseur, etc.

PILOTLESS. Pilotless Airplanes, E. Marcotte. Mech. Eng., vol. 46, no. 12, Dec., 1924, p. 898. Discusses recent progress in telemechanics, with particular application to problem of pilotless flight; problem of stability in air; automatic control in starting; other problems and possibilities. (Abstract.) Translated from Arts & Metiers, vol. 77, no. 45, June, 1924, p. 210.

WING-SPAR VIBRATION. Some Experiments on the Vibration of Bars, E. F. Relf. Lond., Edinburgh & Dublin Philosophical Mag. & Jl. Sci., vol. 48, no. 286, Oct. 1924, pp. 646-653, 3 figs. Work undertaken to throw light on questions relating to practical problem of vibration in airplane wing spars.

AIRSHIPS

HANGARS. *See Hangars.*

WATER RECOVERY FOR. Water Recovery for Airship, H. F. Parker. Soc. Automotive Engrs.—Jl., vol. 15, no. 6, Dec. 1924, pp. 532-535, 2 figs. Describes how total weight of airship becomes less as its flight continues, and gives details of means used to counteract this rising tendency: reviews experimental work that led to equipment of Shenandoah with water-recovery apparatus, and results following its installation.

ALLOY STEELS

CORROSION-AND-HEAT-RESISTANT. Alloys Resistant to Heat and Corrosion, J. H. G. Monypenny. Soc. Glass Technology—Jl., vol. 8, no. 31, Sept. 1924, pp. 150-162, 5 figs. Account of useful mechanical properties of some alloys, used for valves and other fittings for steam service and to such articles as rams, pump rods and valves for hydraulic pumps and presses, with indication as to how they may be utilized, deals principally with stainless steel.

Stainless, Non-Corrosive Alloy Steels Meet Exacting Chassis and Body Requirements. Automotive Industries, vol. 51, no. 22, Nov. 27, 1924, pp. 937-938. Abstract of booklet on non-corrosive and heat-resisting steels issued by Crucible Steel Co. of Am., in which various steels of this type manufactured by company are described and subject discussed in general way.

ALLOYS

ALUMINUM. *See Aluminum Alloys.*

BEARING METALS. *See Bearing Metals.*

BRASS. *See Brass.*

CORROSION-RESISTING. Tests for Grading Corrosion-Resisting Alloys, Wm. E. Erickson and L. A. Kirst. Am. Electrochem. Soc.—advance paper, no. 27, for mtg. Oct. 2-4, 1924, pp. 427-434. Results of experiments undertaken in hope of separating alloys into several groups according to their resistance to corrosion; of common metals, silicon and chromium appear to be most resistant to corrosion; addition of either or both of these elements to iron reduces corrodibility very appreciably.

IRON. *See Iron Alloys.*

NICKEL. *See Nickel Alloys.*

NON-FERROUS. *See Non-Ferrous Metals.*

STRUCTURAL COMPOSITION, DETERMINATION OF. Determination of Structural Composition of Alloys by a Metallographic Planimeter, E. P. Polushkin. Am. Inst. Min. & Met. Engrs.—Trans., no. 1387-E, Dec. 1924, 19 pp., 11 figs. Shows that structural composition of alloy may be found by planimetric measurement of total area occupied by each of constituents on a few representative photomicrographs of this alloy; when area is determined, volume and proportional weight of constituent may be calculated; method has been used for determination of structural composition of binary eutectics and other binary alloys with known constituents; also composition of unknown constituents in binary alloys.

ALUMINUM

CASTINGS. Aluminum Castings, C. Dicken. Foundry Trade Jl., vol. 30, no. 432 Nov. 27, 1924, pp. 466-468 including (discussion). Selection of metal; melting details; temperature; patterns; tunning; molding; blow-holes.

FOUNDRY PRACTICE AND WORKING. Aluminum and Its Alloys. Metal Industry (Lond.), vol. 25, nos. 15, 18 and 20, Oct. 10, 31 and Nov. 14, 1924, pp. 351-353, 421-422, 4 figs., and 475-476, 3 figs. Oct. 10: Aluminum foundry practice. Oct. 31. Working of aluminum. Nov. 14. Corrosion and protection of aluminum.

WELDING. Soldering, Welding and Riveting of Aluminum (Löten, Schweissen, Nieten von Aluminium), H. Buschlinger. Praktische Maschinen-Konstrukteur, vol. 57, nos. 35 and 36, Sept. 16 and 23, 1924, pp. 481-482 and 492-495. Discusses most favorable conditions and gives suggestions for effective operation. Welding of aluminum castings.

ALUMINUM ALLOYS

CASTINGS FROM SHEET SCRAP. Aluminum Alloy Castings from Sheet Scrap, H. C. Knerr. Metal Industry (N. Y.), vol. 22, no. 22, Dec. 1924, pp. 481-482, 2 figs., and Metal Industry (Lond.), vol. 25, no. 20, Nov. 14, 1924, pp. pp. 470-472, 2 figs. Outlines methods by which very small foundry, started on experimental basis, succeeded in meeting requirements for sound and dependable aluminum-alloy sand castings, only scrap aluminum sheet and copper available at factory being used. (Abstract.) Paper read before Am. Foundrymen's Assn.

MAGNESIUM IN. Cast Alloys of Aluminium Containing Small Amounts of Magnesium, S. Daniels. Indus. & Eng. Chem., vol. 16, no. 12, Dec. 1924, pp. 1243-1249, 19 figs. Small additions of magnesium progressively increase strength and hardness of aluminum, but more rapidly decrease its ductility; heat treatment is not economically justifiable; describes metallography of several alloys.

ARCHES

DESIGN. The Design of Masonry and Concrete Arches, A. C. Hughes. Surveyor & Mun. & County Engr., vol. 66, no. 1709, Oct. 17, 1924, pp. 315-316, 1 fig. Reviews present position and, by a liberal reference to literature dealing with arches, presents a bibliography of information.

REINFORCED-CONCRETE, CENTERING FOR. An Economical Design for Concrete Arch Centers, A. F. Wynn. Eng. & Contracting (Buildings), vol. 62, no. 5, Nov. 26, 1924, pp. 1161-1166, 3 figs. Describes centering built in fall of 1922 for a bridge over Salmon River at Pulaski in New York State. Bridge is a two-rib open spandrel arch of 200 ft. clear span and rise of 26 ft. 6 in., distance from crown to river bed being about 40 ft.

AUTOMOBILE ENGINES

DESIGN, INFLUENCE OF FUEL ON. Fuels and Engine Evolution, W. R. Ormandy. Motor Transport (Lond.), vol. 39, no. 1030, Nov. 24, 1924, pp. 613-614. How present-day fuel condition sand requirements are likely to influence engine design.

DEVELOPMENTS. Automobile Engines: Evolution, Improvements and Tendencies (Le moteur d'automobile; Evolution, perfectionnements, tendances), Martinot-Lagarde. Technique Moderne, vol. 16, nos. 19 and 20, Oct. 1 and 15, 1924, pp. 629-632 and 669-675, 10 figs. Discusses fuels, two-and four-stroke engines, compression, form of explosion chambers, speed of rotation, construction of a normal engine, and present state of automobile construction.

FUEL-FEEDING PUMP. Magnetically Operated Bellows Pump Used as New Fuel Feeding Device, D. Blanchard. Automotive Industries, vol. 51, no. 24, Nov. 20, 1924, pp. 890-891, 3 figs. Device known as Autopulse magnetic fuel pump operates off storage battery on same principle as electric bell; is mounted directly carburetor and is said to maintain full supply regardless of grade or temperature.

STARTING, COLD-WEATHER. Danger of Scuffed Pistons and Oil Dilution Reduced by Gasoline Pre-heating Devices, P. M. Heldt. Automotive Industries, vol. 51, no. 22, Nov. 27, 1924, pp. 928-933, 10 figs. In starting a car cold, only most volatile portions of present-day fuels form ignitable mixtures; flooding engine is necessary unless preheating arrangement is provided; describes several types of electric primers.

SUPERCHARGING. Supercharging at Low Speeds. Autocar, vol. 53, no. 1519, Nov. 28, 1924, pp. 1103-1106, figs. Improving top gear performance and acceleration of a touring car. Actual results of careful tests on road and track.

AUTOMOBILE MANUFACTURING PLANTS

METHODS AND MACHINERY WORKERS. Machinery and Production in the Automobile Industry, M. W. La Fever. Monthly Labor Rev., vol. 19, no. 4, Oct. 1924, pp. 1-26. Results of study made by Bur. of Labor Statistics of changes in methods and machinery in automobile industry and in average resultant productive capacity of wage earner which have resulted from them; data were obtained from 25 automobile manufacturing plants regarding actual production per man before and after inauguration of improved methods, systems, machinery, decives, etc.

AUTOMOBILES

BRAKES. Another Air Brake. Motor Transport (Lond.), vol. 39, no. 1028, Nov. 10, 1924, pp. 559-561, 6 figs. Particulars of brake produced by Knorr Bremse A. G. of Berlin-Lichtenberg, introducing distinctive features, including different pressures for light and loaded running, tire filling, sanding and horn blowing.

Lockheed Develops Internal Brake of the Three-Shoe Type. Automotive Industries, vol. 51, no. 23, Dec. 4, 1924, p. 975, 1 fig. Actuated in same manner as in external hydraulic equipment, new device utilizes wrapping action between brake and drum to reduce required pedal pressure.

SERVICE METHODS. A Modern Motor-Car Service System, H. N. Davock. Soc. Automotive Engrs.—Jl., vol. 15, no. 6, Dec. 1924, pp. 562-566, 5 figs. Problems encountered in dealing with service at factory and in field; evolution and inauguration of standard specifications and prices; how proper use of them has been successfully met; education of dealers in use of standard specifications and prices.

SHIPPING. Preparing and Loading Automobiles for Shipment, B. R. Moore. Soc. Automotive Engrs.—Jl., vol. 15, no. 6, Dec. 1924, pp. 511-515, 9 figs. Procedure at plant; double and half decking; "side" and combination loading; inspection methods; oversea shipment; loss and damage.

AVIATION

ASTRONOMICAL METHODS. Astronomical Methods in Aerial Navigation, K. Hilding Beij. Nat. Advisory Committee for Aeronautics—Report, no. 198, 1924, 52 pp. 30 figs. Outlines various methods of determining positions and their application and value; résumé of theory of astronomical method; describes observation instruments; rapid method of finding position from altitudes of two stars; maps and map cases. Bibliography.

B

BARYTES

CANADA. Barytes Situation in Canada (1923). Can. Min. Jl., vol. 45, no. 46, Nov. 14, 1924, pp. 1119-1120. Data on sources, mining, uses, production, imports and exports, and Canadian and United States tariff.

BEARING METAL

RAPID ANALYSIS. Method for the Rapid Analysis of Bearing Metals (Eine analytische Schnellmethode für Lagermetalle), A. Bartsch. Chemiker-Zeitung, vol. 48, no. 99, Aug. 16, 1924, p. 577. Determination of antimony and tin; filtrate from copper is titrated with ferrocyanide for zinc, using acetic-acid solution of iron alum as external indicator.

BEARINGS, BALL

MINE-LOCOMOTIVE MOTORS. The Use of Ball Bearings on Mine Locomotive Motors, C. A. Atwell, Elec., Jl., vol. 21, no. 11, Nov. 1924, pp. 513-516, 8 figs. Reasons for their use; lubrication; amount and renewal of lubricant; removal and reapplication of ball bearings.

SPIRO. The Spiro Ball Bearing. Machy. (Lond.), vol. 25, no. 633, Nov. 13, 1924, pp. 210-213, 7 figs. Bearing with spiral series of balls for heavy loads at high speeds.

BEARINGS, ROLLER

COLLIERY EQUIPMENT. Roller and Ball Bearings for Colliery Equipment, R. H. Boyd. Colliery Eng., vol. 1, nos. 2, 3 and 5, Apr., May and July, pp. 93-95, 121-122 and 236-239, 24 figs. Discusses various types of anti-friction bearings available for use underground. Adoption of anti-friction bearings to above-ground machinery.

BELTING

CREEPING. A Discussion of Belt Creep and Its Effect on the Application of the Fundamental Belting Formula, R. F. Jones. Sibley Jl., of Eng., vol. 38, no. 7, Oct. 1924, pp. 173-175 and 185, 3 figs. Discusses slippage caused by elastic give and return of belt, called creep, slippage not due to elastic action, called true slip, and total slip, which is a combination of both creep and true slip, and their effect in calculation.

BOILER FEEDWATER

OIL ELIMINATION. Purification of Feed-Water Containing Oil, C. E. Joos. Power Plant Eng., vol. 28, no. 24, Dec. 15, 1924, pp. 1244-1247. Sources of contamination; effect of foaming and priming; corrosion; methods of detection and estimation; methods of elimination.

BOILER FURNACES

DESIGN AND OPERATION. Stokers and Furnaces. Nat. Elec. Light Assn., Serial Report of Prime Movers Committee, Aug. 1924, 45 pp., 70 figs. Developments during year; test data on three furnace air preheaters; mixing of gases in boiler furnaces; water-cooled and air-cooled furnace walls; rate of coal burning on various types of stokers; furnace construction; tests of refractories as to size and physical characteristics. Manufacturers' statements.

FORCED-DRAFT. The Burning of Colliery Refuse Fuels. Colliery Engr., vol. 1, no. 3, May 1924, pp. 148-149, 4 figs. Describes important modification of turbine forced-draft furnace.

BOILER OPERATION

CONTROL. Scientific Control of Steam Generation in Factories, H. S. Rowe. Mech. World, vol. 76, nos. 1976, 1977 and 1978, Nov. 14, 21 and 28, 1924, pp. 315-317, 332-333 and 348-349, 2 figs. Shows that application of principles of scientific control to continuous working under every-day conditions may be made to give results in keeping with high standard stated to be possible.

EFFICIENCY. Increasing Boiler Economy by Modern Methods, H. K. Blanning. Power Plant Eng., vol. 28, no. 24, Dec. 15, 1924, pp. 1236-1243, 6 figs. Describes work which has been going on at 60,000-kw. station at Lowellville, O., with aim of increasing efficiency and of raising power-producing capacity without additional installation of boilers or generators; clear view of operating floor from control house; gages placed for guidance of firemen; records are posted on blackboard; steam pressure is maintained practically constant.

BOILER PLANTS

INSTRUMENTS. Boiler Room Instruments as an Aid to High Efficiency, E. G. Bailey. Nat. Engr., vol. 28, no. 12, Dec. 1924, pp. 591-595, 4 figs. Instrument readings showing operating conditions; advantages of steam-flow-air-flow method.

BOILERS

A. S. M. E. CODES. American Steam Boiler Code (Amerikanische Dampfkesselvorschriften), Rich. Baumann. Zeit. des Vereines deutscher Ingenieure, vol. 68, no. 47, Nov. 22, 1924, pp. 1219-1223, 18 figs. Discusses important sections of new code and compares them with corresponding German specifications; specifications for plate, water tubes, copper and brass; specifications for design of boiler parts.

ELECTRICALLY HEATED. Electrically Heated Steam Boilers. Eng. & Boiler House Rev., vol. 38, no. 5, Nov. 1924, pp. 186-188, 3 figs. Their possibilities for increasing load factor.

Tests on Electric Boilers, C. Dantsizen and E. H. Horstkotte. Elec. Wld., vol. 84, no. 22, Nov. 29, 1924, pp. 1156-1157, 2 figs. Liberation of hydrogen in 5000-kw., 6600-volt unit found to be small and to cause no detrimental action.

HIGH-PRESSURE, DRY-STEAM PRODUCTION IN. Dry Steam and How to Produce It in High Pressure Boilers (La vapeur sèche et les moyens de la produire dans les générateurs à haute vaporisation), M. Bussac. Société des Ingénieurs Civils de France—Mémoires et Compte Rendu des Travaux, vol. 77, nos. 4-6, Apr.-June 1924, pp. 262-278, 4 figs. Describes a new boiler in which steam is much drier than usual, being produced by a much higher rate of evaporation.

LOCOMOTIVE. *See Locomotive Boilers.*

OPERATION AND TYPES. Boilers, Superheaters and Economizers, Nat. Elec. Light Assn., Serial Report of Prime Movers Committee, Sept. 1924, 57 pp., 80 figs. Principal features of many boiler installations made during past year in old as well as new stations. Describes combined boiler, superheater, economizer and air heater manufactured by Stahl Turbine Co. of Sweden. Effectiveness of soot blowing equipment. Operating results obtained at Lakeside Station of Milwaukee Elec. Ry. & Light Co. with a Foster economizer and radiant-heat-type superheater installed in connection with an Edge Moor boiler fired with pulverized fuel. Manufacturers' statements. Bibliography.

STAYBOLTS. The Expanded Boiler Bolt (Der Aufdornstehbolzen), A. Tross. Hanomag-Nachrichten, vol. 11, no. 128, June 1924, pp. 96-105, 25 figs. Older design, in which oversize threaded bolt was riveted at both ends, has been substituted by new type hollow bolt, which has an easy-fitting thread, and is expanded to a tight fit after being screwed in place between two boiler plates. Complete description of all processes involved.

WATER-LEVEL GAGES. A New Level Indicator. Engineer, vol. 138, no. 3597, Dec. 5, 1924, p. 647, 5 figs. Describes two types of gages made by Aster Eng. Co., Wembley, one for boiler work, and other for showing level in open tanks.

BORING MACHINES

JIG-AND-FIXTURE. Jig and Fixture Boring. Eng. Production, vol. 7, no. 146, Nov. 1924, pp. 332-334, 4 figs. Describes machine for high-precision work.

BRASS

HEAT TREATING. Experiments on the Heat Treatment of Alpha-Beta Brass, O. W. Ellis and D. A. Schemnitz. Min. & Metallurgy, vol. 5, no. 216, Dec. 1924, pp. 593-594. Experiments show that by reheating alpha-beta brass, which as result of quenching is retained at room temperature in condition of homogeneous beta solid solution, it is possible to cause precipitation of alpha in submicroscopic form. (Abstract.)

BRIDGES LIFT

BASCULE. The Johnson Street Bridge, F. M. Preston. Eng. Jl., vol. 7, no. 12, Dec. 1924, pp. 717-721, 3 figs. Details of construction methods and comparative costs of Johnson Street Bridge in Victoria, B.C.; bascules are erected on solid concrete piers carried on piles driven to rock.

BRIDGES, RAILWAY

TESTING. Dynamic Examination of Bridges (Dynamische Untersuchungen von Brücken), J. Geiger. Bauingenieur, vol. 5, no. 19, Oct. 1924, pp. 606-611, 13 figs. Discusses vibrations due to mass effect of locomotive driving, its mass pressure moment, deviation of wheels from circular shape, deviation of track from straight line, measuring apparatus for vibrations, methods and results of measurement.

BUILDINGS

INDUSTRIAL, PLANNING CONSTRUCTION PROGRAM. Planning the Construction Program, A. G. Anderson. Mgt. & Administration, vol. 8, no. 6, Dec. 1924, pp. 595-598, 6 figs. Value of specialized knowledge in industrial building.

BUILDING CONSTRUCTION

TUBULAR-STEEL SYSTEM. Steel Construction with the use of Tubular Members. Engineering, vol. 118, no. 3072, Nov. 14, 1924, pp. 674-675, 16 figs. Examples of structures built in Holland making use of tubular members; advantages claimed for method.

WEATHER CONDITIONS AFFECTING. Weather and Construction. Eng. & Contracting (Buildings), vol. 62, no. 5, Nov. 26, 1924, pp. 1175-1187, 2 figs. Results of study to determine average and extreme weather conditions affecting building construction in nine large cities. Gives tables of climatic conditions in these nine representative construction centers, with explanation of their use in planning all-year construction, prepared by Division of Building and Housing Dept. Commerce, Wash., D.C.

C

CABLEWAYS

JIG-BACK. Up-to-Date Jig-Back Ropeways, Geo. F. Zimmer. Indus. Mgt. (Lond.), vol. 11, no. 17, Nov. 1924, pp. 475-478, 6 figs. Describes jig-back line built for formation of spoil dumps which, it is claimed, would be efficient in vast majority of cases of spoil disposal; consists of driving terminal, steel lattice mast, intermediate trestle supports, rail and haulage ropes, and automatic tipping carriage.

CAR WHEELS

CAST-IRON. The Development of the Cast Iron Car Wheel, Geo. L. Fowler. Ry. & Locomotive Eng., vol. 37, no. 12, Dec. 1924, pp. 367-371, 8 figs. Outline of outstanding features in production of present day wheel.

CARBON DIOXIDE

ABSORPTION FROM GAS BUBBLES. Absorption of Carbon Dioxide and Ammonia from Gas Bubbles, P. G. Ledig. Indus. & Eng. Chem., vol. 16, no. 12, Dec. 1924, pp. 1231-1233, 8 figs. Deals with continuance of previous work upon absorption.

CARGO HANDLING

SHIP LOADING AND UNLOADING. How There May be Obtained the Greatest Speed in the Mechanical Discharging and Loading of Ships and Barges Burdened with Miscellaneous Cargo, H. McL. Harding. Wld. Ports, vol. 12, no. 7, May 1924, pp. 78-97, 3 figs. Discusses terminal design, slip design, quays, cranes, sheds, etc.

CARS, COAL

20-TON. The Great Western Railway's 20-Ton Coal Wagons. Colliery Eng., vol. 1, no. 8, Oct. 1924, pp. 364-368, 8 figs. On each 500 tons of coal conveyed in these wagons there is nearly 400 ft. saving in length of trains; their use uncreases capacity of private owners' sidings by 30 per cent.

CARS, FREIGHT

HOT BOXES. Hot Boxes on Freight Cars, E. von Bergen. Car Foremen's Assn. of Chicago—Official Proc., vol. 18, no. 9, Sept. 1924, pp. 18, 21-22, 25-26 and 29 and (discussion) 29-30, 33-34, 37-38, 41-42, 45-46 and 49-52. Discusses problem of combating hot boxes, and methods employed.

CARS, PASSENGER

SLEEPERS. Sleeping Car Service Begun by Interstate Public Service Company. Elec. Ry. Jl., vol. 64, no. 19, Nov. 8, 1924, pp. 801-803, 6 figs. Describes all-steel 10-section sleeping cars placed in service between Indianapolis and Louisville; extra long berths, with windows alongside uppers; large washrooms and easy riding qualities; 62 ft. long and 8 ft. 8½ in. wide; operated on a slow schedule with a layover before entering terminal.

CARS, REFRIGERATOR

LOW TEMPERATURE IN. Low Temperatures in Refrigerator Cars, M. E. Pennington. Ry. Age, vol. 77, no. 21, Nov. 22, 1924, pp. 947-950. Explains why fruit, vegetables and eggs should move at less than 50 deg. fahr.; light salting of ice said to be important. Paper presented at Int. Congress of Refrig. Industries.

CAST IRON

GRAPHITIZATION. The Graphitization of White Cast Iron, A. Yates, W. J. Diederichs and H. E. Flanders. Metal Industry (Lond.), vol. 25, no. 20, Nov. 14, 1924, pp. 479-480. Mechanism of graphitization; essentials for complete graphitization; shortened treatment adopted; production of intermediate products; commercial considerations of new treatment. (Abstract.) Paper read before Am. Foundrymen's Assn.

MANGANESE, INFLUENCE OF. The Influence of Manganese on Cast Iron, J. E. Hurst. Foundry Trade Jl., vol. 30, no. 430, Nov. 13, 1924, pp. 417-419, 1 fig. Condition of manganese in iron-carbon alloys; influence of manganese in iron-carbon-silicon alloys; hardness and shrinkage; soundness and fluidity.

NICKEL DETERMINATION IN. Analysis of Grey Iron Foundry Alloys. Foundry Trade Jl., vol. 30, no. 432, Nov. 27, 1924, p. 464. Determination of nickel in cast iron; solutions required; estimation.

PEARLITIC. Lauds Pearlitic Cast Iron, C. Irresberger. Foundry, vol. 52, no. 23, Dec. 1, 1924, pp. 941-943, 10 figs. Ascribes desirable properties to iron cast under close control as to analysis and cooling rate; structural differences noted.

PHOSPHORUS, INFLUENCE OF. The Influence of Phosphorus on Cast Iron, J. E. Hurst. Foundry Trade Jl., vol. 30, no. 431, Nov. 20, 1924, pp. 433-436, 10 figs. Deals with iron and phosphorus; iron, phosphorus and carbon; solidification of commercial phosphoric irons; influence of phosphorus on carbon, on melting point, and on strength properties; net work structure; phosphide segregations.

CASTINGS

COOLING, IMPORTANCE OF UNIFORM. The Importance of Uniform Cooling in Castings, F. C. Edwards. Metal Industry (Lond.), vol. 25, no. 22, Nov. 28, 1924, pp. 525-527, 5 figs. Gives two examples in which tensile stress was direct cause of fracture in one case, and shear stress in the other; in both cases stresses, has been induced by uneven cooling.

CEMENT

ALUMINA. Aluminous Cement in Practice, T. J. Gueritte. Contract Rec., vol. 38, no. 49, Dec. 3, 1924, pp. 1197-1198. Discusses practical precautions, effect of temperature, shrinkage, and action of chemicals, in connection with practical application of alumina cement.

HYDRAULIC. French Specification for Hydraulic Limes and Cement. Eng. Wld., vol. 25, no. 6, Dec. 1924, pp. 376-379, 2 figs. Specification covering test methods, conditions of acceptance, classification of quality, classification according to nature of product, recommendation for requirements of quality, and conditions of delivery. Translated from French.

CENTRAL STATIONS

DESIGN AND MAINTENANCE. Design and Maintenance of a 7500 Kw. Central Station Plant. Nat. Elec. Light Assn. Serial Report of Prime Movers Committee. Sept. 1924, 13 pp., 20 figs. Includes also manufacturers' statements.

ELECTRICAL DESIGN. Progress Evident in Station Electrical Design, R. E. Argersinger. Power Plant Eng., vol. 28, no. 23, Dec. 1, 1924, pp. 1204-1207, 3 figs. Summary of developments in electrical design as shown by large stations now nearing completion.

LARGE. The Economics of German Electricity Supply (Grundsätzliches zur deutschen Elektrizitätswirtschaft), G. Klingenberg. Zeit. des Vereines deutscher Ingenieure, vol. 68, no. 45, Nov. 8, 1924, pp. 1168-1170. Traces stages of centralization; points out that large central stations with comparatively low installation costs and technically and economically good operation are limited by high transmission costs; interconnection and extension of power plants through district federations; national co-operation only in the case of a few very large undertakings, especially hydro-electric and lignite works.

REMOTE CONTROL, SUPERVISORY SYSTEMS FOR. Supervisory Systems for Remote Control, J. C. Field, Elec. Communication, vol. 3, no. 2, Oct. 1924, pp. 134-144, 16 figs. Three types developed to meet three different operating conditions.

CHIMNEYS

DESIGN. Design of Chimneys and Stacks for Power Plant Boilers, W. E. Biggs and W. R. Woolrich. Nat. Engr., vol. 28, no. 12, Dec. 1924, pp. 585-588, 3 figs. Notes on reinforced-concrete and steel chimneys; draft produced by chimneys; effect of stack height on capacity.

DRAFT AND CAPACITY. Draft and Capacity of Chimneys, J. G. Mingle. Combustion, vol. 10, nos. 3, 4, 5, 6 and 7, and vol. 11, nos. 2, 3, 4, 5 and 6, Mar., Apr., May, June, Aug., Sept., Oct., Nov. and Dec. 1924, pp. 186-193, 270-278, 354-360, 424-431, 67-74, 134-144, 219-225, 289-293, 364-369 and 444-452 and 457, 78 figs. Mar.: Draft and its importance. Apr.: Theory of natural draft. May and June: Available draft and losses due to velocity and friction. July: Draft performance of chimneys. Aug.: Required draft and general draft equation. Sept.: Height of chimney. Oct., Nov. and Dec.: Theory of capacity.

CHROMIUM

USES. Chromium—Its Uses and Its Alloys, W. M. Mitchell. Blast Furnace & Steel Plant, vol. 12, nos. 8, 10 and 11, Aug., Oct., and Nov., 1924, pp. 372-375, 452-455 and 504-507, 13 figs. Use in steel industry for manufacture of alloy steels and heat and corrosion-resisting alloys. See also Forging—Stamping—Heat Treating, vol. 10, nos. 9 and 10, Sept. and Oct. 1924, pp. 357-359 and 373-374.

CITIES

CONGESTION IN. Study in Problems of Urban Growth, T. Adams and H. L. Seymour. Can. Engr., vol. 47, no. 22, Nov. 25, 1924, pp. 543-549, 3 figs. Forms and causes of congestion in modern cities; problems in Toronto; building and street congestion; sunlight and high buildings. Paper presented at Toronto mtg. of Brit. Assn. Applied Sci.

CITY PLANNING

ROUTE PLANNING. Changing the Horse-and-Buggy Road to Fit the Automobile, S. D. Waldon. Soc. Automotive Engrs.—Jl., vol. 15, no. 6, Dec. 1924, pp. 521-531, 10 figs. Describes master plan to which Detroit is endeavoring to make its street improvements conform, and offers suggestion that additional rights-of-way should be acquired at once; outlines plan for superhighway that will meet modern requirements and make rapid operation safe.

CLUTCHES

AUTOMATIC CENTRIFUGAL. The Design and Operation of the Lancashire Automatic Centrifugal Clutch, H. Storar and W. P. Gladwell. Machy. (Lond.), vol. 25, no. 633, Nov. 13, 1924, pp. 193-200, 10 figs. Considerations in design; outputs; diameter of hub; thickness of driving arms; strength of rim; calculated outputs; lubrication.

COAL

CANADIAN RESOURCES. Report of Institute Fuel Committee. Eng. Jl., vol. 7, no. 12, Dec. 1924, pp. 721-724. Data on sources, production, transportation and distribution of fuels; bituminous or sub-bituminous coals for domestic heating; bituminous coal for power purposes; coke.

CARBONIZATION. Future Prospects of Low Temperature Carbonization, S. W. Parr. Gas Age-Rec., vol. 54, no. 21, Nov. 22, 1924, pp. 733-734 and 756. Review of present-day situation, and future aspects.

SPONTANEOUS HEATING. An Adiabatic Method for Studying Spontaneous Heating of Coal, J. D. Davis and J. F. Byrne. Am. Ceramic Soc.—Jl., vol. 7, no. 11, Nov. 1924, pp. 809-816, 2 figs. Describes apparatus developed in Bur. Mines laboratory for investigation of spontaneous heating of coal with adiabatic control, and shows briefly extent of heating which takes place when adiabatic condition is maintained. Pub. by permission U. S. Bur. Mines.

VOLATILE CONSTITUENTS, DETERMINATION. Determination of Volatile Constituents in Solid Fuels (Beschouwingen over de bepaling der vluchtige bestanddeelen in vaste Brandstoffen), S. de Waard. Chemisch Weekblad, vol. 21, no. 38, Sept. 20, 1924, pp. 433-435, 2 figs. Suggestions of Kreulen for use of standard burner and crucible are supported, but actual apparatus is criticized.

COAL HANDLING

CAR DUMPERS. Handling Coal with Gondola Car Dumper, E. H. Kidder. South. Engr., vol. 42, no. 2, Oct. 1924, pp. 56-57, 3 figs. Describes rotary dumper installed at new Cahokia plant of Union Elec. Light & Power Co., St. Louis Mo. Fifty-ton car of coal dumped in 1 min. 10 sec., with only one unskilled man.

PIERS. Electrically Operated Coal Pier, R. W. McNeill. South. Engr., vol. 42, no. 4, Dec. 1924, pp. 40-44, 7 figs. Describes new coal pier of West. Md. Ry. Co., at Port Covington, Baltimore; 30,000 tons of coal are handled per day of two 10-hour shifts with 50-ton coal cars; with 100-ton cars capacity is between 40,000 and 50,000 tons per day.

COAL MINING

COAL-CUTTING MACHINES. Adapting Shortwall Machine to Center Cutting. Coal Age, vol. 26, no. 21, Nov. 20, 1924, p. 725, 3 figs. Undercutter can be mounted on truck so as to cut kerf from 1½ to 2½ ft. or from 3 to 4 ft. above track.

LONGWALL SYSTEM. H. S. Gay Long Ago Tried Out "Modified Longwall", A. F. Brosky. Coal Age, vol. 26, no. 20, Nov. 13, 1924, pp. 677-680, 5 figs. Efforts in 1905 at full retreating longwall failed because of uncontrollable roof but rib-slapping in rooms 300 by 80 ft. was safer and raised output to 9.2 tons per day per inside employee.

METHODS. With Slabbing System and One Machine Loader Gay Handles 250 Tons of Coal in 8 Hours, A. F. Brosky. Coal Age, vol. 26, no. 22, Nov. 27, 1924, pp. 745-750, 6 figs. Methods employed at mine of Gay Coal & Coke Co., Logan County, W. Va.; mechanical loader increases output per face employee 40 per cent; parting from 8 to 20 in. thick removed by arcwall machine.

COKE MANUFACTURE

BY-PRODUCT. Comparative Survey of Coke-Oven Practice in Various Countries, G. A. Hebden. Iron & Steel of Can., vol. 7, no. 11, Nov. 1924, pp. 223-230 3 figs. Deals with the matter from a practical rather than a technical standpoint, and considers only question of coke made in by-product ovens. Discusses separately practice followed in various countries, and compares the various methods and conditions. Paper read before Empire Min. & Met. Congress.

COMBUSTION

SPONTANEOUS. Spontaneous Combustion: Diffusion of Gases, Wm. Galloway. So. Wales Inst. Engrs.—Proc., vol. 40, no. 4, Oct. 9, 1924, pp. 299-316; and (discussion), no. 5, Nov. 13, 1924, pp. 338-342. Gives explanation for generation of heat and ignition of gas which takes place when mixture of lighting gas and air comes into contact with platinum sponge. It is suggested that initial rise in temperature of coal which is absorbing oxygen is due, at least in early stage of heating, to compression of that gas in manner described, and not to any appreciable extent to process of combustion.

COMPRESSED AIR

APPARATUS, AFTER-COOLERS FOR. After-Coolers as a Means of Removing Moisture from Compressed Air, L. H. Geyer. Nat. Engr., vol. 28, no. 11, Nov. 1924, pp. 535-537, 3 figs. Functions of aftercoolers and their relation to efficiency of compressed-air plant. Construction dateils and cooling water required.

CONCRETE

AGGREGATES. Concrete and Concrete Aggregates, R. N. Van Winkle. Pit & Quarry, vol. 9, no. 5, Dec. 1, 1924, pp. 81-84. Results of compression tests of concrete made with trap rock and soft limestone, two extremes in aggregates, and of tests to compare strength of gravel and stone concrete. Mixing of concrete.

CONCRETE CONSTRUCTION, REINFORCED

PRE-CAST. Pre-Cast Concrete Used in Engine Terminal. Ry. Age, vol. 77, no. 23, Dec. 6, 1924, pp. 1025-1027, 6 figs. Western Pacific builds two structures of this type of construction at Stockton, Cal.

CONCRETING

COLD-WEATHER. Practical Rules for Concreting in Cold Weather. Contract Rec., vol. 38, no. 47, Nov. 19, 1924, pp. 1141-1146, 12 figs. Principle is to supply enough heat and moisture to keep chemical action progressing. Practical rules for cold weather work. Use of tarpaulins.

CONDENSERS, STEAM

OPERATION. Condensing Equipment. Nat. Elec. Light Assn., Serial Report of Prime Movers Committee Sept. 1924, 60 pp. 76 figs. Operating results with jet condensers of different sizes, giving tests with various arrangements; analysis to show effect of varying amount of injection water; and suggested methods for determining economical quantities. Spray pond design and operation; surface condenser operation; air pumps; improvements in condensing performance affected by Laning; detection of condenser leakage; effect of heat transfer of various methods of cleaning condensor tubes; etc. Manufacturers' statements. Bibliography.

CONNECTING RODS

MILLING. Milling Automobile Truck Connecting rods, Chas. O. Herb. Machy. (N.Y.), vol. 31, no. 4, Dec. 1924, pp. 276-278, 6 figs. Complete tooling for milling operations on connecting rods for Mack trucks, designed and made by Cincinnati Milling Machine Co.

COPPER

ELECTROLYTIC. Electrolytic Copper, J. G. A. Rhodin. Engineer, vol. 138, no. 3594, Nov. 14, 1924, pp. 560-561. Outline of exhaustive research carried out by late Jos. W. Swan up to autumn, 1893, dealing with stationary and moving cathodes, motion of electrolyte, static effects of detrimental nature; nature of solutions in relation to current density; bright copper deposits; electrolytic goldleaf; copper wire by direct electrolysis; conductivity of pure electrolytic copper.

CORONA

LOSS TESTS. Corona Loss Tests on the 202-Mile 60-Cycle 220-Kv. Pit-Vaca Transmission Line of the Pacific Gas and Electric Company, R. Wilkins. Am. Inst. Elec. Engrs.—Jl., vol. 43, no. 12, Dec. 1924, pp. 1109-1116, 20 figs. Physical and electrical characteristics of 220-kv. transmission likely to affect corona loss; measured corona losses were found to follow exponential laws in three distinct phases; at no point did losses follow quadratic law. (Abridgment.)

CORROSION

COATINGS, FORMATION OF. Coatings Formed on Corroded Metals and Alloys, Geo. M. Enos and Rob. J. Anderson. Min. & Metallurgy, vol. 5, no. 216, Dec. 1924, pp. 594-595. Experiments on coating formation. (Abstract.)

CONTRACT WORK

ESTIMATING. Estimating Contract Work, D. S. Cole. Indus. Mgt. (N. Y.), vol. 68, no. 6, Dec. 1924, pp. 373-376, 1 fig. Outlines method which simplifies estimating and makes easier executive's work of keeping his plant profitably busy.

CRANES

CHANGE-GEAR. Hoists with Change-Wheel Drives (Hebezeuge mit Wechselgetrieben), W. Claes. Zeit. des Vereines deutscher Ingenieure, vol. 68, no. 48, Nov. 29, 1924, pp. 1247-1249, 9 figs. Describes new type of crane developed by firm of Arn. Georg, known as AGO crane; increased efficiency is demonstrated by comparison with other types; its practical importance for different special purposes.

OVERHEAD, ERECTION OF. Erection of Overhead Crane Made Easy, Wm. L. Laing. Power, vol. 60, no. 22, Nov. 25, 1924, pp. 836-839, 8 figs. Methods of handling crane parts.

CUPOLAS

THERMAL PRINCIPLES. The Thermal Principles of the Cupola Furnace (Die wärmetechnische Grundlage des Kupolofens), E. Diepschlag. Zeit. für die Gesamte Giessereipraxis, vol. 45, no. 41, Oct. 12, 1924, pp. 321-323, 5 figs. Coke consumption should not exceed 6 per cent of charge, care should be taken to have melting occur at proper temperature, too much coke and too high temperatures being injurious to cast iron.

CURVES

CONSTRUCTION. The Plotting of Observations on Curves and Analysis of the Curves, G. B. Upton. Sibley Jl. of Eng., vol. 38, no. 7, Oct. 1924, pp. 168-172 and 185, 15 figs. Discusses superiority of graphic presentation, preference of curves to tabular matter, types of curves, expressing data in curves, plotting and fairing, etc.

D

DIESEL ENGINES

CASTINGS. Castings for Diesel Engines. Foundry Trade Jl., vol. 30, no. 433, Dec. 4, 1924, pp. 475-480, 6 figs. Abstracts of papers read before joint conference of Instn. Brit Foundrymen and Instn. Mech. Engrs., as follows: Temperature Stresses and Working Conditions in Diesel Engine Cylinders, A. L. Mellanby; Some Characteristics of Cast Iron for Oil Engine Castings, A. Campion; Oil Engine Designs as Affected by Foundry Practice, Jas. Richardson; Oil Engine from a Foundryman's Point of View; and discussion of papers.

EXHAUST-CHAMBER CASTING. Making a Diesel Engine Water-Cooled Exhaust Chamber, A. J. Richman. Metal Industry (Lond.), vol 25, no. 20, Nov. 14, 1924, pp. 477-479, 6 figs. Castings measures 6 ft. long by 2 ft. 10 in. outside diam., and is cored for water jacket giving ½ in. thickness of metal on one side and 5-8 in. on other; details of molding and casting.

EXPERIMENTAL WORK. Further Experimental Work on Diesel Engines, R. Beeman. Mar. Engr. & Motorship Bldr., vol. 47, no. 561, June 1924, pp. 227-231, 2 figs. Requirements of internal-combustion engine for naval work and account of some experimental work in connection with development of high-powered oil engines. Abstract of paper read at Instn. Naval Architects.

MAYBACH AUTOMOTIVE AND RAIL-CAR. Maybach High-Speed Automotive and Rail-Car Diesel. Oil Engine Power, vol. 2, no. 11, Nov. 1924, pp. 595-596, 2 figs. Heavy-oil air-injection oil engine weighing only 19 lb. per b.hp. develops 150 b.hp. at 1300 r.p.m.; points way to solution of problem of using unmodified Diesel principle in engines of strictly automotive character.

OPERATION. Practical Diesel Engineering, L. R. Ford. Mar. Eng., vol. 29, nos. 7, 8, 9, 10, 11 and 12, July, Aug., Sept., Oct. Nov. and Dec. 1924, pp. 389-393, 473-476, 543-546, 607-610, 669-673 and 741-744, 26 figs. Practical information regarding construction, operation and upkeep of Diesel engines. July: Action of gases in cylinder; definitions; pressure-volume curves; cycles and cyclic processes; Otto and Diesel cycles; Aug.: Use of heat cycles; how horsepower of a reciprocating engine is measured; indicator. Sept.: Mechanical cycles; construction of two- and four-cycle engines; opposed-piston and double-acting engines. Oct.: Normal practice; engine-room arrangements; preparations for starting engines. Nov.: Maneuvering ship; routine under way; engine room stores; purchasing fuel and lubricating oils; precautions in handling fuel oil. Dec.: Derangements likely to occur in operation and adjustments required for their correction.

POWER PLANTS, USE IN. The Diesel Engine Power Plant, L. R. Ford. South. Engr., vol. 42, no. 4, Dec. 1924, pp. 55-58. Discusses fitness of Diesel engine for all kinds of work as well as principles on which it works.

USE AS PRIME MOVER. The Diesel Engine as a Prime Mover, L. H. Morrison. South. Engr., vol. 42, no. 3, Nov. 1924, pp. 50-54, 11 figs. Compares main important points in favor of Diesel engine with other prime movers. Paper read before Nat. Assn. Stationary Engrs.

DRILLING MACHINES

CONTINUOUS. Langelier Continuous Drilling Machine. Machy. (N. Y.), vol. 31, no. 4, Dec. 1924, p. 317, 1 fig. Ten-spindle rotary machine designed primarily for drilling tapped hole in nuts used on hub of automobile disk wheels, but which can easily be arranged to drill other parts of similar form.

DROP FORGING

DIES. Drop-Forging Dies: Materials, Allowances, Hardening, and Tempering. Mech. Wld., vol. 76, no. 1977, Nov. 21, 1924, pp. 325-326. Choice of material; allowance for shrinkage; draft allowance; amount of flash; use of lead proof.

PRACTICE. Drop Forging, B. Brett. Eng. Production, vol. 7, no. 146, Nov. 1924, pp. 337-340, 6 figs. Description of work produced; features in design and application of drop-forging equipment; multiple die stamping, and design of hammer specially brought out for application of this system of drop forging; furnaces for drop forging.

DRYING

PRINCIPLES AND METHODS. Principles and Methods of Drying in Modern Industrial Processes, C. L. Hubbard. Nat. Engr., vol. 28, no. 11, Nov. 1924, pp. 543-547, 9 figs. Discussion of the different methods used in drying processes and their relative advantages and applications.

E

EARTH

PRESSURE. Determination of Sliding Surfaces in Taking Earth Pressures (Bestimmung der Gleitflächen bei Erddruckermittlungen), M. Buchwald. Bautechnik, vol. 2, no. 48, Nov. 7, 1924, pp. 546-549, 20 figs. Describes a simplified method of calculation and gives examples of applications.

TEMPERATURES WITHIN, CALCULATION OF. Temperature at Moderate Depths Within the Earth, L. H. Adams. Wash. Acad. Sci.—Jl., vol. 14, no. 20, Dec. 4, 1924, pp. 459-472, 2 figs. Factors which determine cooling of primitive Earth; initial temperatures near surface; calculates probable temperatures in upper 300 kilometers.

EDUCATION, ENGINEERING

CO-OPERATIVE. Co-operative Railway Engineering Courses. Ry. Age, vol. 77, no. 21, Nov. 22, 1924, pp. 921-924, 7 figs. Program worked out by Central of Ga. Ry. and Ga. School of Technology.

ELECTRIC CIRCUITS, A. C.

RESONANCE. Electrical Resonance. E. Ambrose and P. B. Frost. Elecn., vol. 93, no. 2425, Nov. 7, 1924, pp. 524-525, 1 fig. Results of an investigation which throw some light on breakdowns on a.c. systems attributed to surges.

ELECTRIC CONDUCTORS

CURRENT-CARRYING CAPACITY. The Current-Carrying Capacity of Solid Bare Copper and Aluminum Conductors, E. W. Melsom and H. C. Booth. Instn. Elec. Engrs.—Jl., vol. 62, no. 335, Nov. 1924, pp. 909-915, 7 figs. Describes Cooling-curve method which was used in determining coefficient of heat emissivity for series of small sample lengths of round and flat copper aluminum conductors of various sizes and surface conditions; this was checked by direct electrical heating of longer lengths, which showed two methods to be in close agreement; gives tables for current carrying capacity of copper and aluminum busbars.

ELECTRIC DISTRIBUTION SYSTEMS

NETWORK THEOREM. A New Network Theorem, A. Rosen. Instn. Elec. Engrs.—Jl., vol. 62, no. 335, Nov. 1924, pp. 916-918, 5 figs. Gives generalized theorem of which well-known three-ray star-mesh transformation is particular case; formula is of simple nature and great saving of labor results from its use; gives three examples of application.

ELECTRIC GENERATORS

AUXILIARY, PARALLEL OPERATION. Parallel Operation of Auxiliary Generators, H. B. Seeley. Power Plant Eng, vol. 28, no. 24, Dec. 15, 1924, pp. 1257-1260, 6 figs. New arrangement consisting of small auxiliary generator direct connected to main unit presents new operating problems.

ELECTRIC GENERATORS, A.C.

AIR GAP IN SALIENT-POLE, SHAPE OF. The Shape of Pole-Shoe Required to Produce a Sinusoidal Distribution of Air-Gap Flux Density, B. Hague. Instn. Elec. Engrs.—Jl., vol. 62, no. 335, Nov. 1924, pp. 921-929, 10 figs. Gives theory of commonly used method in which reluctance of gap from point to point is adjusted to value proper to sinusoidal flux by shaping pole face to give gap of varying length, longer at tip than at center of pole; deals with flat and circular armatures with any number of poles; numerical example illustrating theory given in text.

Polyphase High-Frequency. Note on Polyphase High-Frequency Alternators, S. Cbiba. Instn. Elec. Engrs.—Jl., vol. 62, no. 335, Nov. 1924, pp. 947-954, 18 figs. Calculations lead to conclusion that utilization of armature or stator peripbery is inherently far better in polyphase than in single-phase machines.

ELECTRIC FURNACES

Heat-Treating Steel Wire. Electric Furnace for Heat Treating Steel Wire, R. H. MacGillivray. Elec. Wld., vol. 84, no. 23, Dec. 6, 1924, pp. 1210-1211, 2 figs. Consists of two units, one an electrically heated air-hardening furnace, the other a hardening furnace having nickel-chromium retort with nickel-chromium resistance elements on top and bottom.

Steel. The Practical Economics of the Electric Steel Furnace, D. D. MacGuffie. Metal Industry (Lond.), vol. 25, no. 21, Nov. 21, 1924, pp. 501-502. Taking 3-ton Herault furnace as practical example, author discusses chief points in equipment, operation, and maintenance of electric furnaces, from point of view of obtaining most economical results.

ELECTRIC LOCOMOTIVES

Oil-Engine-Driven. Oil-Engine-Driven Electric Shunting Locomotive. Engineering, vol. 118, no. 3075, Dec. 5, 1924, p. 781, 3 figs. Built jointly by Gen. Elec. Co. and Ingersoll-Rand Co. for switching service; it is equipped with 300-hp. oil engine directly connected to 200-kw. generator.

Regenerative. New Locomotives for the Norte Railways of Spain, W. R. Taliaferro. Ry. & Locomotive Eng., vol. 37, no. 12, Dec. 1924, pp. 364-365, 1 fig. 3,000-volt d.c. regenerative locomotives built by Westinghouse Elec. Int. Co. and Baldwin Locomotive Works.

Westinghouse-Baldwin-Naval. Electric Locomotives for the Spanish Northern. Ry. Age, vol. 77, no. 23, Dec. 6, 1924, pp. 1037-1038, 1 fig. Westinghouse Baldwin-Naval locomotives are of 6-axle type with 6-wheel swivel trucks. See also description by W. R. Taliaferro in Ry. Rev., vol. 75, no. 23, Dec. 6, 1924, pp. 912-915, 7 figs.

ELECTRIC RAILWAYS

Contact System. Contact System for Virginian Electrification, C. L. Hancock. Ry. Elec. Engr., vol. 15, no. 12, Dec. 1924, pp. 419-420, 3 figs. Entire construction including contact wire, messenger and fittings to be non-ferrous material.

ELECTRIC TRANSMISSION LINES

Calculation. A Simple Method for the Calculation of Long High-Tension Lines (Eine einfache Methode zur Berechnung langer Hochspannungsleitungen). Wm. Rung. Elektrotechnische Zeit., vol. 45, no. 43, Oct. 23, 1924, pp. 1147-1148. Method of calculating no-load tension and short-circuit impedance.

Inductive Interference. Inductive Interference with Communication Circuits, A. Russel. Instn. Elec. Engrs.—Jl., vol. 62, no. 335, Nov. 1924, pp. 941-946. Discusses interference between power circuits and telegraph and telephone circuits; distinction is made between radiation and induction; experiment shows that in radio work approximate solutions can be obtained by assuming that earth is non-conductor and its inductivity is unity; thus it is shown that intensity of radiation field in simple cases falls off inversely as distance and inversely as wave length.

Overhead. Electric Transmission Lines and Their Steel Masts, G. J. Gumersall. Colliery Engr., vol. 1, no. 3, May 1924, pp. 117-120, 4 figs. Modern practice in overhead-line work and design of steel masts for this purpose.

Relay Protection. Relay Protection as Applied to Large Transmission Network, R. Wilkins. Elec. World, vol. 84, no. 21, Nov. 22, 1924, pp. 1101-1106, 11 figs. System used by Pac. Gas & Elec. Co. shows 95 per cent correct operations out of more than 1,500; scheme is based on separation of smallest practicable section of network.

Sinusoidal Currents. The Building-up of Sinusoidal Currents in Long Periodically Loaded Lines, J. R. Carson. Bell System Technical Jl., vol. 3, no. 4, Oct. 1924, pp. 558-566, 2 figs. Discusses general formulas and curves which describe building-up phenomena, as a function of line characteristics and frequency of applied electromotive force, in extremely important case of long periodically loaded lines.

ELECTRIC WELDING

Types and Applications. Modern Welding (Neuzeltliches Schweissen), H. Neesc. Bauingenieur, vol. 5, no. 19, Oct. 1924, pp. 636-638, 7 figs. Discusses types of welding, use of welding wire, types of butt and lap welding and riveting plates, and results of welding tests.

ELECTRIC WELDING, ARC

Galvanized Tanks. The Sheathed Electrode and An Example of Its Application to the Automatic Welding of Galvanized Tanks, B. C. Tracey. Gen. Elec. Rev., vol. 27, no. 11, Nov. 1924, pp. 772-773, 3 figs. Outstanding features of sheathed electrode. Describes welding of galvanized iron tank by use of automatic arc-welding machine; savings effected by electric welding.

Low-Carbon Steel. Electric Welding (Ueber elektrische Schweissung), H. Neese. Zeit. des Vereines deutscher Ingenieure, vol. 68, no. 43, Oct. 25, 1924, pp. 1125-1132, 19 figs. Notes on arc welding of low-carbon steel. Metallurgy of low-carbon-steel welding; chemical composition and structure; influence of strength of current; strength of different welds; experimental results of welds with d.c. and a.c.; performance tests; useful possibilities of welding and costs.

Structural Steel. Use of Electric Arc for Welding Structural Steel, R. E. Kinkead. Am. Welding Soc.—Jl., vol. 3, no. 10, Oct. 1924, pp. 20-23. Considers fundamentals which enter into problem of determining what makes a perfect rivet work loose; reasons why rivets are not perfect; limitations of welded joint.

Welding as a Method of Fabricating Large Structures, H. Goldmark, W. Spraragen and W. L. Warner. Am. Welding Soc.—Jl., vol. 3, no. 10, Oct. 1924, pp. 27-69, 25 figs. Welding versus riveting in structural work; use of welding as a substitute method for fabrication; results of English tests; results obtained on a large steel box for Electric Welding Committee of Emergency Fillet Corp.; tests on arc-welded roof truss; shearing strength of welds; joints specifically designed for welding; welding of lockgates and caissons; cost data; examples of welded structures; corrosion. Appendixes containing following papers: Design for a Riveted Steel Truss for Static Loads, E. P. McKibben, and Welded Truss, W. L. Warner.

ELECTRIC WELDING, RESISTANCE

Spot. Spot Welding, G. A. Hughes. Iron & Steel Engr., vol. 1, no. 11, Nov. 1924, pp. 597-604, 15 figs. Reviews various forms of electric welding for riveting of steel plates.

Uses of Spot Welding in the Structural Field, H. A. Woofter. Am. Welding Soc.—Jl., vol. 3, no. 10, Oct. 1924, pp. 11-19, 14 figs. Results of tests; different applications; principal reasons why spot welding formerly had not been employed in large structural work such as steel building frames, bridges and ships.

ELEVATED RAILWAYS

Subways, Surface Lines and. Elevated Railways. Ry. Engr., vol. 45, no. 537, Oct. 1924, pp. 359-363, 10 figs. Comparison between surface lines, elevated railways and subways. Elevated railway in Philadelphia.

ELEVATORS

Standardization. Elevators Are Being Standardized, A. G. McLaughlin. Contract Rec., vol. 38, no. 47, Nov. 19, 1924, pp. 1147-1149. Manufacturers are developing machines adapted to every condition of building construction. Entire equipment is being made to conform to standards. Typical elevator arrangements.

EXECUTIVES

Mistakes Made by. Mistakes That Executives Make, C. E. Knoeppel. Indus. Mgt. (N. Y.), vol. 68, no. 6, Dec. 1924, pp. 377-382. Deals with common, simple, yet disastrous, mistakes made in managing or organizing industrial plant.

F

FANS

Centrifugal. Centrifugal Fans and Their Characteristics, R. T. Livingston. Power Plant Eng., vol. 28, nos. 21, 22 and 24, Nov. 1, 15 and Dec. 15, 1924, pp. 1105-1106, 1159-1161 and 1262-1263, 11 figs. Nov. 1: Principles of centrifugal fans, types and service requirements. Nov. 15: Study of characteristics of fans and their adaptability for various services. Dec. 15: Application of fan principles toward selection of fans for various purposes.

FEEDWATER HEATERS

Locomotive. Locomotive Feed Water Heating, J. M. Lammedee. St. Louis Ry. Club—Official Proc., vol. 29, no. 6, Oct. 10, 1924, pp. 87-110, 8 figs.; and (abstract) in Ry. & Locomotive Eng., vol. 37, no. 12, Dec. 1924, pp. 361-364. Review of developments; general principles underlying feed-heating process and prevailing methods of putting these principles into practice, both in America and abroad.

FERROALLOYS

Analysis. Analysis of Grey Iron Foundry Alloys. Foundry Trade Jl., vol. 30, nos. 430 and 431, Nov. 13 and 20, 1924, p. 416 and 445-447. Sulphur in ferro-silicon and silico-spiegel; phosphorus; spiegeleisen and ferromanganese; standard permanganate solutions.

FERTILIZERS

Activated Sludge. Activated Sludge as a Fertilizer, V. H. Kadish and O. J. Noer. Pub. Wks., vol. 55, no. 10, Oct. 1924, pp. 311-312. Milwaukee sewerage commission plans to produce a fertilizer attractive in form as well as valuable for farms, golf courses and lawns. Condensed from paper before Am. Soc. for Mun. Improvements.

FIRE EXTINGUISHERS

Carbon Dioxide. Carbon Dioxide in Fire Extinguishing, C. L. Jones. Nat Fire Protection Assn., vol. 18, no. 2, Oct. 1924, pp. 144-165, 9 figs. Present extent of use of carbon dioxide in fire protection and possible avenues of future development.

FLOODS

Flow Characteristics. Flood Flow Characteristics, C. S. Jarvis. Am. Soc. Civ. Engrs. Proc., vol. 50, no. 10, Dec. 1924, pp. 1545-1581, 9 figs. Characteristics of flood flow that may have either general or special application are stated by way of indicating methods of deduction that must be followed; available data that seemed reliable and valuable have been listed and platted to give visual representation of range of discharge per sq. mi. for maximum recorded floods; method of attack by which problems in several Central and Western districts have been solved satisfactorily, both as to prevention of floods and protection of property.

FLOW OF WATER

Open Channels. Investigation of the Formulas of Van Gauckler-Manning for the Determination of the Flow in Open Channels (Beschouwingen over de exponentieele formule van Gauckler-Manning voor de berekening van buisleidingen en open kanalen). C. G. J. Vreedenburgh. Waterstaats-Ingenieur, vol. 12, no. 9, Sept. 1924, pp. 255-262, 5 figs. on supp. plates. Derivation of formulas is given and the various occurring coefficients and exponents are determined by test for certain conditions.

FOUNDATIONS

Stresses in Rectangular Block. An Extension of the Middle Third Theory, A. C. Vivian. Engineering, vol. 118, no. 3075, Dec. 5, 1924, pp. 763-764, 4 figs. Author seeks to elaborate general equation which, it is claimed, provides easy and safe approximation to actual stresses existing under base of eccentrically loaded rigid rectangular foundation block.

FLUE-GAS ANALYSIS

Apparatus. Analyzing Combustion Gases in Industrial Furnaces (L'analyse des gaz de combustion dans les foyers industriels), E. Montrichard. Revue Générale de l'Electricité, vol. 16, no. 19, Nov. 8, 1924, pp. 743-748, 6 figs. Discusses flue-gas analysis, conditions an analysis apparatus must fill, and describes some apparatus, including Cambridge, Aci, Bacharach Positif, etc.

FOUNDRIES

Materials Handling. Improve Shop Transportation, H. R. Simonds. Foundry, vol. 52, no. 23, Dec. 1, 1924, pp. 920-923, 8 figs. Substitution of concrete runways, simplification of department arrangement and adaption of regularly scheduled tractor trains at Walworth Mfg. Co.'s shop.

FOUNDRY EQUIPMENT

Standardization. Standardizing Pattern and Flask Equipment. Can. Foundryman, vol. 15, no. 10, Oct. 1924, pp. 44-45. Progress of work of joint committee. Eight national organizations unite to investigate pattern making and marketing, pattern plates and mounting, as well as flask sizes and other details.

FUELS

Coal. *See Coal.*

Pulverized Coal. *See Pulverized Coal.*

FURNACES, HOT-AIR

Gas-Fired. Gas as Fuel for Warm-Air Furnaces, Thos. Newton. Sheet Metal Worker, vol. 15, no. 21, Nov. 7, 1924, pp. 783 and 810, 2 figs. Brief explanation of what is being done in England in way of gas heating.

FURNACES, INDUSTRIAL

Oil Firing. Use of Oil Firing (Die Verwendung von Oelfeuerungen), G. Spettmann. Praktische Maschinen-Konstrukteur, vol. 57, no. 36, Sept. 23, 1924, pp. 495-496, 4 figs. Discusses advantages of oil firing and furnaces, furnace operation, atomizers, burners and gives examples of application.

G

GAGES

END BARS AND SLIP. End Measuring-bars and Slip Gauges. A. J. C. Brookes. Machy. (Lond.), vol. 25, no. 634, Nov. 20, 1924, pp. 244-249, 3 figs. How to check them; recommendations.

PRESSURE. A Study of Pfund's Pressure Gage, R. T. Cox. Optical Soc. Am.—Jl., vol. 9, no. 5, Nov. 1924, pp. 569-582, 4 figs. Details of experiments made with Pfund's combination of McLeod and Pirani pressure gages with a number of gases.

GAS PRODUCERS

OPERATION. Gas Produces Operation (Ueber den Generatorbetrieb), H. Strache. Sparwirtschaft, no. 13-14, July 1924, pp. 61-64 (GW). Discusses temperature, CO_2 and CO content, ash removal, coal storage, mixed-fuel firing, primary tar production, etc.

TEST CODE FOR. Test Code for Gas Producers. Mech. Eng., vol. 46, no. 12, Dec. 1924, pp. 910-915. Tentative draft of code in series of 19 being formulated by A.S.M.E. Committee on power test codes.

GERAS

MEASURING MACHINES. The Wickman Gear Measuring Machine. Eng. Production, vol. 7, no. 146, Nov. 1924, pp. 317-318, 4 figs. Details of unit for routine testing.

SPIRAL. Chart for Designing Spiral Gears. Machy. (Lond.), vol. 25, no. 633, Nov. 13, 1924, pp. 214-216, 1 fig. Presents chart which is very useful where spiral gears for number of ratios are likely to be required for gear cases, dimensions of which remain fixed.

Spiral Gearing: Measurement of Shaft and Tooth Angles, H. E. Merritt. Mech. World, vol. 76, no. 1976, Nov. 14, 1924, p. 306, 3 figs. Describes method which involves algebraic summation of angles; results show that spiral angle is angle between teeth and axis, and is positive if right-hand, and negative if left-hand; sum of spiral angles is always equal to shaft angle.

TESTING. Universal Gear Testing Machine, F. Johnstone-Taylor. Machy. (N. Y.), vol. 31, no. 4, Dec. 1924, pp. 289-291, 7 figs. Machine developed by Nat. Phys. Laboratory of Great Britain which may be used for any kind of gear and for recording errors in running of meshed gears.

GRINDING MACHINES

CENTERLESS. The CenterlessMethod of Grinding, Geo. W. Binns. Ry. Mech. Engr., vol. 98, no. 12, Dec. 1924, pp. 758-759, 3 figs. Method of producing cylindrical surfaces with no control of center of rotation.

H

HANGARS

REINFORCED-CONCRETE. Housing a Dirigible in a Reinforced Concrete Hangar. Am. Architect, vol. 126, no. 2458, Nov. 5, 1924, pp. 451-454, 8 figs. Design of two hangars built at Orly, near Juvisy, France; length 1,000 ft., width 300 ft., height 196 ft.; ends are closed by metal doors swinging outward.

HEAT STORAGE

ACCUMULATORS, CALCULATION OF. The Calculation of Solid Heat Accumulators (Die Berechnung fester Wärmespeicher), K. Grütter. Schweiz. Elektrotechnischer Verein—Bul., vol. 15, no. 10, Oct. 1924, pp. 493-510, 8 figs. Calculation of temperatures inside of a plate-shaped homogeneous accumulator of solid material, under assumption that heat volume admitted to internal wall and the external temperature are periodically variable; calculation of heat radiated by external surface and of temperature of internal wall; values are used for design calculation of plate-shaped heat accumulators of homogeneous solid material.

HEAT TRANSMISSION

HEAT EXCHANGERS. Economic Features of Heat-Exchanger Design, F. L. Maker and M. W. Thornburg, Mech. Eng., vol. 46, no. 12, Dec. 1924, pp. 891-895. 4 figs. Factors determining economic area of heat exchangers, particularly as applied to oil-refinery operations; graphic method of analysis which is simpler and more direct than methods generally used.

WALLS, HEAT LOSSES THROUGH. Heat Loss through Wall Constructions, A. Kolflaath. Am. Soc. Heat. & Vent. Engrs.—Jl., vol. 30, nos. 9 and 10, Sept. and Oct. 1924, pp. 627-643 and 661-668, 10 figs. Describes experiments carried out at Norway Inst. Technology, Trondhjem, Norway. Develops thermal coefficients from 27 test houses built in an open field, which may be used for other constructions than those tested.

HEATING, GAS

COST. Heating Rooms with Gas (Raumheizung mit Gas), K. Blume. Gas- u. Wasserfach, vol. 67, no. 38, Sept. 20, 1924, pp. 561-563, 1 fig. Discusses calculation of gas consumption, time and temperature of heating, comparison with coal, etc.

HEATING, HOT-AIR

HEATER SELECTION. Basing Warm Air Heater Selection on Climatological Condition and Heater Performance Curves, V. S. Day. Am. Soc. Heat. & Vent. Engrs.—Jl., vol. 30, no. 12, Dec. 1924, pp. 753-760, 5 figs. Requirements of a warm-air heater. Importance of climatological temperature conditions in selection of furnace sizes and types. Table showing wide variation in heating-season mean temperatures, coldest month temperatures, and coldest-liability temperatures for various sections of United States. Graphs showing average annual temperature for Chicago, application of these temperature data to furnace selection problem, and performance for two heaters having same grate diameters.

HEATING, HOT-WATER

WATER IN PIPES, FRICTION OF. Effect of Temperature upon the Friction of Water in Pipes, F. F. Giesecke. Am. Soc. Heat. & Vent. Engrs.—Jl., vol. 30, no. 12, Dec. 1924, pp. 747-752, 3 figs. Calculations for determining how friction varies with temperature of water, in connection with calculations relating to water heating.

HEATING, STEAM

CENTRAL. Another Central Heating System Turns to Live Steam, L. E. Young. Heat. & Vent. Mag., vol. 21, no. 11, Nov. 1924, pp. 41-44, 6 figs. Details of 1924 construction program of Union Elec. Light & Power Co., St. Louis, Mo., which is substituting high-pressure steam operation from a central plant for isolated and interconnected plant service.

SUPERPOWER VS. DISTRICT HEATING. Super-Power Versus District Heating, H. A. Woodworth. Nat. Engr., vol. 28, no. 12, Dec. 1924, pp. 579-582, 1 fig. Discussion on importance of heating requirements in relation to economical power generation for industrial power and district heating service; factors to be considered in design and construction of central heating system; combined heating and power service most successful.

SYSTEMS FOR LARGE CITIES. Economics of Our National Power and Heating Problem, E. Douglas. Nat. Engr., vol. 28, no. 12, Dec. 1924, pp. 598-601. Heating methods in large industrial plants; development of central-heating systems; heating situation in large American cities; modern methods of heating residence sections in cities; New York's unusual heating system; relation of heating and electrical requirements.

HYDRAULIC TURBINES

PROPELLER. The Propeller Turbine (Die Propeller-turbine), Rob. Dubs. Zeit. des Vereines deutscher Ingenieure, vol. 68, no. 48, Nov. 29, 1924, pp. 1243-1246, 14 figs. Describes design of new type of turbine and special features of this design; gives results of tests and points out its value for economic utilization of low-pressure water powers; developed by Escher, Wyss & Cie. Zürich, Switzerland.

RACING. Protection of Hydraulic Turbines Against Racing (Protection contre l'emballement des turbines hydrauliques). Houille Blanche, vol. 23, nos. 89-90 and 91-92, May-June and July-Aug., 1924, pp. 65-70 and 111-114, 10 figs. Shows from existing installation efficiency of various protective devices against increase of velocity, and explains their field of application; describes independent and sure protective device against racing, as in steam turbines.

SPECIFIC SPEED. Specific Speed, Its Meaning and Use as Applied to Hydraulic Turbines, R. T. Livingston. Power, vol. 60, no. 23, Dec. 2, 1924, pp. 880-882, 7 figs. Specific speed as guide to classification of hydraulic turbines; effects of change of load and head on specific speed; why high-specific-speed turbines are used on low heads and low-specific-speed runners are used on high heads.

STEEL-DRAFT-TUBE LINERS. Steel Draft-Tube Liners for Turbines, E. A. Grellin. Elec. Wld., vol. 84, no. 22, Nov. 29, 1924, pp. 1161-1162, 1 fig. 30 per cent saving effected as compared with cost of wood forms; lined tube presents better wearing surface.

HYDRO-ELECTRIC DEVELOPMENTS

CANADA. Water Power in the Northland. Contract Rec., vol. 38, no. 46, Nov. 12, 1924, pp. 1116-1121, 16 figs. Details of Quinze power development of Northern Canada Power Co.; ultimate capacity 60,000 hp.

WATERWAYS. Water Powers on Waterways (Wasserkräfte an Wasserstrassen), Gleichmann. Zeit. des Vereines deutscher Ingenieure, vol. 68, no. 47, Nov. 22, 1924, pp. 1209-1213, 9 figs. General rules for construction and operation; relation between power and navigation requirements; weirs, installation of power plants, heads, velocity of flow; limiting the cost of construction and increasing output; Kaplan turbines of the Viereth and Kacklet power plants on the Main and Danube Rivers; economic considerations

HYDRO-ELECTRIC PLANTS

CANADA. Unique Features in Island Falls Hydro-Electric Plant on the Abitibi River. Contract Rec., vol. 38, no. 45, Nov. 5, 1924, pp. 1094-1096, 7 figs. Ejector gate to compensate for loss of head in flood periods. Distributing cones are encased in cast iron. Reproduces photographs in connection with installation of turbine units which illustrate certain phases of design and construction quite new in hydro-electric field. See also Elec. News, vol. 33, no. 22, Nov. 15, 1924, pp. 60-62, 7 figs.

ICE PROBLEMS. Ice Problems at Hydro-Electric Plants, T. H. Hogg. Can. Engr., vol. 47, no. 20, Nov. 11, 1924, pp. 498-500. Discussion on outline of work of Committee on Ice Problems at Hydro-electric Plants at annual meeting of A.S.C.E. Formation of frazil and anchor ice and some methods of preventing trouble.

LOW-HEAD. Low-Head Hydro-electric Plants (Sur les groupes hydro-électriques de basses chutes), M. Cayère. Société Française des Electriciens—Bul., vol. 4, no. 36, June 1924, pp. 547-558. Discusses difficulties in using fluctuating low heads of water and technical means to meet them.

Low Heads (Note sur l'aménagement des basses chutes d'eau), Ed. Maurein. Arts et Métiers, vol. 77, no. 49, Oct. 1924, pp. 378-382, 8 figs. Discusses types of arrangements for low-head utilization, barrage work, and makes comparison with high-head arrangements.

STORAGE. Hydro-electric Storage Plants (Hydraulische Hochspeicher-kraftwerke), A. Maas. Zeit. des Vereines deutscher Ingenieure, vol. 68, nos. 45 and 46, Nov. 8 and 15, 1924, pp. 1161-1167 and 1195-1199, 29 figs. Discusses different storage possibilities; hydraulic storage plants; describes so-called high-pressure storage system, according to which water volumes from rivers or lakes, which are not used for power purposes, are lifted through pumping plants to natural or artificial basins, and from there are supplied to power plants when required; discusses four examples of hydro-electric storage plants.

The Influence of the Storage of Energy on Power Economics and Profitability of Hydro-electric Plants (Der Einfluss der Energiespeicherung auf die Energiewirtschaft und die Rentabilität von Wasserkraftaulagen), Rob. J. Novotny. Elektrotechnische Zeit., vol. 45, no. 43, Oct. 23, 1924, pp. 1138-1142, 8 figs. Power economics of hydro-electric plants with and without storage of energy; electric accumulators for storage of energy; water storage.

I

ICE PLANTS

ELECTRIC DRIVE. The Application of Electric Energy to the Modern Ice Making and Refrigerating Plant, P. Schlingman. Refrig. Eng., vol. 11, no. 5, Nov. 1924, pp. 165-172, 3 figs. Comparison of motor-driven, uniflow-steam-engine-driven, and oil-engine-driven plants, giving production costs, showing that first is most desirable. Inducements made to ice plants by power companies as to service rates. Factors in selection of prime mover for an electrically-driven plant.

INDUSTRIAL MANAGEMENT

COMMITTEE PLAN. Committees as Aids to Management, A. G. Peter. Indus. Mgt. (N. Y.), vol. 68, no. 6, Dec. 1924, pp. 362-365. Advantages and disadvantages of this form of executive control.

FINANCIAL CONTROL. Working Plans to Realize Profits, G. C. Harrison. Mgt. & Administration, vol. 8, nos. 4, 5 and 6, Oct., Nov. and Dec., 1924, pp. 361-366, 491-495 and 605-610, 9 figs. Oct.: Need for science in industry; scientific management in business; estimating business costs. Nov: Setting sales quotas. Dec.: Determining profits in advance.

FUNCTIONS. Management is Life of Business, C. B. Williams. Iron Trade Rev., vol. 75, no. 22, Nov., 27, 1924, pp. 1434-1437. Interpretation of its functions, in conjunction with ten great rules of conduct; how organization through which it works reflects its spirit.

PRODUCTION CONTROL. Control that Makes Possible Our 30-Day Turn, R. J. Reiser. Factory, vol. 33, no. 6, Dec. 1924, pp. 786-787, 844 and 846, 3 figs. Method of control adopted by manufacturing firm, making woodworking machinery.

Design, Manufacture, and Production Control of a Standard Machine, R. E. Flanders. Mech. Eng., vol. 46, no. 12, Dec. 1924, pp. 873-878, 13 figs. Also (abstract) in Iron Trade Rev., vol. 75, no. 24, Dec. 11, 1924, pp. 1573-1578, 9 figs. Describes methods by which difficulties in manufacture and production control were avoided by Jones & Lamson Machine Co.; principles sought to be established were standardization of product; separate manufacturing equipment and organization for product; departmentalization by product rather than by process; recurrent production schedule; concentration of plant; minimized transportation; visual control of work itself instead of remote control by records; automatic control of inventories; etc.; see also Am. Mach., vol. 61, no. 23, Dec. 4, 1924, pp. 881-888, 20 figs.

Following Up Production in a Three-Stage Process (Terminverfolgung und Arbeitsvertellung im Dreistufen-Verfahren), E. Sachsenberg. Maschinenbau, vol. 3, no. 26, Oct. 23, 1924, pp. 975-979, 9 figs. Details of division and control of quantity production in a galalith pearl factory with samples of work cards used.

SMALL FACTORIES. Profitable Methods for the Small Factory, G. C. Brown. Mgt. & Administration, vol. 7, nos. 2, 3, 4, 5 and 6, and vol. 8, no. 1, Feb., Mar., Apr., May, June and July 1924, pp. 161-167, 305-310; 431-436, 567-572, 689-692 and 53-58, 22 figs. Feb.: Organization of departments and functions. Mar.: Production control in small organization. Apr.: Time study and standardiztion. May.: Wage incentives and profit sharing. June: Distribution of overhead to jobs. July: Recording job costs to show profits.

TIME STUDY. *See Time Study.*

TIME SHEETS, FILLING IN. Costing and Time-booking, F. A. R. Paton. Engineer, vol. 138, no. 3597, Dec. 5, 1924, pp. 633-634. Notes on correct filling in of employee's time sheet.

INDUSTRIAL PLANTS

POWER-COST CONTROL. Organizing to Reduce the Cost of Power, J. P. Jordan Indus. Mgt. (N. Y.), vol. 68, no. 6, Dec. 1924, pp. 336-340. Author showway to mastery of power-cost control by defining and outlining factors involved.

POWER EQUIPMENT. Present and Future Power Equipment, H. E. Collins. Mgt. & Administration, vol. 8, no. 6, Dec. 1924, pp. 617-622, 2 figs. Comparison of prime movers, boilers, and requirements in auxiliaries.

INDUSTRIAL RELATIONS

CO-OPERATIVE PLAN, PHILADELPHIA RAPID TRANSIT. The Philadelphia Rapid Transit Co-operative Plan—a Critical Survey, D. D. Kennedy. Indus. Mgt. (N. Y.), vol. 68, no. 6, Dec. 1924, pp. 367-372. What analysis of its provisions shows as regards safeguarding of employee's interests; indication of past events concerning operation of plan; possible dangers of plan.

RAILWAYS. What Railroad Managements Should Do to Secure Co-operation from their Employees, H. C. Metcalf. Ry. Age, vol. 77, no. 22, Nov. 29, 1924, pp. 982-984. What railway employees think railway management should do; proposals regarding joint relations; demand for personnel program; regularization of employment. See also article by same author entitled, Modern Personnel Administration and Its Application to the Railways, in no. 23, Dec. 6, 1924, pp. 1016-1020, 2 figs.

INSULATING MATERIALS, ELECTRIC

STANDARDIZATION. The Importance of Standards in the Evaluation of Insulating Materials, L. E. Barringer. Gen. Elec. Rev., vol. 27, no. 11, Nov. 1924, pp. 736-741, 11 figs. Demonstrates great difficulty of evaluating insulating materials from data usually available or furnished by manufactures; ultimate solution of problem is standardization of methods for testing insulating materials.

VARNISHES AND PAINTS. Directions for the Study of Electrical Insulating Varnishes, Paints and Enamel Paints. Instn. Elec. Engrs.—Jl., vol. 62, no. 335, Nov. 1924, pp. 936-940. Report received from Brit. Elec. & Allied Industries Research Assn.

INSULATORS, ELECTRIC

SUSPENSION. A Suspension Insulator for High-Voltage Systems, D. F. Miner. Elec. Jl., vol. 21, no. 12, Dec. 1924, pp. 560-564, 15 figs. Describes development resulting from work of Prof. H. B. Smith of Worcester Polytechnic Inst.; progress of work and application of insulator.

INTERNAL-COMBUSTION ENGINES

BEARING PRESSURES. Calculation of Bearing Pressures in High-Speed Explosion Engines (Il calcolo delle pressioni sui cuscinetti nei motori a scoppio a grande velocità), S. R. Treves. Industria, vol. 38, nn. 19, Oct. 15, 1924, pp. 521-529, 14 figs. Develops construction of polar diagram for various types of engines and gives detailed application to Fiat engine as an example.

DRIVING GEAR. Features of the Synchro-Balance Driving Gear. Gas & Oil Power, vol. 20, no. 230, Nov. 6, 1924, pp. 27-28, 4 figs. Invention brought out by Blackstone & Co. which makes for lightness and compactness.

[*See also Airplane Engines; Automobile Engines; Diesel Engines; Motor Buses, Engines; Oil Engines.*]

IRON

CHARCOAL. Swedish Charcoal Iron, N. Danielsen. Min. & Metallurgy, vol. 5, no. 216, Dec. 1924, pp. 569-572 7 figs. Manufacturing process, properties, and uses.

IRON ALLOYS

CORROSION. The Corrosion of Iron Alloys by Copper Sulfate Solution, C. M. Kurtz and R. J. Zaumeyer. Am. Electrochem. Soc.—advance paper, no. 26, for mtg. Oct. 2-4, 1924, pp. 417-426. Samples of 400 different forgeable iron alloys were subjected to copper sulphate test; alloys containing Chromium appeared most resistant; silicon was also found to be very effective.

IRON AND STEEL

CANADIAN INDUSTRY. Canadian Iron and Steel Industry and Trade, G. E. Phoebus. Commerce Reports-Supp., Trade Information Bul., No. 285, Nov. 1924, 12 pp. Canadian producers have been encouraged by establishment of governmental bounties in certain provinces; particulars of these efforts. Detailed statistics of Canadian iron and steel works, production of primary iron and steel products within Dominion, movement of iron ore and consumption of raw materials, and outgoing and incoming shipments of iron and steel.

IRON ORE

WORLD'S RESOURCES. Estimating Iron Ore Resources. Iron Trade Rev., vol. 75, no. 24, Dec. 11, 1924, pp. 1568-1569, 2 figs. World's actual supply sufficient for 76 years; potential tonnage to be exhausted by year 2,200; amount available compared with increasing rate of consumption of pig iron.

L

LABOR

48-HOUR WEEK. The Forty-Height Hour Week and Industrial Efficiency, P. S. Florence. Int. Labour Rev., vol. 10, no. 5, Nov. 1924, pp. 729-758. Results of scientific study of effects of changes in hours of work or of introducing rest pauses into working hours, and of variations in output during working day, all tend, in writer's opinion, to general conclusion that on the whole the 48-hr. week is probably optimum length of hours, giving for majority of industrial operations maximum output with minimum accidents, lost time, and overhead charges and permitting efficient distribution of working hours throughout week and day.

LEAD MINES

CANADA. A Short History of the Discovery and Development of the Sullivan Mine; the Solution of Its Difficult Metallurgical Problems; and a Description of the Plants Used in the Reduction of Its Ores, W. M. Archibald, E. G. Montgomery, E. M. Stiles, R. W. Diamond, B. A. Stimmel, J. Buchanan, G. E. Murray, J. J. Fingland and S. G. Blaylock. Instn. Min. & Metallurgy Bul., no. 241, Oct. 1924, 55 pp., 16 figs. partly on supp. plates.

LIGHTING

STREET. Hollywood's Street-Lighting Installation, O. J. Helvey. Elec. World, vol. 84, no. 23, Dec. 6, 1924, pp. 1201-1202, 4 figs. Specially designed standards and lamps combine beauty with effective illumination; flexibility of posts an important feature; costs of installation and maintenance.

Street Lighting Planning and Judging, A. F. Dickerson. Elec. Light & Power, vol. 2, no. 11, Nov. 1924, pp. 23-25, 92 and 97, 2 figs. Modern practice; planning street lighting; costs, appearance and depreciation.

LIME

KILNS. Factors Affecting the Life of Lime-Kiln Brick Linings, V. J. Azbe. Rock Products, vol. 27, no. 22, Nov. 1, 1924, pp. 30-31, 1 fig. Reasons for failures of linings; choosing brick and laying them properly.

LOCKS

REMOTE CONTROL OF VALVES AND GATES. The Remote Operation of Valves and Gates, R. H. Rogers. Gen. Elec. Rev., vol. 27, no. 11, Nov. 1924, pp. 728-735, 16 figs. Deals with service of electricity in remote operation of valves and gates; remote control of valves and gates at locks of New York State Barge Canal; factors to be considered in design of equipment.

LOCOMOTIVE BOILERS

DESIGN, CONSTRUCTION AND OPERATION. Locomotive Boilers, H. Fowler and S. J. Symes. Ry. Engr., vol. 45, nos. 530, 531, 532, 534, 536 and 539, Mar., Apr., May, July, Sept. and Dec., pp. 81-85, 117-123, 179-183, 237-240, 301-305 and 427-431, 45 figs. Study of conditions which govern design, construction and operation of boilers as applied to railway locomotives, and influences which affect size and power of modern railway engines.

LOCOMOTIVES

DERAILMENTS ON CURVES. Derailments of Locomotives on Curves, R. C. Beaver and M. B. Richardson. Ry. Mech. Engr., vol. 98, no. 12, Dec. 1924, pp. 721-725, 7 figs. Investigation of mechanics of curving to determine why wheels leave rail; result of series of investigations begun in 1919.

DYNAMICS. Dynamics of Steam Locomotives (Zur Dynamik der Dampflokomotiven), A. Closterhalfen. Hanomag-Nachrichten, vol. 11, nos. 124-125, Feb.-Mar. 1924, pp. 13-48, 35 figs. Development of steam engine after Watt; movement of locomotives, including vertical, rocking, rolling, recoiling, turning, and hunting; dynamic aspects and mathematical treatment.

HIGH-PRESSURE BOILER. Delaware & Hudson Co. Two-Cylinder Compound Locomotive with High-Pressure Boiler. Ry. Rev., vol. 75, no. 24, Dec. 13, 1924, pp. 939-942, 1 fig. Super-locomotive, called Horatio Allen, carrying 350 lb. boiler pressure develops tractive effort of 84,300 lb. with factor of adhesion of 3.54.

MALLET. Mallet Compound Locomotive for North Western (State) Railway of India. Ry. Rev., vol. 75, no. 21, Nov. 22, 1924, pp. 821-824, 3 figs. Describes 2-6-6-2 type articulated locomotive built by Baldwin Locomotive Works, which is to be compared with Garratt 2-6-2-2-6-2 compound engine.

0-6-0. Rebuilt 0-6-0 Type Locomotive, London Midland & Scottish Railway. Ry. Gaz., vol. 41, no. 22, Nov. 28, 1924, p. 669, 2 figs. Engines originally designed and built for service in Turkey, now employed on Tilbury section of Lond. Midland & Scottish Ry.

SUPERHEATERS. *See Superheaters.*

TANK. L. M. S. Rly.—"Baltic" Tank Engines. Engineer, vol. 138, no. 3595, Nov. 21, 1924, pp. 582-584, 7 figs. Details of Horwich-built 4-cylinder superheated 4-6-0 locomotive.

THREE-CYLINDER. The Steam Locomotive, J. G. Blunt. St. Louis Ry. Club—Official Proc., vol. 29, no. 7, Nov. 14, 1924, pp. 118-125 and (discussion) 125-132. Presentation of advantages of three-cylinder locomotive. See (abstract) in Ry. & Locomotive Eng., vol. 37, no. 12, Dec. 1924, 359-361.

TIRES AND FORGINGS, MANUFACTURE. Processes and Principles Involved in the Manufacture of Locomotive Tires, Locomotive Forgings and Rolled Steel Wheels for Railway Service, L. H. Fry. South. & Southwest. Ry. Club, vol. 17, no. 11, Sept. 1924, pp. 11-12, 15-16, 17-18, 23-24 and 27-28 and (discussion) 31-32, 35-36 and 39, 12 figs. Principles underlying processes of manufacture.

LUBRICATING OILS

CHANGES DUE TO WEAR. Observations on the Causes of Change in Lubricating and Insulating Oils During Use (Beobachtungen über die Ursachen der Veränderung der Schmier-und Isolieröle im Gebrauch). Maschinenbau, vol. 3, no. 26, Oct. 23, 1924, pp. F29-F30. A. W. F. report. Discusses absorption of air by oil as main difficulty, use of lubricating oil in steam turbines, Diesel engines, compressors and bearings, and mineral oil in transformers.

RECLAMATION. Reclamation of Used Lubricating Oils (Régénération des huiles de graissage usagées). Vie Technique et Industrielle, vol. 5, no. 61, Oct. 1924, pp. 457-458. Discusses filtration, decantation, and centrifuging. Notes on a French patent basing reclamation on contact electrification.

STEAM-TURBINE. Serial Report of the Prime Movers' Committee, 1923-24, Technical National Section of National Electric Light Association. Eng. Wld., vol. 25, no. 6, Dec. 1924, pp. 393-401, 22 figs. Details of tests made on extra-light steam-turbine oils, and description of sludge accelerator; laboratory device used.

TESTS. Lubrication. Nat. Elec. Light Assn., Serial Report of Prime Movers Committee, Sept. 1924, 13 pp., 22 figs. Details of field and laboratory tests covering performance of lubricating oils in steam turbines, and results obtained.

LUBRICATION

JOURNALS. Roller Chain Lubrication (Die Rollen-kettenschmierung), D. F. Dütting. Organ für die Fortschritte des Eisenbahnwesens, vol. 79, no. 12, Sept. 30, 1924, pp. 272-275, 3 figs. A new system of journal lubrication, whereby an ample supply of oil is applied to journal, thereby reducing friction and rise in temperature. Also means for preventing leakage of oil from journal boxes.

METHODS. Lubrication, E. H. Strange. Chem., Met. & Min. Soc. S. Africa—Jl., vol. 25, no. 3, Sept. 1924, pp. 48-52. Discusses friction; different methods of lubricating a bearing; notes on lubrication of steam cylinders, air compressors, dynamos and motors, mine cars, rock drills, and internal-combustion and explosion engines.

PRIME MOVERS. Recent Trends in the Practice of Lubricating Prime Movers, C. H. Bromley. Refrig. Eng., vol. 11, no. 5, Nov. 1924, pp. 159-164 and (discussion) 164 and 179 8 figs. Discusses behavior of mineral lubricating oils in service, steam-turbine oils and turbine lubrication, soluble sludge, effect of heat and air on oil, reciprocating steam engines, hydraulic turbines, Diesel engines, clarification of Diesel-engine oil, and gear lubrication.

M

MACHINE DESIGN

Feeding Devices. Feeding Devices for Automatic Machinery, A. A. Dowd. Machy. (N. Y.), vol. 31, no. 4, Dec. 1924, pp. 295-298, 6 figs. Examples of different designs of feeding devices.

MACHINERY

Fatigue Breakages in Parts. Fatigue Breakages in Machine Parts and Their Elimination by the Use of Heat-Treated Alloy Steels (Utmattningsbrott hos konstruktionsstal och deras förekommande genom, användning av seghärdade specialstal), S. von Hofsten. Teknisk Tidskrift, vol. 54, no. 43½, Oct. 25, 1924, pp. 420-425 (Allmänna Avdelningen), 5 figs. Explains nature of fatigue breakages. Alloy steels permit effective hardening and consequent strengthening of bulky machine parts. High elastic limit most important feature. Co-operation between designers and metallurgists urged.

Foundations. Fundamentals of Machinery Foundation Design and Construction, W. E. Biggs and W. R. Woolrich. Nat. Engr., vol. 28, no. 11, Nov. 1924, pp. 538-540, 4 figs. Hints on construction of foundations and materials to be used for this purpose.

Knocks, Tracing. Tracing Knocks in Engines While Rotating, E. Prince. Mech. Wld., vol. 76, no. 1975, Nov. 7, 1924, pp. 296-297. Methods of tracing knocks of machinery in motion.

MAGNETS

Torque on Cylindrical. Torque on a Cylindrical Magnet through which a Current is Passing, J. Zeleny and L. Page. Physical Rev., vol. 24, no. 5, Nov. 1924, pp. 544-559, 4 figs. Develops theory and describes experiments performed to check theory.

MARINE BORERS

Destructive Action. The Deterioration of Structures in Sea-Water. Engineering, vol. 118, no. 3075, Dec. 5, 1924, pp. 774-775. Review of report published by Committee of Brit. Instn. Civ. Engrs., giving results of experiments and observations.

MATERIALS HANDLING

Apparatus. Characteristics of Construction and Operation of Apparatus for Mechanical Handling (Caractéristiques de construction et de fonctionnement des appareils de manutention mécanique), F. Pacoret. Technique Moderne, vol. 16, no. 21, Nov. 1, 1924, pp. 695-752, 93 figs. Classification of apparatus; continuous conveyors; calculation of aerial cable conveyors; use of electromagnets; various types of electric control; electric braking; safety rules; apparatus for use in ship-building yards, harbors, ships, marine and railway terminals, metallurgical plants, foundries, mines, etc.

Stone and Clay Industries. Modern Conveying in the Stone and Clay Industries (Zeitgemässes Förderwesen in der Industrie der Steine und Erden). Tonindustrie-Zeitung, vol. 48, nos. 78 and 87, Sept. 27 and Oct. 29, 1924, pp. 863-865 and 987-993, 27 figs. Describes methods and different types of conveyors employed.

Tie-Treating Plant. Overhead Cranes Serve New Creosoting Plant. Ry. Age, vol. 77, no. 24, Dec. 13, 1924, pp. 1055-1058, 6 figs. Details of improvements designed to increase efficiency, safety and economy in operation embodied in new timber-treating plant of Southern Pac. at Wilmington, Cal.; how ties are handled; creosoting plant; auxiliary facilities.

METALS

Corrosion. The Corrosion and Decay of Metals and Alloys, E. G. Jarvis. Brass Wld., vol. 20, no. 10, Oct. 1924, pp. 339-341. Discusses season cracking, types of alloy corrosion, etc.; conclusions of experiments with sea water.

Specific Heat. New Method for Determining the Specific Heat of Metals (Eine neue Methode zur Bestimmung der spezifischen Wärme von Metallen), W. U. Behrens and C. Drucker. Zeit. für Physikalische Chemie, vol. 113, nos. 1-2, 1924, pp. 79-110, 9 figs. Details of new method in which a thin metal wire is heated in vacuum to constant temperature, electric energy is passed through and temperature rise is determined by measuring resistance before and after heating.

Spinning. The Spinning of Metals, Wm. Mason. Metal Industry (Lond.), vol. 25, no. 20, Nov. 14, 1924, pp. 469-470, 11 figs. Principle of spinning; spinning "undersunk" articles; spinning lathe and tools; spinning qualities of various metals and their annealing.

MINE TIMBERING

Protection from Fire. Protection of Mine Timbering from Fire, H. E. Tufft. Min. Congress Jl., vol. 10, no. 10, Oct. 1924, pp. 481-484, 2 figs. Outlines possibilities for fire prevention and timber preservation through utilization of the several known methods. Pub. by permission U. S. Bur. Mines.

MINERAL DEPOSITS

Canada. Mines and Mineral Deposits of Canada, R. P. D. Graham. Can. Inst. Min. & Metallurgy-Bul., no. 151, Nov. 1924, pp. 715-830, 2 figs. Outline of geology of Canada. Brief description of the more important ore deposits and mining districts; deals with metalliferous deposits, non-metallic mineral deposits, coal and hydrocarbon compounds, and structural materials and clay products.

MINERALS

Rare, Canada. The Rare Element Minerals of Canada, H. V. Ellsworth. Can. Chem. & Metallurgy, vol. 8, no. 11, Nov. 1924, pp. 261-263. Wide distribution shown of rare minerals in Canadian rocks. Promising research field for chemists in analysis of complex ores. Paper read at Can. Inst. Chem. annual mtg.

MOLDING METHODS

Turbine Waterwheel Parts. Cores Play Prominent Part in Molding Turbine, F. H. Bell. Can. Foundryman, vol. 15, no. 10, Oct. 1924, pp. 39-42 and 59, 8 figs. Describes molding of water wheel at foundry of Canadian Gen. Elec. Co., Toronto.

MOTOR BUSES

Electric. The Electric Road Vehicle, D. E. Batty. Surveyor & Mun. & County Engr., vol. 66, no. 1713, Nov. 14, 1924, pp. 401-404, 4 figs. Its characteristics and its economic fields of usefulness. Extracts from paper read before Instn. Automobile Engrs.

Engines. New Buda Six Cylinder Engine Designed Especially for Bus Service, D. Blanchard. Automotive Industries, vol. 51, no. 23, Dec. 4, 1924, pp. 955-956, 1 fig. Aluminum crankcase extends some distance below crankshaft axis for increased rigidity; special attention given to balancing of moving parts; both crankshaft and camshaft have four bearings.

MOTOR TRUCKS

Electric. The Electric Road Vehicle, D. E. Batty. Automobile Engr., vol. 14, no. 196, Nov. 1924, pp. 375-381, 17 figs. Its characteristics and its economic field of usefulness; the trolley bus; gasoline-electric systems; battery vehicles.

Gas Producers for. Producer Gas as Motor-Truck Fuel, E. Weiss. Mech. Eng., vol. 46, no. 12, Dec. 1924, p. 902, 1 fig. Describes Etia gas producer, which operates on charcoal with steam injection; and Renault unit, consisting of furnace, gas suction chamber, and fuel reservoir. (Abstract.) Translated from Nature (Paris), no. 2635, Oct. 4, 1924, p. 214.

Obsolescence. When Does a Motor Truck Become Obsolete? F. W. Davis. Soc. Automotive Engrs.—Jl. vol. 15, no. 6, Dec. 1924, pp. 516-520. Discusses various factors that make for obsolescence, inadaptability and uselessness.

N

NICKEL ALLOYS

Properties. A Note on the Properties of Some Alloys of Nickel, W. R. Barclay. Soc. Glass Technology—Jl., vol. 8, no. 31, Sept. 1924, pp. 162-173, 3 figs. Deals with nickel-copper and nickel-chromium alloys which are said to be of greatest interest to glass technologists, because of their great resistance to corrosion and their retention of strength at high temperature.

NICKEL STEEL

Softening of Martensitic. The Softening of a Martensitic Nickel Steel (Weichmachen eines martensitischen Nickelstahls), N. H. Aall. Stahl u. Eisen, vol. 44, no. 36, Sept. 4, 1924, pp. 1080-1081. Martensitic structure of a nickel steel with 0.65 per cent carbon and 13.7 per cent nickel can be changed into a readily workable osmonditic structure by tempering.

NON-FERROUS METALS

Alloys, Effect of Cast Temperatures. The Effect of Casting Temperatures on the Physical Properties of Non-Ferrous Alloys. Metal Industry (Lond.), vol. 25, no. 21, Nov. 21, 1924, pp. 498-500, 4 figs. Discussion at West Yorkshire Met. Soc.

O

Hydrogenation. Hydrogenation by the Bergius Method, H. I. Waterman and J. N. J. Perquin. Instn. Petroleum Technologists—Jl., vol. 10, no. 45, Sept. 1924, pp. 670-677, 2 figs. Summary of most important results of research taken up concerning scientific and technical significance of Bergius' hydrogenation process.

OIL ENGINES

Airless-Injection. Features of Airless Injection Oil Engines, H. F. Birnie and R. C. Baumann. Power Plant Eng., vol. 28, nos. 14, 20, 22 and 24, July 15, Oct. 15, Nov. 15 and Dec. 15, 1924, pp. 751-754, 6 figs.; 1056-1058, 6 figs.; 1143-1147, 9 figs.; and 1251-1254, 7 figs. July 15: Advantages and disadvantages of solid injection; types of spray valves used. Oct. 15: Valves of De La Vergne engine. Nov. 15: Scott-Still combination steam and oil engine, illustrating use of differential fuel valves. Dec. 15: Fuel-oil distribution in combustion chamber and directed turbulence are features of Hesselman's system.

Solid-Injection. Types of Modern Power-Plant Oil Engines. Oil Engine Power, vol. 2, no. 11, Nov. 1924, pp. 583-587, 6 figs. New Foos design for units of from 30 to 400 b.hp. is characterized by smooth exterior appearance and enclosure of most of cylinder head within framing; adoption of airless-injection system permits burning some of heaviest fuels at high economy.

Brayton-Cycle. The Brayton Cycle for Oil Engine Work. Oil Engine Power, vol. 2, no. 10, Oct. 1924, pp. 547-548, 3 figs. In engine which has given favorable indications on test block air is introduced into working cylinder from receiver at constant pressure while spray of fuel burns in air current; 2-stage pre-compressor incorporated in engine keeps receiver charged.

Exhaust-Gas Utilization. Putting the Exhaust to Work. Oil Engine Power, vol. 2, no. 11. Nov. 1924, pp. 573-579, 10 figs. Considerations concerning quantity of heat recoverable at various loads and amount of heating surface required.

Heavy-Oil. The Polar Heavy Oil Engine. Engineer, vol. 138, no. 3597, Dec. 5, 1924, p. 648, 3 figs. Details of airless-injection engine exhibited at Gothenburg Exhibition by Atlas Diesel Co., of Stockholm; runs on 2-stroke cycle and crank-chamber compression is employed.

Power-Plant. Types of Modern Power-Plant Oil Engines. Oil Engine Power, vol. 2, no. 10, Oct. 1924. pp. 529-531, 2 figs. Engine developed at Fraser & Chalmers works of Gen. Elec. Co., Erith, England.

OIL WELLS

Control of Flowing. Control of Gas Pressure Great Factor in Conservation of Oil, S. F. Shaw. Nat. Petroleum News, vol. 16, no. 49, Dec. 3, 1924, pp. 64 and 67. Most efficient methods of handling production of oil; control of flow lines.

Drilling. The Evolution of Oil-Well Drilling Methods, A. R. Thompson. Can. Min. Jl., vol. 45, no. 47, Nov. 21, 1924, pp. 1147-1150. Discusses percussion tools, hydraulic percussion, attrition drills, core drills, casing, and costs. Paper read before Min. & Met. Congress, Wembley, Eng.

OILS

Insulating. Insulating Oils for Oil Circuit Breakers, D. Harvey. Elec. Jl., vol. 21, no. 12, Dec. 1924, pp. 573-578, 7 figs. Manufacture of insulating oil; properties of oils; shipment and sampling; method of test for dielectric strength; storage; placing oil in service; maintenance purification.

OPEN-HEARTH FURNACES

Construction. Modern Open-Hearth Furnaces (Les fours Martin modernes), J. A. de Gray. Génie Civil, vol. 85, no. 19, Nov. 8, 1924, pp. 426-430. Details of a modern installation of open-hearth furnaces in northeastern France, and comparison of American and European furnaces as to construction and dimensions.

ORDNANCE

Material, Design of. The Design of Ordnance Material, J. D. Pedersen. Mech. Eng., vol. 46, no. 12, Dec. 1924, pp. 887-890. Procedure to be followed in designing ordnance material for economical, interchangeable mass production.

ORE CONCENTRATION

Mills. New Cornelia Concentrating Mill at Ajo, Arizona, H. K. Burch. Eng. & Min.—Jl., Press, vol. 118, no. 21, Nov. 22, 1924, pp. 808-821, 13 figs. Details of construction of copper flotation plant; suspension-type bin a feature of storage system; how electric power is distributed; power to pumping plant at 44,000 volts; motor-driven rolls selected for final crushing.

ORE TREATMENT

Cyaniding. Calcined Dolomite in the Recovery of Gold and Silver, E. S. Leaver, C. W. Davis and J. A. Woolf. Pit & Quarry, vol. 9, no. 4, Nov. 15, 1924, pp. 95-98. Calcined dolomite as a substitute for lime in cyaniding gold and silver ores. Results of experiments.

P

PAPER MANUFACTURE

DeVain Process. Schacht & Strachan on DeVains Process. Paper, vol. 35, no. 4, Nov. 13, 1924, pp. 131-133. Translation of W. Schcht's article in Wechenblattfuer Papierfabrikation, Oct. 11, 1924, criticizing DeVains process, and reply by J. Strachan.

Pulp Manufacture. Chlorination Treatment of Kraft Pulp, A. Papineau-Couture. Paper, vol. 35, no. 8, Dec. 11, 1924, pp. 314-317. Review of chlorine processes of pulping with reference to Jaffard's work on bleaching of sulphate pulp by DeVains process.

Continuous Pulping Process. Paper, vol. 35, no. 6, Nov. 27, 1924, pp. 227-231, 8 figs. Describes process and device for continuous manufacture of cellulose fibers, patented in United States by French inventor, André Olier, combining novel washing, crushing and pressing principles by which either bleached or unbleached pulp may be produced.

PAPER MILLS

Electrical Apparatus. Modern Electrical Apparatus in Kraft Paper Making, R. L. Gregory. South. Engr., vol. 42, no. 3, Nov. 1924, pp. 44-46, 5 figs. Notes on use of bleeder turbines, motors and exhaust and live steam in a Kraft paper mill.

PATTERNMAKING

Methods. Modern Pattern Making, J. A. Stevenson Foundry Trade Jl., vol. 30, no. 431, Nov.20, 1924, pp. 437-439. Deals. with plate patterns; patterns for oil-sand cores; flanged couplings; ring-oiling pedestals; pinion housings; pipe patterns; grooved-rope and weaving-shed pulleys, etc.

PETROLEUM

Canada. Petroleum In Canada. Can. Min. Jl., vol. 45, no. 47, Nov. 21, 1924, pp. 1144-1146, 3 figs. An American opinion of possibilities in Canada.

PIPE, CONCRETE

Spun. The Modulus of Elasticity of "Spun" Concrete in Tension. Concrete & Constr. Eng., vol. 19, no. 11, Nov. 1924, pp. 709-714, 3 figs. Report of investigation on spun concrete pipes, results of transverse, compression and tension tests.

PISTON RINGS

Design. The Design of Piston Rings, B. M. Thornton. Machy. (Lond.), vol. 25, no. 635, Nov. 27, 1924, pp. 273-274. Deals with design of concentric ring.

PISTONS

Aluminum-Alloy, Casting. Casting Aluminum Alloy Pistons in Metal Moulds, R. J. Anderson and M. F. Boyd. Metal Industry (Lond.), vol. 25, nos. 21 and 22, Nov. 21 and 28, 1924, pp. 494-496 and 517-518, 17 figs. Results of investigations into effect of different gating methods, feeders, risers, etc., and effect of variations in pouring and mold temperatures. (Abstract.) Paper read before Am. Foundrymen's Assn.

POWER

Developments. Lines of Development of Steam Engines and Prospects of Gas Engines and Turbines (Entwicklungslinien der Dampfkraftmaschinen und die Aussichten des Gasmaschinen betriebes), H. Hoff. Stahl u. Eisen, vol. 44, nos. 46, 47 and 49, Nov. 13, 20 and Dec. 4, 1924, pp. 1437-1446, 1482-1488 and 1567-1575, 23 figs. Discusses development leading up to maximum-pressure steam engines; d.c. machines; thermodynamic and economic considerations; linking-up poewr and heat; development of steam turbine; superheating; development of gas engines; waste-heat utilization; prospects of gas turbine. Dec. 4: Discussion of paper.

Resources. Power, F. R. Low. Power, vol. 60, no. 24, Dec. 9, 1924, pp. 937-939. Power resources at hand; notes on molecular action in furnace; absorption of heat from sun; results with early engines; lowest attainable steam consumption.

POWER FACTOR

Correction. Economics of Power-Factor Correction, R. C. R. Schulze. Elec. World, vol. 84, no. 24, Dec. 13, 1924, pp. 1247-1251, 8 figs. Where and why power-factor correction should be applied; method of computing cost and analysis of typical installations; recommendations for use as regards type and location of corrective equipment.

Practical Ways to Correct Power Factor, H. B. Dwight. Elec. World, vol. 84, no. 23, Dec. 6, 1924, pp. 1199-1200. Use of synchronous motors advocated; their neglect by power companies; proposal that bonus be paid for each kva. installed; other methods; illustrative example.

PRESSURE VESSELS

Unfired, Code for. Report on Code for Unfired Pressure Vessels. Mech. Eng., vol. 46, no. 12, Dec. 1924, pp. 916-923, 5 figs. Final report; A.S.M.E. boiler-construction code; report on rules for construction.

PROFIT SHARING

French Factory Plan. Why Our Workmen Produce 30% More Than They Did, E. Romanet. Factory, vol. 33, no. 6, Dec. 1924, pp. 782-785, 836 and 838, 1 fig. Describes form of organization established at Joya Establishments at Grenoble, France, workshops for making hydro-electric equipment, steam boilers, autoclaves, caissons, bridges, etc.; how profits are distributed; it has been proved at factory that profits of capital will be much greater when it is planned to give greater share to workmen.

PYROMETERS

Classification and Application. Classification and Application of Pyrometers, R. W. Newcomb. Engrs.' Soc. West. Pa.—Proc., vol. 40, no. 7, Oct. 1924, pp. 249-267 and (discussion) 268-280, 5 figs. Deals with types and their suitability, construction and serviceability.

PULVERIZED COAL

Boiler Firing. Pulverized-Coal Firing (Le chauffage des chaudières au charbon pulvérisé), M. Sohm. Arts et Métiers, vol. 77, no. 48, Sept. 1924, pp. 338-347, 11 figs. Discusses advantages and application in various industries; describes plant of Bruay Min. Co., and gives operating data; diagrams.

Developments. Powdered Coal Furnace No Longer an Experiment. Coal Age, vol. 26, no. 21, Nov. 20, 1924, pp. 720-721, 2 figs. Furnace life not shortened when pulverized coal s used; well fitted to automatic control. Abstract of report covering years of 1923 and 1924 of Prime Movers Committee of Nat. Elec. Light Assn.

Pulverized Fuel. Nat. Elec. Light Assn., Serial Report of Prime Movers Committee, Sept. 1924, 32 pp., 39 figs. Recent developments. Refinements in design and reliability of apparatus have been accomplished. Statements of operating companies and manufacturers, indicating progress, present trend in design and results obtained with this comparatively new method of burning coal. Progress in Europe.

Nature, Preparation, and Use. Nature, Preparation and Use of Pulverized Coal, R. K. Meade. Rock Products, vol. 27, nos. 9, 11, 14, 16, 20 and 22, May 3, 31, July 12, Aug. 9, Oct. 4 and Nov. 1, 1924, pp. 52-54, 27-29, 34-36, 42-44, 51-53 and 32-34, 53 figs. Application; earlier attempts to burn pulverized fuel; construction and method of operation of types of commercial burners. Oct. 4: Practice of burning cement and lime in rotary kilns using pulverized coal as fuel; application to rotary dryers. Nov. 1: Practice of burning pulverized coal in metallurgy; under boilers; possibilities in shaft lime-kiln firing.

The Preparation and Use of Pulverized Coal, J. W. Wardell. Colliery Engr., vol. 1, no. 3, May 1924, pp. 143-146, 1 fig. Advantages of pulverizing and plant required; crushing and drying methods; pulverizing mills; types of burners; application.

Utilization. Commercial Considerations in the Use of Powdered Fuel, F. A. Scheffler. Nat. Engr., vol. 28, no. 11, Nov. 1924, pp. 527-532, 5 figs. Recent developments in use of pulverized coal. Design of pulverized-fuel furnaces. Cost data on operation of pulverized-fuel plants. Boiler efficiencies of pulverized-fuel plants. Description of distribution systems and their installation.

PUMPING STATIONS

Cleveland, O. The Fairmount Pumping Station and Heating Plant, L. A. Quayle. Mech. Eng., vol. 46, no. 12, Dec. 1924, pp. 866-872, 4 figs. Particulars of novel features incorporated in new station in Cleveland, O., together with analysis of efficiency of various steam prime movers available for water-works use. See also Power vol. 60, no. 22, Nov. 25, 1924, pp. 844-847, 3 figs.

PUMPS, CENTRIFUGAL

Calculation. The Calculation of Centrifugal Pumps (Die Berechnung von Kreiselpumpen), H. G. Bader. Zeit. des Vereines deutscher Ingenieure, vol. 44, no. 68, Nov. 1, 1924, pp. 1145-1149, 9 figs. Theory of the confined vortex, which has been found useful in calculation of airfoils, can be successfully applied to systematic design of centrifugal pumps; the faulty basic equation for calculation of pressure head is replaced by an equation which not only avoids considerable deviation from measured values, but also gives excellent reproduction of characteristic curve.

Turbine. Turbo-Pumps, R. James. Colliery Engr., vol. 1, nos. 3 and 4, May and June 1924, pp. 113-115 and 196-198, 15 figs. Review of principles and practice of turbine pump as applied to conditions of colliery work.

R

RADIO COMMUNICATION

Survey of. Survey of the Field of Radio Communication, A. Gibbs. New Zealand Jl., Sci. & Technology, vol. 7, no. 2, July 1924, pp. 65-78. Forms of transmission, reception of electric waves, radiotelephone broadcasting, amateur stations, irregularities in medium, long-distance radiotelegraphic communication, New Zealand in relation to high-power development, and direction finding.

RADIOTELEGRAPHY

High-Frequency Measurement. The Measurement of High Frequencies, F. E. Nancarrow. P. O. Elec. Engrs.' Jl., vol. 17, part 3, Oct. 1924, pp. 209-217, 6 figs. Account of measurements made at Radio Laboratory with piece of apparatus called Multivibrator, controlled by valve-maintained tuning fork.

Long-Wave Transmission round Earth. Why Wireless Electric Rays can bend round the Earth, Jos. Larmor. Nature (Lond.), vol. 114, no. 2870, Nov. 1, 1924, pp. 650-651. Gives what is supposed to be sufficient and rather striking cause for transmission of long waves horizontally round earth at great latitudes, though rays travelling at lower heights would be gradually quenched.

RAILS

Design and Manufacture. Steel Rails, C. B. Bronson. Eng. Jl., vol. 7, no. 12, Dec. 1924, pp. 703-713, 13 figs. Historical outline of progress in design, details of manufacture and requirements to meet present-day conditions.

Failure. Breaking of Rails; and Rail Joints, W. C. Cushing. Int. Ry. Congress Assn.—Bul., vol. 6, no. 10, Oct. 1924, pp. 677-792, 42 figs. Classification of rail failures, rail-failure analysis, record of failures, breakages attributable to use to which rails are put and breakages attributable to defects in metal in rails, rail designs, specifications, chemistry and wear of rails, operating statistics, etc. Most economical and efficient arrangement of rail joints; types of joints; freedom for expansion of rails; quality of metal in fish-plates; first cost of installing and maintaining joints; and specifications for quenched-carbon, alloy, and high-carbon joint bars, and for coiled spring washers.

RAILWAY ELECTRIFICATION

Hungary. A New System of Main Line Electrification, L. de Verebely. Engineer, vol. 138, no. 3597, Dec. 5, 1924, pp. 630-633, 6 figs. Describes new system developed in Hungary on 3-phase principle; locomotives are equipped with motor and generator united into one machine, called a phase converter; summary of characteristics and advantages of new system.

RAILWAY MAINTENANCE

Methods, Lehigh Valley R. R. Maintenance Methods on the Lehigh Valley R. R., Geo. L. Moore. Ry. Rev., vol. 75, no. 21, Nov. 22, 1924, pp. 824-826. Methods and practices used in connection with maintenance work, and account of reasons why some of them were adopted.

RAILWAY MANAGEMENT

Stores Organization. Soo Line Has Unique Stores Organization. Ry. Rev., vol. 75, no. 24, Dec. 13, 1924, pp. 943-948, 13 figs. Organization of stores department of Minneapolis, St. Paul; Sault Ste. Marie Ry.; general storekeeper controls supplies of commissary department and news agents, keeps time records and accounts of trainmen and enginemen; describes main store of Soo Line at Minneapolis.

RAILWAY MOTOR CARS

Gasoline. Gasoline Railroad Cars, W. L. Bean. New York R. R. Club—Official Proc., vol. 34, no. 8, Sept. 19, 1924, pp. 7345-7357 and (discussion) 7357-7359, 6 figs. Factors of design of cars for branches of trunk lines and for short-line roads.

RAILWAY OPERATION

Train Control. Automatic Train Control on Missouri Pacific Ry. Ry. Rev., vol. 75, no. 21, Nov. 22, 1924, pp. 829-834, 8 figs. First installation ever made of automatic train control superimposed on controlled manual block.

Wrecks Preventable by Train Control, G. E. Ellis. Ry. Signaling, vol. 17, no. 12, Dec. 1924, pp. 478-481. Analysis of statistics to show that only few accidents can be eliminated automatically. Paper presented before Signal Section of Am. Ry. Assn.

Train Movement, Profitable. The Business of Moving Trains at a Profit, W. F. Thiehoff. Ry. Rev., vol. 75, no. 21, Nov. 22, 1924, pp. 845-848. Points to be considered are proper assignment of power, alert employees, adherence to time schedules, good fuel and water. Address delivered before West. Ry. Club. See also Ry. Age, vol. 77, no. 21, Nov. 22, 1924, pp. 925-928; also paper entitled. The Mechanical Man's Part in Profitable Train Handling, E. B. Hall, pp. 928-929.

TRAIN OPERATION. Some Interesting Problems in Train Operation, L. E. Endsley. Ry. Club of Pittsburgh—Official Proc., vol. 23, no. 8, Sept. 25, 1924, pp. 203-208 and (discussion) 208-210. Deals with starting, running and stopping trains.

RAILWAY SHOPS

LIGHTING. Illumination of Railroad Shops and Roundhouses. Ry. Rev., vol. 75, no. 23, Dec. 6, 1924, pp. 915-919, 7 figs. Recommendations and standard practice to meet requirements of safety and efficiency. (Abstract.) Committee report before Assn. Ry. Elec. Engrs.

RAILWAY SIGNALING

AUTOMATIC BLOCK. The Automatic Block System (Le "block system" automatique), A. Bourgain. Nature, nos. 2638 and 2640, Oct. 25 and Nov. 8, 1924, pp. 262-267 and 293-298, 19 figs. Describes system in force in France; semaphores and colored lights, rail splices, relays for d.c. operation, a.c. automatic-block-system operation, etc.

COLORED-LIGHT SIGNALS. Color Light Signals on the I. C., H. G. Morgan. Ry. Signaling, vol. 17, no. 12, Dec. 1924, pp. 469-471, 7 figs. A.c. floating battery and primary battery used on different sections of 109-mi. installation in Kentucky and Tennessee.

ELECTRICAL EQUIPMENT. Electrical Signalling Equipment on Railways, V. Mitchell. Instn. Elec. Engrs.—Jl., vol. 62, no. 335, Nov. 1924, pp. 954-956, 4 figs. Describes evolution of lock-and-block system of signaling and uses of track circuit as now employed on Midland section of Lond., Midland & Scottish Ry.

GAGING. Unit System Used for Gaging Signal Maintenance on Northern Pacific, C. A. Christofferson. Ry. Signaling, vol. 17, no. 12, Dec. 1924, pp. 482-483, 1 fig. Application of system to Fargo and Dakota divisions.

INTERLOCKING. Automatic Interlockings on the G. N. Ry. Signaling, vol. 17, no. 12, Dec. 1924, pp. 475-477, 8 figs. Track-controlled plants without derails, installed by Great Northern, show saving that warrants extensive application of principle.

New Interlocking Plant at Busy Terminal. Ry. Rev., vol. 75, no. 22, Nov. 29, 1924, pp. 861-866, 10 figs. Electro-pneumatic interlocking plant with a.c. control and unusual train-starting system.

RAILWAY SWITCHES

OPERATION FROM GATE TOWER. Canadian National Low-Voltage Plant, C. H. Tillet. Ry. Signaling, vol. 17, no. 12, Dec. 1924, pp. 463-465, 7 figs. Operating cross-over and junction switches from gate tower, at Brantford, Ont., expedites traffic and effects economies.

RAILWAY TRACK

JUNCTIONS. New Flying Junction and Improved Signaling at Harrow, Metropolitan and London & North Eastern Joint Lines. Ry. Engr., vol. 45, no. 539, Dec. 1924, pp. 409-416, 16 figs. Changes made in track and signaling, giving details of transition stages.

WELDING, THERMIT PROCESS. Thermit Process Gives Good Results in Youngstown, D. J. Graham. Elec. Ry. Jl., vol. 64, no. 20, Nov. 15, 1924, pp. 841-842, 10 figs. This method of welding is used in installation and repair of crossings, switches and mates, compromise joints and other special trackwork. Has been standard of Youngstown Mun. Ry. since 1916.

RAILWAYS

INTERNATIONAL COMMERCE COMMITTEE REPORT. I. C. C. Annual Report to Congress. Ry. Age, vol. 77, no. 23, Dec. 6, 1924, pp. 1029-1034. Abstract of report of Interstate Commerce Commission making new recommendations for legislation; review of years' activities. See also Ry. Rev., vol. 75, no. 23, Dec. 6, 1924, pp. 908-911.

REFRACTORIES

MANUFACTURE AND PROPERTIES. Interesting Facts About Refractories, F. A. Harvey. Fuels & Furnaces, vol. 2, nos. 4, 5, 6, 7 and 8, Apr., May, June, July and Aug., 1924, pp. 335-338 and 388, 455-458, 669-672 and 765-770, 2 figs. Discussion of their manufacture and properties. Apr.: Silica brick. May: Fireclay brick. June: Silica, fireclay and special cements. July: Magnesite, silicon carbide, aluminous refractories, alundum, dolomite, diatomaceous earth and zirconia. Aug.: Testing refractories.

THERMAL CONDUCTIVITY. Thermal Conductivity of Refractory Materials (Sur la conductibilité thermique des matériaux refractaires), P. Gilard. Revue Universelle des Mines, vol. 4, no. 1, Oct. 1, 1924, pp. 34-50, 5 figs. Discusses heat transmission and its determination. Tests show that heat transmission increases with temperature. Bibliography.

REFRIGERANTS

LOW-PRESSURE. Low-Pressure Refrigerants, H. D. Edwards. Universal Engr., vol. 40, no. 5, Nov. 1924, pp. 24-27, 2 figs. Consideration of the different chemicals used, and of lubrication problem. Abstract of paper read before Nat. Assn. Practical Refrig. Engrs.

NATURAL GAS-GASOLINE. Use of Highly Volatile Natural Gas Gasoline as a Refrigerant, L. D. Wyant. South. Engr., vol. 42, no. 3, Nov. 1924, pp. 55-58, 2 figs. Results of experimental runs using gasoline as a refrigerant.

REFRIGERATING MACHINES

SMALL DOMESTIC. Small Domestic Refrigerating Machines, Chas. Schlumberger. Mech. Eng., vol. 46, no. 12, Dec. 1924, pp. 907-908. Describes types on European market as demonstration of his claim that problem of designing and building small domestic refrigerating machines has been solved.

THROTTLE EXPANSION. On the Coefficient of Performance of Refrigerating Machines employing Throttle Expansion, A. W. Porter. Lond., Edinburgh & Dublin Philosophical Mag. & Jl. Sci., vol. 48, no. 287, Nov. 1924, pp. 1006-1010, 2 figs. When comparison is made between two cases of mechanical refrigeration in one of which cooling is produced by cylinder expansion and in other by throttle expansion but in which all else is same in both, coefficient of performance is less in throttle case than in other for two reasons: (1) more work is required to keep fluid in circulation, (2) less heat can be removed from cold stores.

REFRIGERATING PLANTS

COMPRESSOR EFFICIENCY. Compressor Efficiency in Relation to Discharge-Pipe Temperature, E. Prestage. Ice & Cold Storage, vol. 27, no. 320, Nov. 1924, pp. 285-287, 3 figs. Reproduces and discusses indicator diagrams taken from a 15½ in. diameter by 30-in. stroke horizontal compressor working at Union Cold Storage Co.'s St. Petersburg store on Sept. 20, 1911, with object of arriving at relative efficiency of compressor when working "wet" or "dry".

REFRIGERATION

MECHANICAL APPLICATIONS OF. Mechanical Refrigeration and Its Application, C. H. Kane. Can. Ry. Club—Official Proc., vol. 23, no. 7a, Oct. 1924, pp. 21-29 and (discussion) 29-37. Review of field of mechanical refrigeration and descriptions of systems in practice and cycle of operation.

RESEARCH. Recent Developments in Refrigeration Research, E. Griffiths. Engineering, vol. 128, no. 3074, Nov. 28, 1924, pp. 742-744, 7 figs. Describes experimental work on refrigeration; tests of insulating properties of different materials carried out at (Brit.) Nat. Physical Laboratory. (Abstract.) Paper read before Brit. Cold Storage & Ice Assn.

TRANSIT TEMPERATURES. Low Temperature in Transit, M. E. Pennington. Ice & Refrigeration, vol. 67, no. 5, Nov. 1924, pp. 323-325. Some findings of pomologist, plant pathologists, bacteriologists and bio-chemists in investigating relation of fruit and vegetable rots, disease and fungus infections to temperatures maintained in transit, and of low bacterial counts and retardation of chemical decomposition as determined in animal and fish products when well handled at adequately low temperatures.

RETAINING WALLS

CALCULATION. Retaining Walls for Water (Sui muri dritti di ritenuta d'acqua), L. Conti. Annali dei Lavori Pubblici, vol. 62, no. 8, Aug. 1924, pp. 746-775, 1 fig. Discusses straight walls of triangular profiles, elasticity and stability, and makes calculations to determine most economic profile for given conditions.

ROADS

FLEXIBLE-BASE. Flexible Base Pavements in the Northwest, K. C. Schmidt. Mun. & County Eng., vol. 67, no. 5, Nov. 1924, pp. 224-229. Advantages of flexible-base pavements, i.e., pavements whose bases are of either some form of crushed rock such as Telford and waterbound macadam, or asphaltic concrete; Minnesota's first black base; mineral grading specifications; etc.

RESURFACING AND RECONSTRUCTION. Pavement Resurfacing and Reconstruction. H. J. Baum. Eng. & Contracting (Buildings), vol. 62, no. 6, Dec. 3, 1924, pp. 1209-1212. Outlines problems of smaller cities.

ROADS, CONCRETE

NON-UNIFORMITY OF CONCRETE. Causes of Non-uniformity of Concrete. Pub. Roads, vol. 5, no. 8, Oct. 1924, pp. 20-21. Replics received from State highway departments and district offices to tabulation forwarded by Bur. Pub. Roads showing results of compression tests on cores drilled from several concrete pavements in each of four widely separated states, which indicated a lack of uniformity in strength of concrete. with suggestions as to ways and means of improving uniformity.

ROAD MATERIALS

HYDRAULIC BINDERS. Hydraulic Binders for Highways (Les liants hydrocarbones pour le revêtement des routes), F. Mange. Génie Civil, vol. 85, no. 20, Nov. 15, 1924, pp. 446-451. Use of tars and bitumen, and their comparative advantages; mixing with sand; composition of aggregates, and proportioning of binder.

ROLLING MILLS

ELECTRIC DRIVE. The Electrical Drive of Rolling Mills, A. Hartmann. Brown Boveri Rev., vol. 11, nos. 2, 7 and 11, Feb., July and Nov. 1924, pp. 31-37, 127-139 and 249-259, 58 figs. Discusses non-reversing rolling mills, motors, starters, regulating contrivances, rotary converters and commutator motors in cascade with main motor, conversion of 3-phase current to direct current. Nov.: Drive of non-reversing mills; advantages of electric drive.

SHEET MILLS. Enlarges Semifinishing Capacity, J. D. Knox. Iron Trade Rev., vol. 75, no. 22, Nov. 27, 1924, pp. 1431-1433, 3 figs. Describes how plant of United Alloy Steel Corp., Canton, O., increased production by combining discarded rolling equipment with 3-high sheet-bar mill; describes present layout.

ROOFS

ASPHALT SPECIFICATIONS. Master Specification for Asphalt for Unsurfaced Built-up Roofing. Eng. Wld., vol. 25, no. 5, Nov. 1924, pp. 309-311, 3 figs. Specification officially adopted by U. S. Bur. Standards Federal Specifications Board on June 1, 1924 for use of Departments and Independent Establishments of Government in purchase of asphalt for unsurfaced built-up roofing. Fed. Spec. Bd., Spec. No. 88.

REINFORCED-CONCRETE. Reinforced-Concrete Roof Covering [Couverture en ciment armé du quai nord-ouest du port de Sfax (Tunisie)], F. Willm. Génie Civil, vol. 85, no. 19, Nov. 8, 1924, pp. 424-426, 7 figs. Design and construction of roof covering over north west quay of port of Sfax, Tunis.

S

SAND, MOLDING

GRADING, GRAIN-SIZE. The Grain Size Grading of Moulding Sand, H. C. Dews Foundry Trade Jl., vol. 30, no. 430, Nov. 13, 1924, pp. 413-415, 4 figs. Discusses three common methods of grading sand according to its grain size; screening elutriation, and sedimentation.

PROPERTIES. The Properties of Foundry Sand and Their Importance (Das Wesen des Formsandes und seine Bedeutung für die Giessereitechnik), Aulich Zeit. für die Gesamte Giessereipraxis, vol. 45, no. 43, Oct. 26, 1924, pp. 337-339. Description of method by L. Treuheit to investigate grain sizes of foundry sand, also a method by same inventor to investigate hardness of sand molds, similar to Brinell system of measuring hardness of metals.

SEWAGE DISPOSAL

INDUSTRIAL WASTES, PURIFICATION OF. Purification of Trade Wastes, H. Kessener. Eng. & Contracting (Water Wks), vol. 62, no. 5, Nov. 12, 1924, pp. 1067-1070. Describes experimental work in Holland. Paper read at Int. Conference on Sanitary Engineering, Lond., Eng.

SMOKE

ABATEMENT. Atmospheric Pollution and Smoke Abatement in London, Glasgow and Hamburg, J. B. C. Kershaw. Combustion, vol. 11, no. 6, Dec. 1924, pp. 442-444, 2 figs. Facts and figures extracted from report of Committee on Atmospheric Pollution, London, and of Verein für Rauchoekämpfung, Hamburg, relating to progress of smoke-abatement movement in those cities. See also Engineer, vol. 138, no. 3594, Nov. 14, 1924, pp. 545-546, 2 figs.

STEAM

TABLES, CALLENDAR. The Enlarged Callendar Steam Tables, W. M. Selvey. Elec. Times, vol. 66, no. 1725, Nov. 6, 1924, pp. 533-534. Examines a case by means of new tables which in their new form, are said to be of greatly enhanced value to designers.

STEAM ACCUMULATORS

DESIGN AND POSSIBILITIES. The Steam Accumulator, F. Münzinger. Combustion, vol. 10, no. 6, Dec. 1924, pp. 430-435, 11 figs. How load curve of boilers affects capital outlay; load curve and fuel consumption; effect on production; thermal principles on which design of accumulators is based; accumulators in power stations with high steam pressures; relation between steam economy and production.

STEAM GENERATORS

ELECTRIC, HYDROGEN-LIBERATION DETERMINATION. Determination of Hydrogen, C. Dantsizen and E. H. Horstkotte. Paper Trade Jl., vol. 79, no. 24, Dec. 11, 1924, pp. 43-44, 2 figs. Results of test made on a unit rated 5,000 kw. 3-phase 60-cycle 6,600 volts, operating at 100-lb. gage, installed at plant of Union Bag & Paper Corp., Hudson Falls, N. Y., to determine amount of hydrogen liberated in an electric steam generator under actual operating conditions.

STEAM PIPES

ALIGNMENT CHARTS FOR. Alignment Charts for Piping Problems, L. E. Partch. Power Plant Eng., vol. 28, no. 23, Dec. 1, 1924, pp. 1215-1216, 3 figs. Steam velocities and pipe sizes, equivalent areas and boiler efficiencies calculated graphically.

STEAM POWER PLANTS

DESIGN. Designing a 500-Horsepower Steam Power Plant, C. L. Hubbard. South. Engr., vol. 42, nos. 2, 3 and 4, Oct., Nov. and Dec. 1924, pp. 47-50, 40-43 and 35-39, 8 figs. Design of a steam power plant for an industrial establishment of medium size. Oct.: Determining power requirements, types of motors, prime movers, lighting, ventilating and elevators and hoists. Nov.: Steam for heating and ventilating, types of prime movers, operating non-condensing and condensing. Dec.: Extraction of bleeder steam turbine as a means of supplying low-pressure steam.

EQUIPMENT. A Compendium of Modern Power Plant Equipment, Jas. T. Beard, 2nd. Indus. Mgt. (N.Y.), vol. 68, no. 6, Dec. 1924, pp. 331-335. Defines power apparatus and appliances and shows their relation to cost sheet.

HIGH-PRESSURE PROBLEMS. High Pressures Affect Boiler Accessories. Power Plant Eng., vol. 28, no. 23, Dec. 1, 1924, pp. 1191-1195, 8 figs. High-pressure feed-pumps, water columns for 1,200-lb. boilers and superheat control are among problems encountered.

STEAM SHOVELS

TUNNEL MUCKING BY. Tunnel Mucking Performed by Power Shovels for the First Time. Contract Rec., vol. 38, no. 44, Oct. 29, 1924, pp. 1070-1072, 7 figs. Unusual use for steam shovels demonstrated by tunnel project put through by Niagara Power Co. of Niagara Falls, viz., driving 36-ft. diameter tunnel, 4300 ft. long, through solid rock. Entire clean-up was handled by five specially prepared shovels.

STEAM TURBINES

BRUSH-LJUNGSTRÖM, MANUFACTURE. The Manufacture of the Brush-Ljungström Turbine. Engineering, vol. 118, no. 3073, Nov. 21, 1924, pp. 699-700, 7 figs. partly on supp. plate. Description of new shop and machinery.

DESIGN. Steam Turbines and Condensing Equipment, F. Hodgkinson. Elec. Jl., vol. 21, nos. 11 and 12, Nov. and Dec. 1924, pp. 505-513 and 548-559, 27 figs. Nov.: Developments and present tendencies; modern types. Dec.: Blading and blade fastening; blade materials; balancing; turbine costs; condensers and auxiliaries. (Abstract.) Paper presented before World Power Conference.

Tendencies in Steam Turbine Construction. Power Plant Eng., vol. 28, no. 23, Dec. 1, 1924, pp. 1183-1186, 5 figs. Trouble is not anticipated with operating pressures as high as 1200 b.; temperatures will not go above 850 deg. fahr.

GEARED. Geared Turbines of the English Electric Company. Engineering, vol. 118, nos. 3073 and 3075, Nov. 21 and Dec. 5, 1924, pp. 698-699 and 760-763, 14 figs. partly on supp. plate. Discusses factors upon which efficiency depends, and describes geared turbines of Eng. Elec. Co.

NOZZLE-LOSS ANALYSIS. Turbine Nozzle Loss Analyzed by Air-Flow Measurement. Power, vol. 60, no. 23, Dec. 2, 1924, pp. 875-877, 7 figs. Wind tunnel is utilized in principle for investigating suitability of turbine nozzles, valves, buckets, or other parts for transmitting steam efficiency.

SMALL-PLANT. Application of Turbines to Small Plants, A. Iddles. Power Plant Eng., vol. 28, no. 23, Dec. 1, 1924, pp. 1186-1190, 6 figs. Use of high pressures and regenerative cycles; combinations of various types possible in industrial plants.

STEEL

ALLOY. *See Alloy Steels.*

CALORIZING. Making Edge Layers on Iron Heat Resistant by Diffusion (Hitzebeständige Randschichten auf Eisen durch Alterierung), A. Fry. Werkstattstechnik, vol. 18, no. 21, Nov. 1, 1924, pp. 614-616, 7 figs. Describes process of making surfaces of iron and steel heat resistant by diffusion with aluminum, patented by Krupp A. G.

FINISHING MELTING TEMPERATURES. Finishing Melting Temperatures of Simple Ingot Steels, H. D. Hibbard. Am. Inst. Min. & Met. Engrs.—Trans., no. 1384-C., Dec. 1924, 13 pp. Information regarding temperatures of molten steels, covering all carbon contents up to 1.5 per cent.

FRACTURES. Temper Brittleness in Steel (Anlass-sprödigkeit in Stahl), Geo. Wazau. Zeit. des Vereines deutscher Ingenieure, vol. 68, no. 46, Nov. 15, 1924, pp. 1185-1190, 24 figs. Investigation of certain cases of extraordinary brittleness of steel products with aid of the Fry lines of force; causes of fracture are traced to superimposing of "cold working" and "tempering."

NICKEL. *See Nickel Steel.*

NICKLE-COPPER. The Properties of Nickel-Copper Steel, J. A. Jones. Can. Chem. & Metallurgy, vol. 8, no. 11, Nov. 1924, pp. 264-265. Results of tests show that addition of copper up to 0.6 per cent, while not detrimental, does not produce marked beneficial effects.

SULPHUR AND CARBON DETERMINATION. The Simultaneous Determination of Sulphur and Carbon in Steel, Pig Iron and Ferroalloys by Means of Burning in Oxygen Current (Die gleichzeitige Bestimmung des Schwefels und Kohlenstoffs in Stahl, Roheisen und Ferrolegierungen durch Verbrennung im Sauerstoffstrom), C. Holthaus. Stahl u. Eisen, vol. 44, no. 48, Nov. 27, 1924, pp. 1514-1519, 2 figs. Describes apparatus and method for rapid and accurate determination of sulphur and carbon through burning in oxygen current, followed by titration.

STEEL CASTINGS

ANNEALING. Annealing Steel Castings and Its Importance to Consumers, H. A. Neel. Ry. & Locomotive Eng., vol. 37, no. 12, Dec. 1924, pp. 375-376. Benefits of steel castings from annealing are (1) increased physical properties; (2) relief of strains set up in cooling and in welding operation; and (3) increased machinability.

Five Steel Companies Using the Electric Method of Melting Agree to Anneal all Castings. Automotive Industries, vol. 51, no. 22, Nov. 27, 1924, p. 926. Research group formed which will turn out only fully annealed castings unless otherwise ordered; advantages claimed are better machining qualities and greater resistance to shock loads.

STEEL MANUFACTURE

ELECTRIC. The Development of Electro-Steel Manufacture in Germany, F. Sommer. Eng. Progress, vol. 5, no. 11, Nov. 1924, pp. 244-246. Statistical data; development of electric arc furnaces; induction furnaces; metallurgical development of electric-steel smelting process; position of electric-steel process compared with other steel processes.

STOKERS

DEVELOPMENTS. Activity in Stoker Field Shows Results, Jos. G. Worker. Power Plant Eng., vol. 28, no. 23, Dec. 1, 1924, pp. 1196-1198, 5 figs. Use of longer stokers and water walls have increased boiler output; better heat utilization shown.

STRUCTURAL STEEL

CONSTRUCTION CODE. Standard Practice in Steel Construction. Contract Rec., vol. 38, nos. 48, 49 and 50, Nov. 26, Dec. 3 and 10, 1924, pp. 1168-1170, 1194-1196 and 1210-1212. Code drawn up by Am. Inst. Steel Construction with a view to establishing uniform practice in fabrication and erection of structural steel and eliminating inconsistencies that have come into existence.

SUBSTATIONS

AUTOMATIC. A 500-Kilowatt Automatic Sub-station. Engineer, vol. 138, no. 3595, Nov. 21, 1924, pp. 590-591, 3 figs. Substation exhibited at Brit. Empire Exhibition by Brit. Thompson-Houston Co., designed for d.c. output of 500 kw. at pressure of 550 volts.

SUPERHEATERS

LOCOMOTIVE. Locomotive Superheaters, R. T. Wagner. Mech. Eng., vol. 46, no. 12, Dec. 1924, pp. 905-906, 6 figs. Examines 12 types of superheaters used or tried on German railways. (Abstract.) Translated from Zeit. des Vereines deutscher Ingenieure, vol. 68, no. 37, Sept. 13, 1924, p. 951.

The Manufacture of Locomotive Superheaters. Ry. Engr., vol. 45, no. 539, Dec. 1924, pp. 420-422, 9 figs. Methods and equipment of superheater shops at Wallsend works of North Eastern Mar. Eng. Co.

SUPERPOWER

INTERCONNECTION OF SYSTEMS. Interconnection of Power Systems in the Southeastern States, W. E. Mitchell. Am. Inst. Elec. Engrs.—Jl., vol. 43, no. 12, Dec. 1924, pp. 1150-1153. Problems of interconnection, power interchange and operation of interconnected systems. (Abridgment.)

T

TELEPHONY

TRANSMISSION EFFICIENCY, MEASUREMENT OF. Practises in Telephone Transmission Maintenance Work, W. H. Harden. Am. Inst. Elec. Engrs.—Jl., vol. 43, no. 12, Dec. 1924, pp. 1124-1128, 10 figs. Presents general picture of practical applications of methods of measuring transmission efficiency in Bell System which have been developed by study and experience under plant-operating conditions.

TEMPERATURE CONTROL

PHOTOGRAPHIC RECORDERS. A Photographic Recorder for Temperature and Other Physical Quantities, W. H. Stannard and P. E. Klopsteg. Optical Soc. Am.—Jl., vol. 9, no. 5, Nov. 1924, pp. 587-598, 5 figs. Describes instrument developed for purpose of obtaining data on a number of variables simultaneously over long periods of time much more completely and accurately than is possible by personal observation. Can be used in study of any problem in which it is possible to obtain galvanometer deflections as known functions of variables in question, as well as for study of temperature control.

TEMPERATURE, MEASUREMENT

TEMPERATURE SCALE AND HEAT UNIT. The German Code for Temperature Scale and Heat Unit (Das deutsche Gesetz über die Temperaturskale und die Wärmeeinheit), M. Jakob. Zeit. des Vereines deutscher Ingenieure, vol. 68, no. 45, Nov. 8, 1924, pp. 1176-1178. Origin and significance of code developed by Physikalisch-Technische Reichsanstalt for German Government; main points of code; practical fundamentals of temperature scale.

TERMINALS, LOCOMOTIVE

TURNTABLES. The Bethlehem Twin-Span Turntable. Ry. & Locomotive Eng., vol. 37, no. 12, Dec. 1924, pp. 357-359, 4 figs. Describes adaptation of rigid fulcrum to purposes of turntable.

TIDAL POWER

INSTALLATIONS. Tidal Power Installations, A. J. V. Underwood. Elec. Rev., vol. 95, no. 2451, Nov. 14, 1924, pp. 725-727, 1 fig. Discusses method of utilizing energy of tides by use of hydraulic compressors, and compares this system with water-turbine system.

TIME STUDY

FOUNDRIES. Uniform Piece Work Rates in the Foundry (Wie kommen wir zu einer einheitlichen Akkordbestimmung in der Giesserei?) H. Resow. Stahl u. Eisen, vol. 44, no. 44, Oct. 30, 1924, pp. 1363-1370, 1 fig. Discusses analysis of detailed foundry jobs and gives detailed list of processes with time added to each item, also time study cards.

TIME-MOTION CHARTS. Some Studies of Handling Time, A. Whitehead. Machy. (Lond.), vol. 25, no. 636, Dec. 4, 1924, pp. 289-294, 10 figs. Time-motion charts applied to analysis of tooling and assembly operations.

TRACTORS

CATERPILLAR. Caterpillar Tractor in the Lumber Industry (Der WD-Raupenschlepper in der Holzindustrie). Hanomag-Nachrichten, vol. 11, no. 126, Apr. 1924, pp. 49-68, 23 figs. Description of a type of caterpillar tractor combined with a hoist, which is used to fell trees and to haul them away. Calculations proving its economical superiority to use of animal power; testimonials; list of users.

TRAFFIC

ESTIMATION OF FUTURE. Methods of Estimating Future Street Traffic, E. P. Goodrich. Eng. & Contracting (Roads & Streets), vol. 62, no. 5, Nov. 5, 1924, pp. 1031-1033. Steps for determining future population, its distribution and activities. Paper read before Am. Soc. Mun. Improvements.

TRANSFORMERS

SPECIAL APPLICATIONS. Special Applications of Standard Transformers, J. B. Gibbs. Power, vol. 60, no. 22, Nov. 25, 1924, pp. 841-843, 5 figs. Factors to be considered when transformers are to be operated under other than rated conditions; amount of overload that can be safely carried: operating on other than normal voltage or frequency.

TRANSIENT CURRENTS IN. Transient Currents in Transformers, C. A. Melhuish. Ry. Signaling, vol. 17, no. 12, Dec. 1924, pp. 467-468, 5 figs. Explanation of cause of transient currents; how they affect signal operation.

TRANSPORTATION

AUTOMOTIVE. Motor Transportation of the Future, E. Church. Automotive Mfr., vol. 66, nos. 7 and 8, Oct. and Nov. 1924, pp. 8-9 and 29; and 8-9. The problem as a whole; various agencies and part each will play; passenger and commercial cars, railroads, buses, terminals, road surfaces.

RAILWAY, MOTOR-TRUCK AND BUS. Relation of Railroad, Motor Truck and Bus. Ry. Age, vol. 77, no. 24, Dec. 13, 1924, pp. 1067-1070. Recommendations formulated at conference held in Boston, Mass., and sponsored by Nat. Automobile Chamber of Commerce; includes following contributions; Motor Vehicles Should be Subject to Regulation, A. H. Swayne; The Railroads and Highway Transport, C. L. Bardo; Motorized Passenger Service is Here to Stay, Jas. M. Swift; The Railroad's Relation to Motor Trucks, G. C. Woodruff.

TUBES

BRASS, MANUFACTURE OF. The Manufacture of Brass and Copper Tubes, G. Evans. Metal Industry (Lond.), vol. 25, no. 19, Nov. 7, 1924, pp. 443-446, 7 figs. Casting the shells in brass foundry.

STEEL, FOR ROLLER BEATINGS. Making Steel Tubes for Roller Bearings, F. L. Prentiss. Iron Age, vol. 114, no. 23, Dec. 4, 1924, pp. 1463-1469, 8 figs. Electric-furnace plant for alloy steel; from ingot to seamless tube in series of mills; piercing mill used.

TURBO-ALTERNATORS

VENTILATION. The Multiple-Path Radial Ventilation of Large Turbo-Alternators, M. D. Ross. Elec. Jl., vol. 21, no. 12, Dec. 1924, pp. 540-545, 10 figs. Description of multiple-radial system and its advantages; limitations of other ventilating schemes.

1,200-LB. Operation of 1,200-lb. Pressure Generating Unit at the Weymouth Power Station, Edison Electric Illuminating Co., Boston, E. W. Norris. Gen. Elec. Rev., vol. 27, no. 11, Nov. 1924, pp. 714-718, 3 figs. Describes turbine generator which will be first of so high a pressure to be placed in commercial service in United States; its unique thermodynamic features and its operation under both normal and emergency conditions.

V

VALVES GEARS

LENTZ. Curve of Normal Path of the Lentz Oscillating Cam Gear (Eine Normal-Wegkurve zur Lentz-Schwingdaumensteuerung), H. Falk. Hanomag-Nachrichten, vol. 11, no. 129-130, July-Aug. 1924, pp. 126-133, 4 figs. Graphic determination of curve of path, effect on acceleration curve, valve dimensions in relation to curve of path, determination of spring power required.

VARNISHES

SYNTHETIC. Characteristics of Synthetic Varnishes (Caractéristiques des laques synthétiques), R. van Muyden. Revue Industrielle, vol. 54, no. 3184, Nov. 1924, pp. 353-361, 11 figs. General notes on synthetic rubbers; manufacture; properties; applications, particularly in electrical insulation; advantages of electrical material impregnated with synthetic varnish known as "Isolemail," and mechanical advantages of synthetic varnishes.

VIBRATION

ELECTRICAL MACHINERY. The Vibration Problem in Engineering, C. R. Soderberg. Elec. Jl., vol. 21, no. 12, Dec. 1924, pp. 579-582, 7 figs. Influence of stationary parts of electric machines upon critical speeds of rotating members.

W

WAGES

PREMIUM SYSTEMS. Setting Premium Rates, P. J. Rees. Machy. (N. Y.), vol. 31, no. 4, Dec. 1924, pp. 286-288, 5 figs. How premium rates can be determined in plants not engaged in quantity production.

RATE SETTING IN COAL MINING. Day Wage Versus Tonnage Rates for Operating Labor Saving Machinery in Coal Mining, Jer. C. White. Coal Mine Mgt., vol. 3, no. 11, Nov. 1924, pp. 23-27. Points out that day rate is faulty; application of piece-work rates; premium system eliminates unfairness of other systems.

WASTE HEAT

RECOVERY. Waste Heat Recovery Pays Fuel-Oil Bill. Oil Engine Power, vol. 2, no. 11, Nov. 1924, pp. 579-583, 4 figs. At plant of Am. Chocolate Almond Co., which is powered with 65-hp. oil engine, jacket water from engine passes through exhaust heater on its way to feed pump of heating boiler; heat thus reclaimed is equivalent to 20 tons of coal per month.

WASTE UTILIZATION

PREVENTION, AND. Utilization and Prevention of Waste, C. B. Auel. Soc. Automotive Engrs.—Jl., vol. 15, no. 5, Nov. 1924, pp. 407-411. Duties of salvaging engineer should be studying of plant for purpose of (1) preventing or minimizing waste items, (2) reclaiming as much of unavoidable waste as possible; (3) disposing of waste to best advantage, and (4) applying wastes of other manufacturers to one's own products; describes how problem is handled by Westinghouse Co. See (abstract) in Am. Mach., vol. 61, no. 18, Oct. 30, 1924, pp. 681-684.

WATER ELEVATORS

BOULTON. A Deep Well Water Elevator. Engineer, vol. 138, no. 3592, Oct. 31, 1924, p. 506, 2 figs. New Boulton water elevator, with which water is raised from depth of over 400 ft., recently put down at Citadel Barracks, Dover.

WATER GAS

BLUE. Blue Water Gas Offers Industrial Fuel Economies, D. J. Demorest. Chem. & Met. Eng., vol. 31, no. 23, Dec. 8, 1924, pp. 887-890, 5 figs. Discusses economy and its applications, particularly for small furnaces operating at high temperatures and processes like welding, where high temperatures must be obtained without regeneration.

WATER MAINS

CLEANING. Benefits of Water Main Cleaning, J. O. Endris. Can. Engr., vol. 47, no. 18, Oct. 28, 1924, pp. 454-456. Satisfactory results obtained at New Albany, Ind.; capacity of mains increased; method employed in cleaning mains. Paper presented at Indiana Sanitary & Water Supply Assn. annual convention.

SUBMARINE LAYING. Submarine Pipe Laying for the Narrows Siphon, New York. Eng. & Contracting (Water Works), vol. 62, no. 4, Oct. 8, 1924, pp. 779-782, 1 fig. Method of placing about 7800 ft. of 42-in. flexible joint cast-iron main across Narrow of New York harbor at a depth of about 56 ft. below mean sea level.

TYPES. Large Supply Mains, D. H. Maury. Am. Water Wks. Assn.—Jl., vol. 12, no. 1, Sept. 1924, pp. 1-41 and (discussion) 41-60, 19 figs. Principal types of pipe available for large supply mains, including cast iron, steel, concrete and wood-stave pipe, and process of manufacture; approximate estimates of first costs for various diameters and pressures.

WATER PIPES

REINFORCED-CONCRETE. Reinforced Concrete Pipe for Water Supply Lines Under Pressure, F. F. Longley. New Eng. Water Wks. Assn.—Jl., vol. 38, no. 3, Sept. 1924, pp. 257-286, 12 figs. Methods of constructing lock joint pipe for pressure water supply; discusses hydraulic qualities, water-tightness, durability, cost, and justification for its use.

WATER SUPPLY

CORROSIVE EFFECT OF. Determining Corrosive Effect of Water Supplies, J. W. Ledoux. Fire & Water Eng., vol. 76, no. 18, Oct. 29, 1924, pp. 969-970, 997 and 999-1000, 2 figs. Suggestions as to neutralization of corrosion arising from qualities in water supply, and methods of determining relative corrosibility of these supplies. Excepts from paper read before Pa. Water Wks. Assn.

GROUNDWATER. States of Hygroscopically Combined Water and Condensation of Unsaturated Vapors to Dilute Drop-Forming Liquids (Die Zustandsformen des hygroskopisch gebundenen Wassers und die Verdichtung ungesättigter Dämpfe zu verdünnten tropfbaren Flüssigkeiten), C. Mezger. Gesundheits-Ingenieur, vol. 47, no. 46, Nov. 15, 1924, pp. 538-546, 3 figs. Discusses formation of groundwater, hygroscopic and capillary absorption of water, hygroscopic equilibrium, dehydration and air content of hydro gels, water absorption by ground at varying temperature and varying vapor density, etc.

METERING. An Improved Water Supply for Chicago and the Relation of Metering to Service, J. Ericson. West. Soc. Engrs.—Jl., vol. 29, no. 10, Oct., 1924, pp. 371-378. Summary of efforts made to improve water supply of Chicago; urges adoption of universal metering as sensible means of overcoming these conditions. See also article entitled. Metering the Water Supply of the City of Chicago, H. A. Allen, pp. 379-400, 13 figs.; and discussion, pp. 400-404.

OFFENSIVE, TASTES. Offensive Tastes in Public Water Supplies, Chas. F. Dalton. Am. Jl., Pub. Health, vol. 14, no. 10, Oct. 1924, pp. 845-847. Report of Committee on Sanitary Engineering on causes and occurrences of offensive tastes.

WATER TREATMENT

SOFTENING PLANT. Water-softening Plant at Erith. Engineer, vol. 138, no. 3593, Nov. 7, 1924, pp. 522-523, 6 figs. Describes Becco-Legg plant which has capacity of 160,000 lb. of water per hr.; softening is effected by addition of lime-soda mixture.

WATERWAYS

ST. LAWRENCE. St. Lawrence Deep Waterway to the Sea, F. C. Shenehon. Can. Engr., vol. 47, nos. 19 and 20, Nov. 4 and 11, 1924, pp. 481-487 and 501-506, 7 figs. Vital principles which should obtain in engineering ways of securing ultimate benefits from St. Lawrence waterway. From paper presented at Detroit Mtg. of A.S.C.E. See also discussion of above paper by H. C. Sadler, pp. 477-478, by T. H. Hogg, pp. 479-480, and by H. DeB. Parsons, Nov. 18, 1924, pp. 519-521.

WELDING

ELECTRIC. *See Electric Welding; Electric Welding, Resistance.*

MULTI-THROW CRANK. Butt-welding Multi-throw Cranks, A. M. Lount. Machy. (Lond.), vol. 25, no. 631, Oct. 30, 1924, pp. 143-144, 2 figs. Difficulties involved in production; sequence of operations; welding section together; method of inspection.

ELECTRIC. *See Electric Welding, Arc, Electric Welding, Resistance.*

WIND POWER

FARM ELECTRIC PLANTS. Wind Power for Farm Electric Plants, F. J. Pancratz. Mech. Eng., vol. 46, no. 11, Nov. 1924, pp. 675-680 and (discussion) 680-682, 10 figs. Test data on 15-ft. wheels; losses due to air drag; best size of wheel for farm electric-light plants; combination plant for generating electric power and pumping.

WINDOWS

AIR LEAKAGE AROUND OPENINGS. Air Leakage Around Window Openings, C. C. Schrader. Am. Soc. Heating & Vent. Engrs.—Jl., vol. 30, no. 6, June 1924, pp. 465-474, 8 figs. Deals with effect of increasing width of stile, that is, increasing clearance.

WOOD

FUNGI IN. Effect of Kiln Drying, Steaming, and Air Seasoning on Certain Fungi in Wood, E. E. Hubert. U. S. Dept. Agriculture, Bul. No. 1262, Aug. 1924, 20 pp., 13 figs. partly on supp. plates. Details of study to determine whether fungi in lumber are killed under ordinary commercial kiln conditions and steaming processes and to gain some idea of minimum time and temperature limits necessary to kill these organisms. Results of tests.

PRACTICAL CONSERVATION. The Practical Conservation of Timber. Chem. & Met. Eng., vol. 31, no. 22, Dec. 1, 1924, pp. 857-861, 6 figs. National conference, called by Secretary of Agriculture in Washington to evolve plan and policy for better utilization and longer life of wood.

WOODWORKING MACHINES

MANUFACTURE. Producing Woodworking Tools to Close Limits, A. Murphy. Can. Machy., vol. 32, no. 17, Oct. 23, 1924, pp. 17-19, 7 figs. Operations at Hamilton, Ont., plant of P. P. Yates Machine Co.

WOOD PRESERVATION

PRESERVATIVES. Preservation of Wood (Ueber die Konservierung des Holzes), M. Sedlaczek. Kurststoffe, vol. 14, nos. 4, 5, 6, 7 and 9, Apr., May, June, July and Sept. 1924, pp. 49-50, 68-71, 84-86, 103-105 and 134-135. Discusses colloidal impregnation agents, mineral coatings, inorganic compounds, including mercury and arsenic compounds, magnesium-zinc salts. Organic compounds including tar oils, phenols, nitro-compounds. Dyeing staining of wood. Processes of further manufacture of wood, cork, etc.


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THE ENGINEERING INSTITUTE OF CANADA FOUNDED 1887

MARCH 1925

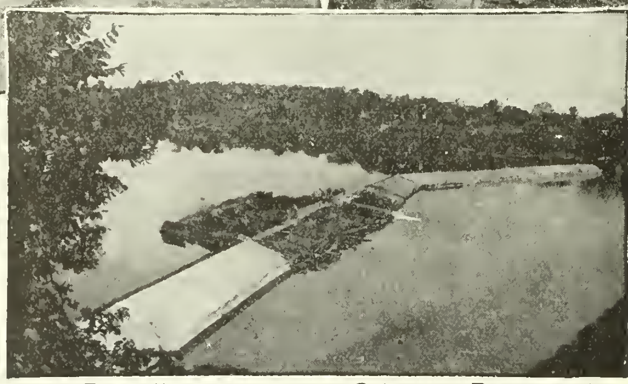
PUBLISHED MONTHLY BY THE ENGINEERING INSTITUTE OF CANADA

AT 176 MANSFIELD STREET, MONTREAL

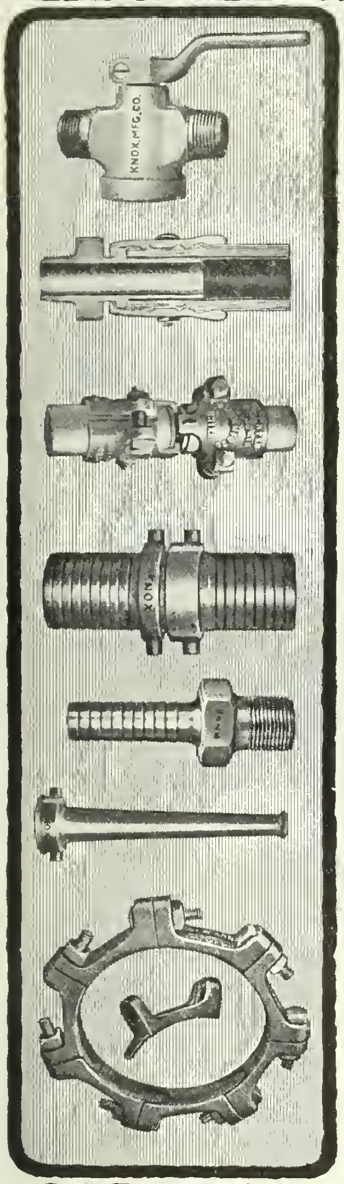
Vol. VIII No. 3

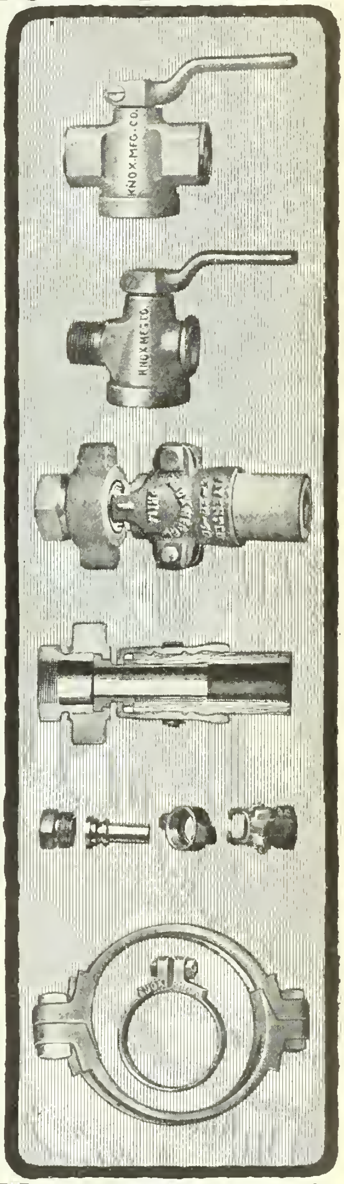
Ice rush at old Caledonia Dam.

Old Caledonia Dam before Concrete reconstruction commenced.



Partially reconstructed Caledonia Dam (1921).





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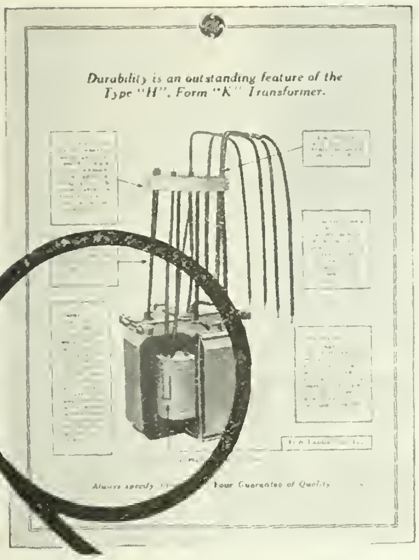

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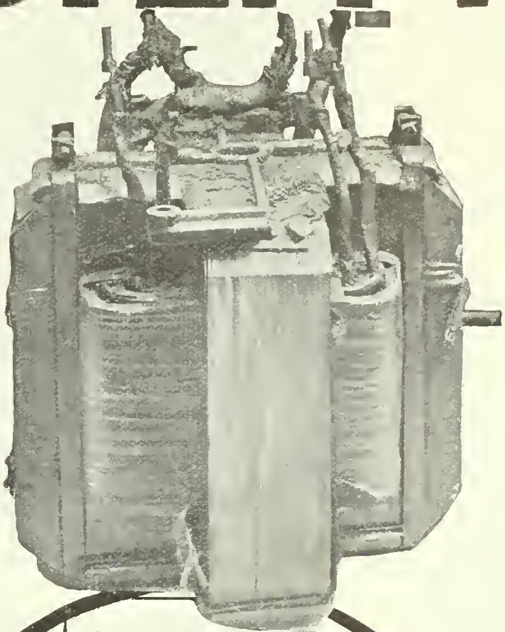

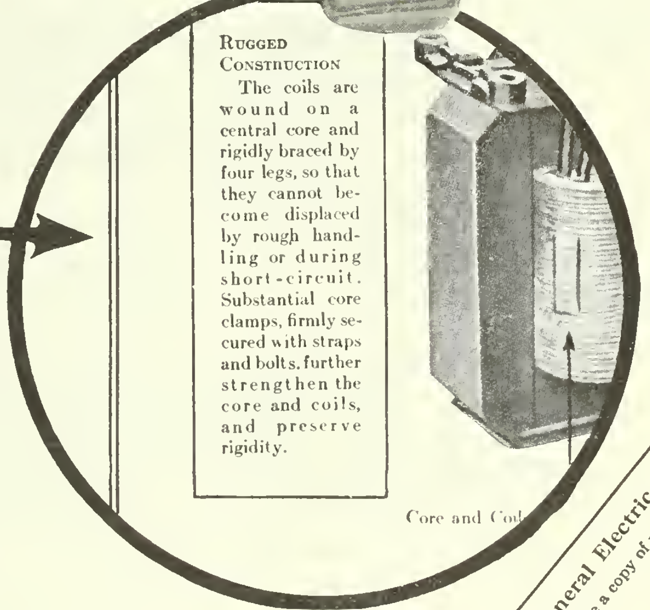

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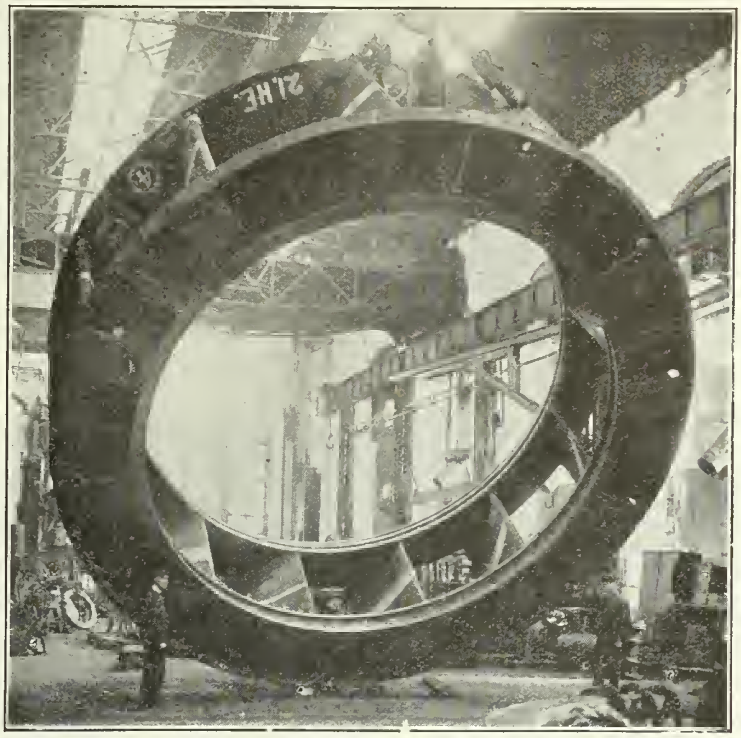

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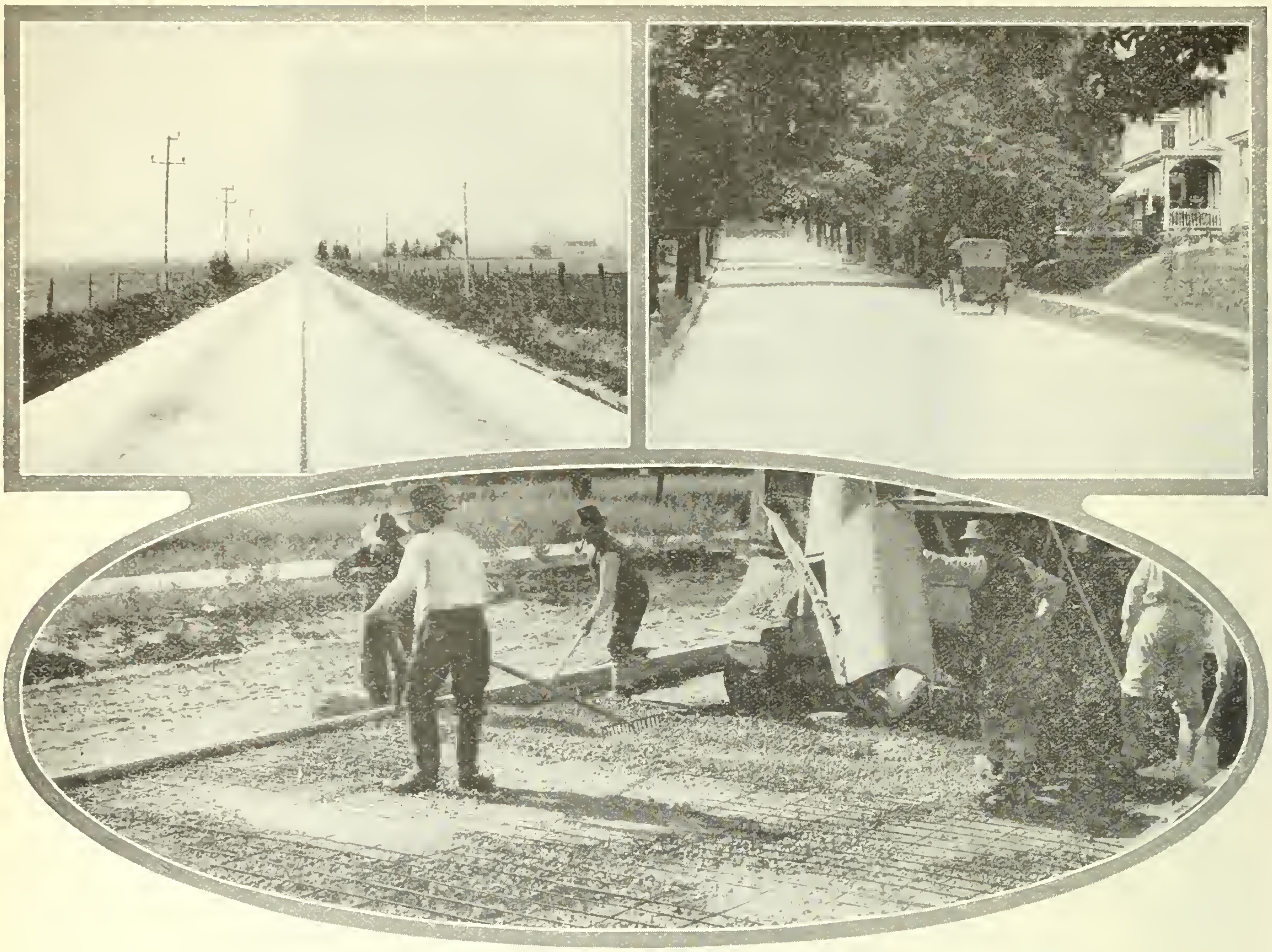

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Symposium on Engineering Education

Engineering Education was discussed at the annual meeting from the viewpoint of the Society for the Promotion of Engineering Education, the engineering college, the manufacturer, the engineering society, and the profession at large. The interest aroused in the discussion which took place at the Windsor Hotel on Wednesday, January twenty-eighth, showed that it was an opportune subject to bring to the attention of the members of The Institute.

On this occasion The Institute *was favoured with the presence of Mr. H. P. Hammond, associate director of investigation of the Society for the Promotion of Engineering Education, to open the discussion. Mr. Hammond devoted the major portion of his remarks to outlining the organization and the work of the society of which he is associate director. In dealing with the purpose of the investigation he grouped the objectives under five headings, under which he explained in more detail the purpose of each particular study and the progress which has been made in the same.*

The subject of engineering education was then treated from the viewpoint of the university by Professor C. J. Mackenzie, M.E.I.C., dean of engineering, University of Saskatchewan, in his paper entitled "Engineering Education". After outlining the principal investigations which have already been carried on in connection with this subject, Professor Mackenzie dealt with the influences which are necessitating further investigation. In his opinion, there is need of a change in our educational system to meet the changing conditions of to-day but that the change should be in the nature of a gradual and natural adjustment. The opinion that is frequently expressed, to the effect that our universities should train young men for leadership, was termed as futile nonsense by the speaker, and as positively harmful to the student, who should be given a thorough training which will make him capable of developing into an able and efficient executive although he should expect to start at the bottom of the ladder. In conclusion, Professor Mackenzie stated the basic truth remains that the problem of education resolves itself into one of teaching.

Further views on the subject from the standpoint of the university were presented by Professor H. M. MacKay, M.E.I.C., dean of the faculty of applied science, McGill University, in his paper "Some Thoughts Regarding Engineering Education". Professor MacKay in his opening remarks dealt with the immediate usefulness of the graduate and pointed out that in order to be immediately useful the young man must be familiar with all details of the work on which he is engaged and that these could not be effectively taught or learned except when surrounded by actual conditions and under the spur of responsibility. On the whole, Professor MacKay believed it may be reasonably claimed that our present curricula properly handled are capable of giving good results and that they do so in the case of abler students.

From the point of view of the manufacturers, W. M. Cruthers, B.A.Sc., A.M.E.I.C., secretary, Students' Course, Canadian General Electric Company, Peterborough, discussed the question of engineering education, outlining the provision made by his company for special practical courses for young graduates and how the results of these courses were studied. He then compared the success of the college graduate with the man educated with the long and more tedious route of every day study of practical work, pointing out that the college man has all the advantages, provided personality is equal, so long as he will continue to be a student, but if he does not continue to study let him look out for the self-educated man who is continually studying. He urged that each member of the staff of the university should spend a certain length of time in some branch of industry as, in this way, the faculty would be constantly in touch with the most modern ideas and practices.

The subject was treated from the viewpoint of an engineering society, such as The Engineering Institute of Canada, *in the paper entitled "Engineering Education — An Engineering Society Viewpoint", by Fraser S. Keith, M.E.I.C., the main theme of which is stated briefly in one of the opening paragraphs in which Mr. Keith says, "Throughout the length and breadth of the Dominion of Canada we are giving to a large number of young men as fine a training as anybody could receive; as well equipped to face the world and its problems as any body of men could be, and then we are attempting the impossibility of, in the main, directing their future lives into what we call the engineering profession which is already seriously overcrowded. Lest this statement be misinterpreted let me emphasize my belief that this country could absorb per year twice as many technically trained men as are now being turned out of our engineering colleges; but the engineering profession itself cannot absorb a fraction of those who are leaving our colleges year by year, firm in their belief that the only way they can receive the greatest benefit from their training is to secure an engineering position in some one or other of its many phases."*

Following the presentation of the various papers, there were read discussions by Professor Peter Gillespie, M.E.I.C.; Doctor R. W. Boyle, M.E.I.C.; Professor R.S.L. Wilson, A.M.E.I.C.; Professor I. F. Morrison; Professor H. J. MacLeod and Professor Charles A. Robb, M.E.I.C., while a number of members present at the meeting also contributed to the discussion.

The Study of Engineering Education

H. P. Hammond,
Associate Director of Investigation of the Society for the Promotion of Engineering Education.

Paper read before The Annual General and General Professional Meeting, Montreal, Wednesday, January 28th, 1925.

During the past fifteen or twenty years there has been a growing tendency to ask some rather pointed questions regarding the methods and results of higher education. This has centered principally upon branches which prepare for definite vocations, the methods of which are consequently susceptible of measurement in terms of definite results. The movement has crystalized into a number of definite inquiries or investigations, of which the Flexner investigation of medical education is one of the best known. Other investigation of a similar character have been made or are in progress in the fields of law, dentistry, theology and other divisions of higher education.

I think we should not be disconcerted by this movement, but rather that we should regard it as a healthy sign that higher educational methods are undergoing a desirable readjustment to fit them more closely to present-day needs.

It might be interesting to discuss the results of these investigations, but time does not permit of any adequate analysis in this paper. If doubt exists as to the results accomplished, one has but to compare medical education to-day with what it was twenty years ago. It is true that the Flexner study is but one phase of this remarkable change; but I am convinced that it was the most important single element in it.

These past and present inquiries have had one effect which has an important bearing upon the situation in engineering education. In the period above mentioned there appears to have been a tendency toward a more clearly defined differentiation between the professional type of training for specific vocations, and the more general collegiate or academic courses. This matter will be discussed later in this paper, but is mentioned at this time since it has arisen in connection with the educational surveys previously mentioned.

Education in engineering has not escaped this critical scrutiny, nor is it desirable that it should have done so. In fact, probably no other branch of higher education has received more thought or discussion, or more effort better to adapt it to our present industrial and social conditions. Engineers, educators and industrialists have devoted, in the aggregate, an enormous amount of time and energy to the problem. All of this has no doubt been for the general good of engineering education, but I feel that there has been a great expenditure of undirected energy and that we have comparatively little of measurable accomplishment to show for our efforts.

It was a realization of the desirability of co-ordinating these efforts in a common and purposeful effort which led to the inception of the two studies of engineering education; i.e. the Mann investigation, and the present study which is being conducted by the Society for the Promotion of Engineering Education under a grant of funds made by the Carnegie Corporation of New York.

The fundamental conception of the present undertaking has been described on previous occasions, but I believe it may be advisable, even at the risk of going over what is old ground to some, again to point out that the project differs from most of the other investigations in that it originated in and will be carried out primarily by the college faculties themselves, rather than through an outside agency. The project is a co-operative undertaking in a very real way. While it is being conducted under the auspices of the engineering faculties, through the Society for the Promotion of Engineering Education, the effort is being made to obtain the assistance and the views of all those who have contact with the methods or product of the engineering colleges. To this end the co-operation of the engineering societies, the United States Bureau of Education, the industries — through the National Industrial Conference Board, and others has been sought and obtained. In fact the widespread interest and co-operation in the undertaking are indications of the general desire not only to maintain engineering education upon a sound basis, but to enhance its standards and usefulness to the greatest possible degree.

Before taking up in detail the purposes of the investigation and the ends which it is hoped to accomplish, it will probably be desirable briefly to describe the organization through which it will be carried out.

Organization of the Investigation

As a general agency for planning and directing the activities of the co-operating agencies, a central board, known as the Board of Investigation and Co-ordination of the Society for the Promotion of Engineering Education, has been created. Professor Charles F. Scott of Yale University, formerly president of the Society, is chairman of the board, and Dean F. L. Bishop of the University of Pittsburgh is its secretary. Acting under the general direction of the Board is a Director of Investigation — Mr. W. E. Wickenden, and a staff consisting of the speaker as associate director and an office and clerical force. This central staff maintains contact with the several co-operating agencies and committees; prepares outlines of studies to be undertaken by those agencies; receives, compiles and publishes the information supplied by co-operative committees; and conducts a number of investigations which are best handled under the immediate supervision of the director or the associate director. Among the latter are the studies now in progress of engineering education in Europe.

Representing the collective agency of the faculties there are four committees from the general membership of the society, each of which has general supervision and advisory direction of one or more of the projects which are being carried out.

The active work of investigation is being carried out within the colleges by committees of the faculties. Thus far one hundred and one such committees have been organized in institutions in the United States and Canada. These institutions include, with a few exceptions, all of the colleges in which high grade engineering courses are given.

Committees of the engineering societies are co-operating by conducting studies of a number of questions formulated by the central staff.

The United States Bureau of Education, under the immediate direction of Dr. Walton C. John, is making valuable contributions of data relative to enrollment in engineering courses, the requirements for admission and for graduation, and other data.

On the industrial side of the problem, the National Industrial Conference Board, under the direction of an advisory committee composed of representatives of the industries and of the colleges, is conducting an independent but co-ordinate study of the demand for engineering graduates in industry and the conditions surrounding their employment, work, and advancement to positions of responsibility.

This constitutes the set-up of the organization at present. As the work proceeds it may be desirable to expand it so as to include other agencies, though there is no present expectation of doing so.

Objectives of the Investigation

As to the purposes of the investigation and the results which it is hoped to accomplish, I will refer to a formal statement issued by the Board of Investigation and Co-ordination entitled "A Statement of Objectives and Outline of Procedure of the Investigation of Engineering Education". A supply of reprints of this statement is available and the members present may obtain them for examination if they wish.

The objectives, as formulated in the above mentioned statement, have been grouped under five headings as follows:

1. It is the intention to clarify the educational functions and responsibilities of the colleges of engineering.
2. It is the intention to establish guiding principles for the content and arrangement of curricula and the improvement of teaching.
3. It is the intention to consider in what ways problems relating to engineering students, graduates and teachers may be dealt with more effectively.
4. It is the intention to examine the practicability and possible benefits of closer group relationship among the colleges and with the professional organizations of engineers.
5. It is the intention to make an analytical comparison of the organization and practices of engineering education in Europe and America.

Each of these principal divisions is sub-divided into a number of more explicit purposes. It will not be possible to discuss each of these explicit purposes in detail, but since my purpose is principally to set forth the main facts regarding the investigation, and since a discussion of its objectives will serve to bring out a considerable number of the important aspects of engineering education, I believe it will conduce to an orderly arrangement if I take up the five major divisions of the statement of objectives in turn and devote some attention to each of them.

Division I—The Problem of Function

Mention has already been made of the tendency toward a more definite differentiation between the professional type of training and the general academic courses such as those in arts and science. There seems to be not a little confusion as to the extent to which engineering courses partake of the nature of a specialized professional training or a broader collegiate type of training in which science and its technological applications are employed as the principal educational media. This may perhaps be made clearer by reference to two particular branches of higher education. As an example of a specialized type of training for a particular vocation we may consider courses in dentistry. Here the end sought is the training of a particular and specialized type of professional man — the dentist, who deals in his practice with a sharply defined line of work. At the other extreme we have the schools of agriculture whose function is to it prepare men to deal with any of the multitude of problems arising in connection with the industry of agriculture — among them such diversified activities as animal husbandry, horticulture, the technology of soils, forestry, dairying, farm machinery and power, farm management, agricultural economics, rural sociology, and the like. The graduate dentist, after devoting four, five or six years to his college training, is prepared practically to go immediately into the practice of his profession — as in fact many do. On the other hand would any one assume that the graduate of a course in agriculture has received in college alone the preparation required to make him a practical farmer or a farm manager? These extremes will serve to illustrate the problems in reference to the position of courses of engineering in the educational scale. To which of the above courses would you say that engineering corresponds more nearly?

It is the hope that the investigation will result in a clearer and more universally accepted understanding of the place of engineering courses in the educational scale, with a consequent clarification of many of the subordinate issues such as the length of the course, the extent to which specialization should be carried, the extent to which the courses of study should be adapted to the capabilities of students or, on the other hand, students should be selected with reference to their fitness to become engineers. Many of the specific problems confronting the engineering schools seem to depend for solution upon a clear determination of the function — as above defined — of education in engineering. The Board holds the view that if this question of function can be satisfactorily answered, many of the other problems will be in a fair way toward early solution.

As corollaries to the general problem of the function of engineering colleges, we are endeavouring to determine how engineering curricula may be co-ordinated more effectively with the needs of industry and the requirements of engineering practice; to determine whether or not it may be desirable and practicable to vary the extent of training in engineering to accord with the capacities of students on the one hand and with the requirements and opportunities of the field of practice on the other; and to determine what responsibilities the colleges should assume for the further training of graduates. In explanation of these purposes I would say that while the differences in the individual capacities and abilities of students are recognized in a general way, there is little definite appreciation of the extent of difference between individuals. This is not of the order of two to one, but rather of the order of ten to one, or even much more than that. This statement is based upon very definite and carefully verified measurements. Furthermore the demands of industry are not such as to call for the same extent of special training in all graduates. This statement seems to call for no amplification. Yet in spite of the wide diversity of students and of the requirements of the positions which graduates fill, we are attempting to fit all students into the same educational mold and to provide them with identical training, no matter what level of attainment in practical work they are capable of eventually reaching. It is the purpose of the investigation to determine to what extent a greater degree of differentiation both in the scope and content of engineering courses is desirable and feasible. This, it is realized, is a large order, but it is hoped that we may be able to point the direction in which steps towards a solution may be taken, and the lines along which further study of the problem is required.

If there is any one movement in engineering education which has been discernable in the past five or ten years it is, I think, in the direction of a broader curriculum and more attention to thoroughness in teaching the fundamental principles which underlie all engineering, and away from the top-heavy specialization which marked the engineering courses of ten years or so ago. It is not my purpose to discuss the validity of this tendency, but one thing is clear, — if I have not misappraised the situation: namely, that there is a need among graduates, who have found the lines of work which they will follow, for a more extended training in the particular branch of engineering in which they find themselves. To illustrate, I may mention the condition in New York City. A number of the colleges there have instituted evening and Saturday afternoon courses in engineering. From small beginnings these courses have grown until there are several thousand students studying engineering while at the same time they are working in engineering positions. Among them there is a large proportion of college graduates who find it desirable to continue their education by taking special courses which follow closely the line of their daily work. The market for this type of course in New York seems practically unlimited, and while one institution after another has established extension departments, the enrollment in each of them continues to increase until it is necessary to place applicants upon waiting lists and to admit them in order of priority of application or in accordance with special qualifications. This demand for more extended and specialized training is one which it might be thought could best be served in the ordinary undergraduate course. But is this the case? Does the ordinary college graduate have a definite idea of the line of work he will follow? Would it be possible, even if students did know accurately what their future would be, to provide for the multitude of engineering specialties by any reasonably adequate undergraduate training? May it not be preferable to postpone such training until the young engineer has found his berth, and then to provide for his further training through some form of extension instruction? This is one of the problems to which the answer is by no means clear, but which is receiving attention in connection with the investigation. In this connection the mutual responsibilities and possibilities of the colleges and industry are being considered.

Division II — Curricula and Methods of Instruction

The second major division of the undertaking deals with the establishment of principles for the selection of the content and arrangement of curricula and improvement in teaching. This objective probably requires little explanation. The matters comprised apply primarily to the internal affairs of the colleges, yet there is no phase of engineering education upon which the voice of practicing engineers should not be heard. There is just one element of this situation which I should like to amplify. It is the need for a closer co-ordination of the work of the several departments of instruction in which engineering students are taught. If there is any one phase of education in engineering which would seem susceptible of prompt remedy it is this; yet, as a matter of fact, there is probably no other element of the situation in which improvement is more difficult. The engineering student in most cases receives his instruction in mathematics in one department of the institution, physics in another, chemistry in a third, and so on. In some cases these departments are all administered by the dean of the engineering college, but in many — perhaps a majority — they are not. The tradition of academic freedom of professors, their individual control over methods of instruction, (and to a considerable extent over selection of subject matter as well), and most important of all, the angle from which the various subjects are approached by individual teachers, militate against the degree of correlation which an engineering course, (which is, or should be, to a large extent an organic whole), would seem to require. It is common experience that teachers in one department complain of the preparation given to their students by the faculty of other departments. Students find it difficult to make the frequent adjustments to the different viewpoints from which closely related subjects are taught. One of the major purposes of the investigation is the endeavour to lay down guiding principles for the selection of subject matter, for organizing it into courses, and for methods of instruction so as to provide a more organic structure to engineering courses and a better correlation of instruction in the various departments.

Division III — Personnel

The third main division of the objectives relates to problems of personnel — engineering students, graduates and teachers. Under this main heading four specific problems are being studied.

1. To determine what steps may be taken to insure the entrance of properly qualified students.
2. To determine what measures may be taken to deal more effectively with the problem of eliminations.
3. To ascertain the methods which may best be used by the colleges to facilitate the obtaining of suitable employment by their graduates and to promote their further development.
4. To indicate how methods of recruiting and developing engineering teaching staffs may be improved.

It would be quite possible to devote the entire time allotted to this paper to any one of these problems.

The admissions problem, for example, is one which has troubled the colleges for years, and a great deal of study has been given to it. Yet the evidence in many parts of the United States indicates that we are far from obtaining the sort of students or of preparation which we desire. Over sixty per cent of all students who enter engineering courses are eliminated before graduation. Two-thirds of these eliminations are due to scholastic failure. A large proportion of eliminations — a majority in many colleges — occur during the first year. These facts seem clearly to indicate that we are admitting a considerable number of students not fitted to pursue engineering courses as they are given at present. While these facts are well known, the problem of dealing with them is quite another matter. Preparation is controlled by the high schools and will continue to be so controlled. The high schools have their own problems and I do not mean to criticize them. With engineering courses on an undergraduate basis, there is no opportunity for the preliminary sifting process which takes place in the years of preprofessional work, which now precede courses in medicine and law. Nor is there any present indication that engineering will be placed upon other than an undergraduate basis. Then there is a broader aspect of the problem than that relating merely to formal entrance requirements and scholastic preparation. This is the attraction of the highest obtainable grade of young men to engineering courses and to engineering as a life work. Since 1900 there has been a tremendous increase in college enrollment. In the decade from 1900 to 1910 the population of the United States increased twenty-one per cent. In the same period college enrollment increased eighty-five per cent. From 1910 to 1920 the increases were approximately fifteen per cent in population and ninety-six per cent in college enrollment. The same ratios have held, approximately, for the engineering colleges. With this tremendous expansion there has been a dilution of high grade students by those of mediocre abilities. That there should be any limitation upon college-going need not be touched upon here, but in the case of engineering — one of the most exacting of the professions — it seems to me clear that a higher degree of selection and better means of attracting desirable students should be in effect. This problem is receiving our earnest attention.

Engineering education will never be stronger than its teachers. And though engineering faculties are equally as good as others, (one college president who have given much study to the problem has told me that in his opinion engineering faculties as a whole are stronger than those in any other branch of education), the tremendous expansion of higher education has made it extremely difficult to find sufficient well qualified teachers to fill all the positions. How to recruit teaching staffs with properly qualified men, how to provide means for the development and training of the younger teachers, and how best to provide adequate and proper contacts of teachers with industry and engineering practice are receiving a considerable share of the attention of the investigation. As one phase of this matter, we hope to be able to present a clear picture of the rewards and opportunities of a teaching career in engineering and to clear up many of the misapprehensions in this connection.

Division IV — External and Internal Relationships

The fourth main division of the investigation deals with the relationships which do and should exist between the colleges and the professional engineering societies, and the means through which effective group action may be taken by the engineering colleges.

Studies in this division are being conducted under the general guidance of a board of councillors consisting of two representatives from each of the four founder societies in the United States, the executive secretaries of those societies, and the members of the Board of Investigation and Co-ordination of the S.P.E.E. as representatives of the colleges.

The first step in the studies undertaken under the supervision of this group has been a thorough analysis of the relationships between schools and societies in other professions. A second step will be the determination of the relationships between engineering schools and engineering societies in England and on the continent of Europe. The condition in other professions and in engineering are not the same in a number of important respects. In the United States, at least, there is no single association representing all engineers, but rather there are the four founder societies and a considerable number, (thirty or more), of other national associations. This condition makes it difficult to set up any working relationship between the schools and the organized body of the profession. Then too it is extremely doubtful whether the great diversity of engineering activities make it desirable to have any such close relationship of schools and of profession as exists in medicine. But that there can be a closer and mutually advantageous bond between the schools and bodies of professional engineers seems apparent. Just what form this bond may best take remains to be seen as a result of the investigation and the deliberations of the board of councillors which is advising on the problem.

Attention is also being given to the extension of group action by the engineering colleges, which has been such a prominent feature recently in other professions. Studies of the organizations, activities and benefits derived from group action in other educational fields have been conducted and a condensed summary of the findings will be found in the Journal of Engineering Education for December, 1924.

Division V — European Studies

Finally, as the fifth division of the undertaking, there are the studies which are being made by the Director in Europe. It is the purpose to make an analytical comparison of the positions occupied by American and European colleges of engineering in the educational systems of the two continents; to compare the educational practices in relation to admission methods, examinations, curricula, the status of teachers and methods of instruction; and, as previously mentioned, to study the relations of the colleges to industry, professional organizations and governmental and public service. It is believed that much of value may be learned from an interchange of knowledge concerning American and European educational methods and while the transplanting of any considerable portion of the system or methods of one continent would not suit the conditions of the other, yet there are many elements of value which may be studied to our benefit. Mr. Wickenden will be in Europe in connection with these studies during the first half or more of this year. It is expected that the results of his studies will be published from time to time in news letters and reports, with a final comprehensive summary of the situation as a whole

The foregoing is a brief outline of the history of the investigation and of the objectives which have been set. It remains to state, equally briefly, the policy as to procedures which are being followed in conducting the undertaking.

Procedures

In the first place, it is the policy of the Board to proceed at all times upon a basis of ascertained facts — in other words to follow the procedure of good engineering practice. For that reason, the first half of the three-year period of the Carnegie grant under which we are now operating has been set aside for a survey of the existing situation. This is being done through the agency of the co-operating bodies previously mentioned. Among other portions of the fact-gathering process we are endeavouring to determine accurately the variety and diversity of positions which engineering graduates fill, the relationship of their work to their undergraduate courses, their earnings, the channels through which they have advanced to present positions, the conditions which surrounded their introduction to practical work, the extent to which they have continued their education and the manner in which they have done so — in short a comprehensive picture of the product of engineering courses. We are also endeavouring to learn as much as possible of the antecedents of engineering students, their preparation, their reasons for choosing engineering as a career and the time at which they made a choice of both career and particular course of study. We are endeavouring to get at the bottom of the causes of eliminations and scholastic failures.

The conditions under which engineering teachers carry on their work, the sources from which they are being drawn, methods employed for developing them in their early years as instructors, the extent to which they engage in practical work, the extent to which the industries are drawing well qualified men away from teaching, — these and other fundamental facts are being ascertained regarding the teachers of engineering. Other divisions of the investigation are being studied in the same way, and it is the hope that there will result a clear knowledge regarding the present status of engineering education in its many phases.

Upon the completion of the fact-gathering process it is the intention to analyze the facts, present them in systematic order with suitable exhibits, and to distribute them to the co-operating agencies.

The next stage of the undertaking will be the interpretation of the evidence. This, also, will be carried out in co-operation with the various bodies through which the facts are collected. Experimentation will be suggested where such experiments seem advisable — in fact a number of such experiments are now in progress which time will not permit me to describe. At the end of the three-year period, and to a considerable extent during its duration, the results of the investigation will be published.

While the period of the Carnegie grant is three years, it is not the expectation that the project will come to a conclusion at the end of that period. It is expected that the project will develop into a concerted effort on the part of the colleges to effect the adjustments of curricula and education methods which the investigation has pointed out as desirable. To quote from the statement of objectives which I have mentioned previously "It is not the aim to bring the project to a definite stage of conclusion, but rather to prepare the way for a continuing process of educational inquiry and adjustment, and to develop within the society's (the Society for the Promotion of Engineering Education) organization the means of making the co-operation of the colleges in this process effective".

Engineering Education

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Paper read before the Annual General and General Professional Meeting, Montreal, Wednesday, January, 28th, 1925.

One very naturally approaches with diffidence the formal discussion of Engineering Education, for the problems involved are largely the problems of education in general, problems about which so much has been said and written, that it seems impossible to make any suggestion that has not been better stated already. Even those aspects of the question which concern Engineering Education alone have been the topics of so many discussions recently, by educationists and others interested in this field, that there seems little, if any, new matter to add to the discussion.

However, it is very appropriate that this subject should be chosen for a general discussion by *The Engineering Institute of Canada* at this particular time, when the entire field of engineering education and training is being so thoroughly studied in America as a result of the investigation instituted by the Society for the Promotion of Engineering Education and the Carnegie Foundation.

Investigations

Engineering education in America has been under critical examination almost constantly since 1907, at which date a joint committee of the Society for the Promotion of Engineering Education, and of the various national professional societies organized an investigation which had for its object "to question anew the pedagogic solution of fifty years ago, to examine the curriculum of to-day and the methods of teaching now employed, and to suggest in the light of fifty years of experience the pedagogic basis of the course of study intended to prepare young men for the work demanded of the engineer of to-day."

The report of that investigation was published in 1918 as bulletin No. 11 of the Carnegie Foundation entitled, "A Study of Engineering Education", by C. R. Mann. This report which is no doubt well known to most of us, contained, in addition to much interesting historical and statistical data and suggestions, three general conclusions which may be summarized as follows: (1) That with the rapid increase of scientific and technical knowledge, the original curriculum had become overloaded with a greater number and larger quantity of subjects to the prejudice of sound training; (2) that the original pedagogic method of devoting the first two years of the curriculum to a study of the fundamental sciences and the last two years to a study of the principles of their application to practical problems, was not giving the best results. A recommendation was made that the fundamental theory and application might better be taught simultaneously in some manner resembling the well known "Case Method" of teaching law; (3) that the common method of examination is not a true index of the fitness of students, and that some type of objective test would likely be found more satisfactory.

This report was critically studied in most engineering colleges on this continent, and the first conclusion received quite general approval. There has been a decided reaction, in recent years, against the tendency to so-called specialization in technical subjects and there has also been made a real effort to cut down the number of different subjects studied at one time as well as the total number of required hours, in order to give the student more time and opportunity to go thoroughly into the subjects which he is taking. With regard to the second and third conclusions, in Canada at least, there does not seem to be any general inclination at present to accept them. While a few schools in the United States are apparently making a success with co-operation plans, whereby the student alternates his time between actual work in industries and theoretical work in school, a great many educationists feel that while the Case Method is a most excellent one for the study of law and possibly of business, the analogy does not necessarily hold with engineering, as the principles which are taught during the first two years in engineering courses are principles of science not of applied science and it is difficult to see just how it would be easier and clearer to elucidate a law of pure science, by using supposititious conditions of application.

As to examinations, engineers as a whole probably feel sympathetic towards objective tests for fitness but they probably also feel that until the so-called intelligence, aptitude, training or other psychological tests, have been more fully demonstrated, the old method of examination, unsatisfactory as it is, will have to remain. While on the subject of examinations, it is interesting to note that the method of holding a general examination at the end of the course, which is common in England, is being adopted with apparent success in some of the well known liberal colleges in America, and the suggestion that the principle be adopted in engineering schools is worthy of serious consideration.

The present investigation, referred to at the opening of this paper, which is being conducted under the direction of Mr. Wickenden and the assistant director Mr. Hammond may, in a measure, be considered as a continuation of the study of Dr. Mann, but the specific objects of the two differ. Mr. Mann was primarily investigating the pedagogical aspects of the engineering curriculum and the methods of teaching, while the present investigation is undertaking "A study of the objects of engineering education and the fitness of the present day curriculum for preparing the student for his profession". The present investigation is therefore much wider in its scope, it will not only question the teaching of engineering, but will also attempt a thorough study of the requirements of the present and future, both as to the numbers, quality and particular type of man needed and of the curriculum to produce the required product. It is a most comprehensive investigation, directed by men of ability and experience in education, business and industry, and the report, when made, will no doubt have a marked influence on the future trend of education on this continent.

Influences Affecting the Problem of Engineering Education

While awaiting the results of this study, it will be quite proper and profitable to note some of the present trends, observe some of the influences that have affected the general problem and speculate upon possible future demands and changes.

These inquiries into engineering education are no doubt merely outward indications of a feeling of unrest which has been prevalent within our profession for the past two decades. This unrest has been due not to discontent and depression but rather to the healthy growing pains of a young and vigorous body. The questioning has been directed mainly towards the larger relationships of the engineer and the engineering profession to the new order of civilization which has been evolving so rapidly. This new order brought about by the striking improvements in transportation and communication by the development and extension of industry and commerce has, as we so well know, completely revolutionized the political, economic and industrial outlook of the present world. Engineers as a class have found themselves playing a very active part in this transition, being called upon more and more to solve problems, and to meet conditions, which have arisen largely as a result of their own activities. The solving of some of the problems, which at first seemed of a purely technical nature, has led, and will continue to lead the engineer into the more general fields of economics, business and even public life, as well as into many highly specialized technical branches. The result has been, especially in the United States where the development has been most rapid, that men with an engineering training have found many openings in industry and special branches of engineering which formerly were occupied by men with no ormal training. So rapid was the development that during the early stages the resources of the engineering schools were taxed to meet the demand upon them. As young graduates often found rapid advancement in these new and special fields more and more courses of a special nature were offered until now courses are offered in American Colleges in more than thirty different branches of engineering.

The result is that the engineering profession as a whole embraces a body of men with widely different interests engaged in work of a character varying from that of the scientist to that of the salesman, from that of the research or designing engineer to that of the administrator or industrial executive. It is not strange that the profession of engineering has not been able to present to the public the same organic unity as have the professions of law and medicine. The feeling that our profession did not enjoy the same kind of recognition led to the agitation for some form of legal recognition and while such has been obtained to a great extent, it seems that the very nature of engineering activities,—their constructive character, their intimate association with industry and business, — make the engineering profession fundamentally different from those other professions which administer directly to personal needs and are remedial, corrective or preventative in nature. It seems that there is developing a new type of professional service whose votaries work in groups to serve the general public and that the hope of the engineers lies in this new direction rather than in any attempt to pattern their ideals and aspirations on those of the older professions.

Engineers as Executives and Public Leaders

Considering the manner in which engineering as a profession has developed it is not strange that the man engaged in highly specialized research or designing should disagree with his professional brother, the executive officer of an industry or of a utility, as to the importance of various details of their common college course. The industrialists, and perhaps the general public, feel that engineers as a class are lacking in some of those qualities that go to make up a good executive or a public leader, and from some quarters there has gone forth the call for engineering colleges to train leaders.

It may be true that engineers have not in the past assumed their rightful share of the high places in industry and public life, and that the present curriculum might well be modified slightly so as to provide study in liberalizing subjects, as well as a more thorough training in the fundamentals of economics and accounting. But it must be conceded that in recent years more and more engineers have taken their place in the sun. Their success has made it a reasonable assumption that the fundamental and rigorous training, which engineers are receiving to-day is in the main sound, that if the important executive and other positions of leadership are now considered as possible openings for the engineer, it is due to the fact that the sound training which he has received has brought out qualities and abilities that are needed in important positions. If we weaken materially this sound training in the sciences for the sake of applying a superficial coating of general information, in the phraseology of the correspondence advertisements the young graduate might be better able to "sell himself" but it is doubtful if he would bring a very high price as a "Captain of Industry" or a "Public Leader".

There is much talk these days of training young men for leadership, most of which is not only futile nonsense but positively harmful to the student starting at the bottom of the ladder, where of course he should start; he will soon get impatient with the routine of his early duties if he imagines that due to his particular training he is an embryonic leader destined to high executive positions. Although a student may no doubt be given training which will make him capable of developing into an able and efficient executive, he cannot by training alone be made a leader; leaders are born not trained. All that we can do, for the potential leader who enters the engineering profession, is to help him create for himself a breadth of interest and outlook and to train his mind by a thorough drilling in the fundamentals of engineering so that when he does start to lead he will lead wisely and in the right direction. It is probably true that many men with the urge for public life and leadership have been in the past discouraged from entering engineering and have chosen law as the field which seemed to offer the easiest path towards that goal, but conditions are changing without question, and the signal success in high places which many men of engineering training have attained in recent years should awaken the public to the intrinsic value of such training for the practical world of to-day, and we may confidently expect to find more and more engineers filling such positions with the natural consequence that more young men with the ambition to serve in public life will be attracted to the profession.

A Gradual Change Necessary in Training System

Lest the writer be accused of complacency with respect to our present system of training engineers, he would like to state that in his opinion there is need of a change in our educational system to meet the changing conditions of to-day but that the change should be in the nature of a gradual and natural adjustment.

On this continent, the rapid development stage, when frontiers were being pushed back and new areas thrown open, has probably passed. That there will be great developments in the future no one denies, but those developments will very likely be of the more ordered type characteristic of older countries. This will mean refinement in engineering design and practice, perhaps a grading of engineering occupations. In a democratic country we recoil at the suggestion of stratification but it will probably come in engineering training. Even now it is generally admitted that all fields of engineering do not demand the same intensity of training, and it might be profitable to look to some of the older countries for suggestions. In France we find a condition of approaching saturation both from the standpoint of industrial development and of population density, a condition which we will approach in the future. There it is found that those engaged in engineering work are divided into two broad divisions, the college-trained (certificated) engineers and those who have not been so trained. The former occupy most of the positions of prominence and constitute a profession of considerable prestige. These certificated engineers, however, do not all receive their training in the same way, but various systems are available varying in length from three to six years, following the baccalaureat of the Lycees. Entrance to these courses is governed by the abilities and aptitudes of the candidates and it is usually found that the grade of work in which they eventually engage bears a general relationship to the training received. The highest professional course consists of several years of a very thorough scientific training, followed by two years or more in a purely professional school.

In England, Cambridge offers a course somewhat different from most of the other schools in that it is an honour course in the mechanical sciences, roughly paralleling their honour courses in pure science, with no attempt made to specialize in any particular branch of engineering. There also the tendency is to push all specialization into post graduate courses, thus giving the student time to master the many and ever increasing fundamental principles which are now needed. It is reported that graduates from this course find no difficulty in getting located and that a considerable number enter, besides special engineering fields, the different fields of administration, business and commerce as well as the army.

In the California Institute of Technology there is a striking example of the new trend in the field of science and technology. This institute aims at becoming primarily a centre of scientists and scientific training, an aim which it will no doubt realize as there is gathered there a group of the world's leading scientists, who have abundant funds for equipment and research. But it will also train young men, who by virtue of their sound training in fundamentals, will no doubt achieve greatness in the fields of applied science.

The Trend towards Merit Promotion in Industry

There are many evidences in this country that the path to success in engineering is changing, that the young man graduating from a school of science will find the path to important positions in industry much longer in the future than it was in the recent period of rapid expansion. There is a noticeable inclination on the part of railway, utility companies and other industries to train and promote their own personnel, and the young graduate of to-day who wishes to eventually reach a position of responsibility should hasten to acquire experience in the lowest ranks of his chosen field, a preliminary which is rapidly becoming necessary for future advancement.

During the past few years, in many parts of Canada at least, thoughtful engineers and educationists have often asked themselves what is to become of the many excellent young men who are now being trained in our engineering colleges. If the young graduate is to be allowed to feel that his training entitles him at once to a superior professional position there is occasion for pessimism, but if he is prepared to start at the bottom, even at a labourer's job, there will be no cause for alarm as there are many positions in industry which carry both responsibility and a fair salary that will serve as excellent stepping stones for young men of ability on their path upward.

Some industrial organizations have laid down a rigid rule that all employees must start at the bottom and that the highest offices will be filled by a promotion on ability and performance alone. This, of course, means that if our young graduates enter the industries on this condition there is a solemn duty on the part of those industries to keep a close and detailed record of all employees, their records of interest, ability and performance, in order that assured ability and training will have an equally assured promotion. Many of our largest corporations already have highly placed officers whose sole duty it is to watch the progress and training of their personnel.

In the west, at least, young engineers are realizing that to succeed in railway work it is much better for them to devote one summer to work as a labourer on a section gang than to try for a more appealing job as an instrumentman or draftsman, and many graduates after having spent at least two years as instrumentman and acting divisional engineer have spent one of our severe western winters as a track labourer or foreman in order to obtain the promotion which was awaiting men with engineering training and such experience.

It is not alone in railway work that we have graduates working as labourers but in many constructional firms graduates are working as rough carpenters and labourers, at a salary fully the equal of that paid in purely technical junior positions, and with a purpose that will mean future success for them.

This tendency, which should be encouraged, to have graduates start at the very bottom of the ladder will open new vistas for engineers and many positions which are now occupied by older and untrained men will soon become looked upon as the special field of men with a technical education, and the positions will also rise in prestige with the incumbent.

Is it not possible then that in Canada we are approaching the time when a differentiation in training for those going into applied science is needed. May not the future trend be to develop the existing undergraduate courses in engineering into courses of a more scientific nature, stressing more and more the pure sciences, but including with perhaps more of the humanities, a sound training in the fundamentals of economics and accounting, with the consequent withdrawal of even more of the strictly technical studies, leaving only sufficient of the applied atmosphere to point the way to practical affairs. Such a course would suit admirably young men going directly into many branches of engineering, industry or commerce as well as those who wished to specialize in some more technical field in a post-graduate school, in fact would give an excellent training with which to enter at any door the practical world of to-day, which is rapidly becoming one of applied science. For the more intensive study of special professional fields, courses could be offered by the various colleges in those branches which they felt best qualified to give by reason of equipment, staff or location.

A Suggested Functional Division

An interesting suggestion has been made recently that in professional courses, instead of giving instruction in a great number of different branches of engineering, a functional division be made and training of a fundamentally different character given to those who have special aptitudes and desires for any one of the different fields of (a) engineering research, (b) design, (c) administration. This suggestion whether practical or not makes a real appeal, inasmuch as fundamentally different types of men are best suited to those different fields, and in the future, as it will likely be necessary for young men to spend a longer and longer time in junior positions, any well grounded student will have plenty of time to acquire the mere information regarding his particular field. The recent statement of the head of a large industriai research institute is suggestive and worthy of serious thought. He stated that the only requirements necessary for applicants for positions were that they have a thorough fundamental training, and know absolutely nothing about the problem to be investigated.

In opening, the remark was made that the problems of engineering education were largely the problems of all education. After all has been said, the basic truth remains that the problem of education resolves itself into one of teaching. Able teachers are real leaders and as such are born not hired. Given a teaching staff of earnest, inspiring and devoted teachers, the subject matter or organization of courses becomes secondary, that indefinable atmosphere, so necessary for real education, envelops students and staff, and a true university is found, from which will emerge in the course of time a succession of young men inspired with the true spirit of learning and shaped to uphold the most noble traditions of any profession.

Some Thoughts Regarding Engineering Education

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Paper read before the Annual General and General Professional Meeting, Montreal, Wednesday, January 28th, 1925.

The subject assigned to the writer is so broad that it is manifestly impossible to treat it in a balanced way within reasonable limits of time and space. All that will be attempted is to discuss a few debatable questions from the point of view which has been forced upon the writer by his experience as an engineer and as a teacher.

No branch of higher education has been subjected to a closer scrutiny in recent years. Inside of the engineering schools anxious self examination has been the rule and the search light has been turned on the question from without. The engineering profession as a whole has taken a keen interest in the training of recruits, and has contributed much that is valuable in the way of constructive criticism. This very commendable interest on the part of the profession is perhaps not altogether altruistic. The relation of the younger engineer to the older is usually that of employee to employer. The training of the young engineer is, therefore, a matter of very direct interest to the older. The employer is likely to judge the work of the school by the immediate usefulness of the graduate.

Now, in order to be immediately useful in any particular field the graduate must be familiar with all the practical details of the work which he is called on to do, and in general he is not. To illustrate, a valued friend once told the writer that his first assignment to a recent graduate was to go out and set up a derrick. The young man had no information about erecting derricks and did not make much of a success of it. It was therefore suggested that practical courses should be established in handling contractor's plant. This would be quite possible, although expensive, but to cover the whole of say the civil engineering field in such detail would take the better part of a lifetime. Engineering is an art and in some aspects a handicraft, as well as a science. Matters pertaining to the latter aspects cannot in general be effectively taught or learned, except when surrounded by actual conditions and under the spur of responsibility. So far as they are concerned an hour in the field may be infinitely better than a week in the class room.

A comparison is sometimes drawn between the professional training for engineers and for medical men. In the writer's view the engineering school cannot and should not be a professional school to quite the same extent as is the medical school. The medical student has his clinics readily accessible, but it is impossible to bring the mine or the hydro-electric plant within the precints of the university, and the best equipped laboratory is only a partial substitute, in fact its main usefulness is along entirely different lines. The engineering student must therefore go to the field or office or shops to complete his training. The situation is fortunate, because while the young doctor may in emergency be faced with grave responsibilities, the young engineer is, — except in fiction, — fairly free from them, and usually works under direction.

While some believe that the engineering schools should teach details of practice to the greatest possible extent, there has been much discussion from a very different point of view. A few years ago Dr. C. R. Mann, of the Carnegie Foundation, issued a questionnaire to the members of the leading American engineering societies, asking them to rank in order of importance and to attach weights to certain groups of qualities, as they would use them in selecting young men for employment or promotion. These were:—

1. — Character (integrity, responsibility, resourcefulness, initiative).
2. — Judgment (common sense, scientific attitude, perspective).
3. — Efficiency (thoroughness, accuracy, industry).
4. — Understanding of men (executive ability).
5. — Knowledge of fundamentals of engineering science.
6. — Technique of practice and business.

As a result of the many thousands of replies received, the first four groups of qualities, character, judgment, efficiency, and knowledge of men were quite properly, one may concede, rated very high, 75 per cent of the whole. Knowledge of the fundamentals of engineering science and of practical technique, often regarded as the sole stock in trade of the schools, were considered to amount to 25 per cent of the ideal qualification. To practical technique was assigned the lowest rating of all, 10 per cent. Some amusement was caused when a western dean proceeded on this basis to rate two gentlemen of his acquaintance, one an engineer of respectable attainments, the other a grocer, for a post as superintendent of waterworks. The grocer, on account of his high character, efficiency, sound sense and knowledge of human nature, secured the larger number of points, which seemed to indicate some fallacy in the theory on which the rating was based. This fallacy seems to consist in weighing qualities which are essential to success in all fields of human endeavour against those which are demanded only in a particular field.

Now, while any attempt to deal in a quantitative way with the above mentioned qualities may lead to absurdity, they may well stand, so far as they go, as a reasonable specification for an engineer. We may add "power of independent thought" and "power of expression", which are not specifically mentioned. Also, considering that education should be a preparation for life as well as for earning a living, we may add "general culture", by which one means the capacity to regard with interest and appreciation, or at least without boredom, some portion of the work of the leaders in literature, philosophy, science and art. Much of the discussion one hears seems to place on the engineering schools the responsibility of securing all these qualities in their product. This is certainly too great a load for any one human institution to carry, and we surely have the right to assume some assistance from heredity, family training, and the preparatory schools. We must also assume the active co-operation of the student himself. Without a measure of all of these the task is hopeless.

On the one hand, then, the instructor is urged to pay more attention to practical technique and to add more courses to an already overcrowded curriculum. On the other hand, it is suggested that his practical and scientific instruction is relatively of little value, and that his efforts should mainly be directed to other objectives. How can he meet the views of these friendly critics, who look at his work from such divergent points of view and are agreed only in regarding it with some disfavour?

In military tactics it often happens that an objective which is impregnable to frontal attack may be turned by a flanking movement. The writer believes that the same principle holds in educational tactics. In other words, many of the most valuable results of any real educational process are indirect. If we wish to develop character we do not necessarily establish courses in ethics and psychology, but we remember that good work well done is the best of character builders. It must be sufficiently difficult to extend the students' powers, but, having regard to the frailty of human nature, not so difficult as to discourage him. One can even have some sympathy for the position of the stern disciplinarian, who, when advising a parent as to his son's studies said, "It matters little what your son studies so long as it is disagreeable". Strong meat indeed, perhaps a little too strong for the modern stomach, but it at least guards us against educational sugar-plums, royal roads to learning, and "improved" methods which seek to drop information into expectant mouths as manna from heaven, with no further effort on the part of the recipient than that of keeping open the useful organ referred to, for which a yawn suffices. For many of our objectives, at all events, the studies prescribed matter less than how they are studied. But since we can hardly expect to be let off, like the admirable grocer mentioned in an earlier paragraph, without some knowledge of engineering science and technique we naturally select studies which contribute to that kind of knowledge.

The usual curriculum of an engineering school then consists of the following studies:—

1. — Instruments for the expression of ideas, — our ordinary language, English or French as the case may be, mathematics and drawing. The last two may be considered as kinds of shorthand or symbolic languages, well adapted to, and indeed necessary for the expression of many of the concepts of an engineer's mind.
2. — The more or less exact sciences on which the various branches of engineering are based.
3. — Practical applications of these sciences in the field, in the laboratory and in design.
4. — Economics and possibly a sprinkling of cultural subjects. The emphasis given to the third group is the distinctive feature of an engineering course.

While the exact sciences are unsurpassed as an instrument for developing mental power, thoroughness and accuracy, it is in the practical applications that the teacher has his widest opportunity. Practical details, however, should be studied not so much for their own sake as to motivate the student to throw light on fundamental principles and to develop certain faculties.

The concrete appeals to most minds far more than the abstract. The student is stimulated by feeling that he is doing something which has a relation to realities. Abstract theoretical deductions are usually based on the assumption of ideal conditions which are not strictly true in reality. For the sake of simplicity they often ignore factors which actually enter into the problem. Hence the divergence between theory and practice which tends to disappear when the practice is good, and when the theory is based on adequate assumptions and takes due account of the essential factors. In the field and laboratory the student is able to check his deductions. He is always putting them to the proof, developing his sense of proportion and judgment by noting, if he can be induced to do so, the effect of neglected factors in his theory or of imperfections in his work. Designing problems wisely directed, should make for a broader point of view and a more critical attitude. The student should work to standard specifications. In this way he obtains some knowledge of the broad lines of approved practice. He has among other things brought home to him the consequences of ambiguity in specification writing. Specifications should, however, be regarded critically, and not as the fundamentalists would have us regard Holy Writ. The experienced instructor will trace the evolution of the most important clauses, the principles underlying them, and will thus show which are well established, which are matters of judgment or compromise, and which, let us be frank, are to be accepted with reservations. But the teacher should not be dogmatic. He should appeal to reason and common sense. Every exercise in design should be an exercise in common sense and in the development of judgment and a sense of perspective. Economic factors affecting design can readily be made a part of the game which the capable student plays with zest and with a considerable sense of responsibility.

The shortness of the time available in an engineering school for any particular field of study is hardly realized. Few institutions, for example, are able to devote more than the equivalent of 60 or 70 full working days during a four-year course to the entire field of structures. In this time the student must learn all he is to know as an undergraduate of the analysis of stresses in structures and of the design of foundations, dams, retaining walls, buildings and bridges in steel and in reinforced concrete. One must acknowledge some efficiency in the system which enables him to accomplish as much as he does.

Our curricula do not and cannot take care of one important point in Dr. Mann's specification for the ideal engineer. Knowledge of men can only be obtained by personal contact. Rubbing shoulders with his fellows, particularly in the many activities which now form so conspicuous a part of student life, does something, gives him some knowledge of human nature, which is after all about the same in all classes of society. But the point of view of the men whom the engineer must handle and direct, and their mode of thought, can only be learned by contact in the field and workshop, to which we must also look mainly for the practical training in technique and detail which is so essential. In general this training is now carried out in a somewhat fortuitous way. The members of this *Institute* and the corporations which they represent are doing it, and in one way or another are paying for it. Just one suggestion, — would it cost any more, and would it not be more effective if it were in some way systematized and recognized as a regular part of our educational scheme?

The alleged inability of the average engineer, young and old, to express himself clearly in English is a frequent subject of comment and complaint. The criticism may not be altogether fair, for the writings of many engineers are models of clarity and dignity, and the average engineer is often compared with the leaders in medicine and at the bar. Besides, the involved sentences of some of our legal friends show that we are not the only sinners. However there are certain reasons why an engineer may be deficient in this respect. Many of his ideas are difficult to put into words, but readily expressed by a formula or a sketch. In his earlier career particularly, his human professional contacts are likely to be quite different from those of his medical and legal brethren. When explaining one's views to the foreman on the job one is likely enough to forget his choicest diction and to use that touch of colour and emphasis which will convey his idea most forcibly. Habits thus formed persist with all of us.

Some suggest as a remedy increased attention to English composition and courses in engineering English. Let us get away at least from the last term. Engineers need no special kind of English. Formal instruction and exercises in composition are too likely to be regarded by the student suffering from the pedantry schools as another set of unwelcome tasks, to be dismissed from memory when performed sufficiently well to "get by". Results are cancelled by careless habits formed and perpetuated in many homes and by the general cultural environment. The writer thinks that the remedy must be more radical. Clear thinking is the first essential for clear expression; a taste for good literature the next. It is a matter of general culture too deeply rooted to be dealt with by any single method.

The engineering schools can do much to encourage the use of good English by demanding a fair style in all written exercises and by enlarging the opportunities for cultural development, but they are not likely to succeed completely until the standard of the community as a whole is improved.

The impression seems to prevail in many quarters that academic standing is not an indication of future success. There are, it is true, many eminently successful engineers who did not distinguish themselves particularly during their college career. Some of these are in executive positions; others who took matters easily in college, went to work afterwards, and made up for lost time; others still have had special talents fitting in with their subsequent lines of work, which have more than made up for deficiencies in other respects. Investigation shows, however, that the high grade student has a much better chance of professional success than his weaker fellow. A list of the names of nearly 400 eminent American engineers, who were also graduates, was compiled a few years ago, by the registrar of Lehigh University. He divided these into five groups according to the scholastic status of the gentlemen concerned. The results were interesting. It was found that 46.4 per cent stood in the highest fifth as regards scholarship; 27.8 per cent in the second; 18.3 per cent in the third; 3.6 per cent in the fourth, and 3.8 per cent in the lowest. An investigation of about 17,000 graduates of Yale and Harvard gave somewhat similar results, indicating that the chance of success for the high grade as against the low grade man was about 12 to 1. After all high scholarship is a proof of exceptional ability or exceptional industry, or of a reasonable combination of both, and as such is worthy of every respect. There is no doubt that scholarship is less esteemed by students of the present day than was the case a generation ago. Distinguished engineers could do a great deal to counteract the easy going tendencies of the time, if when advising students they were to hold up scholarship as a worthy ideal.

On the whole it may be reasonably claimed, the writer thinks, that our present curricula properly handled are capable of giving good results, and that they do so in the case of the abler students. It is urgent, however, that the average man should obtain a more thorough grip of fundamentals, and broader cultural opportunities are eminently desirable for those who can profit thereby. To secure these ends within the limits of a four years course, which is probably as long as conditions justify, it may be necessary to curtail rather than to increase technical instruction, and certainly to require more thorough preparation for entrance. Advanced work for those fitted to benefit by it can best be given after graduation, and after obtaining some experience. Three words, however, really sum up the writer's ideas as to what is necessary for the best results, — *work, enthusiasm, common-sense.*

The Value of an Engineering Education from a Manufacturer's Viewpoint

W. M. Cruthers, B.A.Sc., A.M.E.I.C.

Secretary, Students' Course, Canadian General Electric Co., Peterborough, Ont.

Paper read before the Annual General and General Professional Meeting, Montreal, Wednesday, January 28th, 1925.

So much has been written on the subject of engineering education, and so many addresses have been given by notable authorities, that when the chairman of the Peterborough Branch of *The Institute* asked me if I would prepare a paper on the subject for the annual meeting I rather hesitated. However, as he assured me that our general secretary had especially asked that the paper be a short one I advised him that I would attempt it on that basis. I trust then that you will bear with me for a few minutes while I attempt to tell you something of the work of training students that we are carrying on in the Canadian General Electric Company at Peterborough and Toronto. With your permission, I will also present a few suggestions for the consideration of those who have charge of laying out the engineering curricula of our colleges.

Provision in Industries for Special Courses

In the Canadian General Electric Company, as is no doubt true in all manufacturing organizations, we find it necessary to train men to augment our engineering and commercial organizations, and the staffs of certain of our manufacturing departments. Previous to 1907 the company had employed a number of technical graduates, but up until that time no concerted effort had been made to give these men special training to fit them for work in the company's service. About that time the company considered the necessity of giving the students certain practical training which it appeared impossible for the colleges to give, and the result was our students' engineering course. We now place a number of technical graduates on this course each year.

In the description of this course, sent out to prospective students, we outline the objects of the course, as follows:—

First — To train men for the company's service.
Second — To maintain a group of competent, trained engineers to make commercial tests of the manufactured product as it is completed.
Third — To provide educational opportunities, including shop experience, for college graduates desiring practical work.
Fourth — To train men for our customers' service.

You will note therefore that the aims of the course are to develop designing, manufacturing, construction and commercial engineers and technical salesmen, as well as to give college graduates practical experience which will be of benefit to them if later on they are employed with central stations, electrical railway companies, consulting firms, etc.

Applicants for the course must have technical college training in electrical or mechanical engineering. Practically all students accepted are taken from the electrical courses of our Canadian colleges, although a few have come from British universities.

The students taking this course spend the greater portion of the time of the course in our testing department, where they carry out the regular commercial and special tests on the apparatus that we build. During this period they have ample time to observe factory processes, to rub shoulders with factory men, to become familiar with modern types of electrical apparatus and to gain practical experience. In short, we are endeavouring to fill in something in the education of college graduates which the colleges cannot give, and at the same time equip these men for more efficient service with our company. We find also that by putting each student in turn as senior man in a section of the test with other men working for him that he gets valuable experience in handling men, at the same time developing his initiative.

During the last three or four years we have been making a greater study of the course in an endeavour to work in any improvements possible. One addition has been a course of lectures, which are given once a week during the fall and winter months by our designing engineers, commercial organization, and certain executive officers. In this way we attempt to acquaint the students with the older men in our organization, and at the same time give them information regarding the apparatus we build and a description of the work being carried on by our various departments.

Observations on Results of the Course

Our records show that of all the men taken on the course, since its inception in 1907, about forty per cent are still in the company's service. Of this forty per cent about one-half are on work of an engineering character, while the other half are on commercial or executive work. Of those not now in the company's service we find the large majority are in the service of electrical operating companies and commissions as engineers. A number are in the service of consulting firms, and a number are also in miscellaneous executive and commercial positions. I feel that the experience that these men have gained in our test course has been a big influence in fitting them for the positions that they now hold.

In a study of these men, who have come from practically all of the colleges in Canada, we cannot find that it is always the man who has taken the highest standing in college who has been the most successful in later life. It has also been our experience that individuals from the smaller colleges have been probably just as successful as those from the larger colleges, and we have come to the conclusion that character and personality play an exceedingly large part in the average student's success.

There is possibly one exception, and that is in connection with men who intend to follow theoretical engineering or research work, and these men I believe should take a post-graduate course in order to make a more intensive study of pure engineering.

I believe, however, that as such a large proportion of engineering graduates are not following pure engineering as their life work, but rather taking up other types of work in organizations of an engineering character, that greater efforts should be made to pick students in the first place with the highest type of character. I do not attempt to suggest how this can be accomplished, but I feel it would be well worth some consideration. I also feel that the colleges have an important responsibility in connection with that side of a student's education which affects his character, including his personality.

The student with a pleasing personality with a co-operative spirit and ability to work in harmony with others, with the proper moral fabric and good health is bound to succeed. I feel that it is this type that industry wants the colleges to educate for them, and the colleges should well scrutinize all applicants to their engineering courses if there is not to be considerable waste in education. Possibly this weeding out can be accomplished during the college course. Engineers are known as men who accomplish results, and there is no place in the engineering profession for the unfit. It would therefore tend to keep the engineering profession on a high plane if the college authorities would encourage students whom they find unfitted for engineering work to take up some other calling in which there is greater probability of their succeeding.

University Course a Foundation of Education

Many men lacking the advantage of college education but having the will to succeed are making good where the college men fail. This statement may be criticized by a number of college men, but they must appreciate that there are more ways than one of getting an education. I have found on visiting the different universities that a large majority of the graduating class seem to feel that because they have put in four years' study at college they are equipped to go out and immediately take the place of practical men who have gained their education in close contact with the everyday problems of industry. In several cases I have found members of the faculty encouraging the students in this idea. This, I believe, is a great mistake, and it is my opinion that much could be done to alter this idea of the graduating student if the college authorities, (the professors and lecturers) would stress the point to the student that he has only received the foundation of his education, — that part in which he has been taught to rightly use his mind, and that his education will not be of much practical value until he has built on this foundation for many years. I think that the majority of those in charge of the work of graduate students will tell you that their work is of very little real value until several years after they leave college. I have found that this is not only the opinion of the larger electrical manufacturing companies, but also of a number of the public utilities. I recently noted the following statement of an officer of one of the larger public utilities on the other side of the line with reference to graduate students. He said, "Unfortunately, however, owing to the peculiar and complex nature of control station work, they do not fit into this type of organization and assume responsible productive work as quickly or so readily as they can do so in other lines of business." I believe that the student should appreciate this fact, and realize that during the first year or so of his work after leaving college he is not paid so much for the productive work that he does as for the work he may do in later years. It has been said that a man is paid for what he knows, but that is not really correct. Is it not rather that he is paid on the basis of putting his knowledge into a clear, concise and practical form in order to pay dividends for his employer. Compensation generally is proportional to the applied knowledge, not the dormant or passive variety.

In making the above remarks, I do not wish to appear to disparage engineering education. Far from it. I believe there is room both for the college-educated man and also for the man educated by the longer, more tedious route of every day study. I also believe that the college man has all the advantages, provided personality is equal, so long as he will continue to be a student, but if he does not continue to study let him look out for the self-educated man who is continually studying.

We cannot all be chief engineers or general managers, and the path for those who are to progress to such positions is strewn with many obstacles and disappointments, but the surest path is by the route of doing well that which is immediately at hand, and as far as possible preparing one's self for the next step up the ladder of success.

Present-day Conditions Alter Educational Requirements

In a review of many recent articles on the subject of engineering education I find a number of prominent engineers advising greater specialization in certain essential subjects, such as mathematics, physics and chemistry, but I also find, and I think they are in the majority, a number who advocate the teaching of a few fundamentals and at the same time drilling the student in such a way that he can attack the problem at hand in a systematic method by applying such fundamentals. I feel that the later method is probably the more satisfactory from the view point of industry.

As so many of our college graduates are finding their way into what is more the business side of engineering, I feel that they should be given some insight into the rudiments of business, economics, accounting, the laws of contracts, banking, and a thorough training in the use of the English language. I do not think that the colleges can be expected to turn out men who will be immediately of value to their employers, and for this reason I think the subjects studied in college should be those only which cannot be taken up later without a great deal of trouble.

The practical side of the student's college education should be received as far as possible during his vacation periods. This has many advantages. The student while working in shop or field becomes familiar with modern shop methods and facilities. He has opportunities of observing the practical side of engineering, and he will each year return to college with a greater appreciation of his studies. If he has been observant during these periods of practical works he will unquestionably get more out of his theoretical studies. At the completion of the college course he can then round out this experience in practical courses, such as are given by a number of manufacturing, contracting and operating concerns.

Importance of Physical Training

There is another equally important side of education which I feel is neglected in some colleges, and that is physical training. In too many instances I am afraid the athletic training is left to those who have had the advantage of such training in their earlier school life and who are anxious to get a place on one of the college teams. I feel this is not as it should be, and I would advocate a system of training so that each student would get some form of regular exercise. Physical culture experts tell us that exercise to be of the most benefit to the body must be enjoyed and of a relaxing nature so that the mind will also receive some benefit. It would be my suggestion that it be made compulsory for all those physically fit to choose some form of exercise and follow it through regularly. There is no one greater asset to any man than that of good health, and athletics taken in moderation will do much to keep the student in the best physical condition.

There are a great many of the brightest students who spend so much time at their studies and in cramming their minds that they neglect the development of their bodies, with the result that later on they lack the physical condition to make the most of their education. It seems to me that athletics have other equally important benefits in character training, — in the spirit of give and take, promptness of thought, quickness of action, concentration, team work, and the capacity of being a good loser.

Closer Contact between Faculty Staff and Industry

It has been suggested, and I believe the scheme is being tried out to some extent in some of the United States' colleges, that one or more members of the staff of each college go out and spend a year in some branch of industry and work at the every day problems of that industry, at the same time rubbing shoulders with the engineers actively engaged in the work of that industry. At the end of a year he would return to college and another would take his place in some other industry. Possibly after three or four years these men would again go out for a second year and take up a different branch of work. In this way the faculty would be constantly in touch with the most modern ideas and practices, and would be the better able to present these modern ideas in conjunction with their lectures and college instruction. I can see that this suggestion would have certain difficulties, and it would no doubt be a troublesome one to work out, but I feel that both the colleges and industry would eventually be well repaid. The details of working out any scheme such as that suggested would, of course, have to be worked out between the individual colleges and industries.

I recently heard a professor from one of our Canadian universities remark that he had noted that at a reunion of graduates none of the professors of the college had been asked to speak before that gathering. At the time I did not particularly note the significance of that statement, but I have since been wondering whether it was not because of the fact that the graduates who are out in active work in the world were looking for modern ideas and felt that there was greater probability of getting such ideas from the leaders in the engineering profession, or from the leaders in industry rather than from the professors. It is just a thought, — I pass it on to our teaching brethren for what it is worth.

In a recent issue of one of the technical papers I noticed a summary of employees of two of the basic industries. I believe it was the tire and the pulp and paper industries that were referred to in the article, where it was stated that of the total number of employees about seven per cent in each case occupied positions of technical or industrial responsibility, and of this seven per cent approximately one-quarter were technically trained. The article then went on to point out that by 1930 American industry could absorb 400,000 men having technical education. Conditions in Canada are no doubt very similar, and there will unquestionably be an increasing demand each year for technically trained men for industry.

There are continually new openings in industry as technical salesmen, in industrial relations and for executive positions where the natural ability to lead and the engineering talent of the brightest engineering graduates will qualify them to fill these positions. It must be the concern of all college authorities to see that industry is not offered too many students of only mediocre ability.

Engineering Education—An Engineering Society Viewpoint

Fraser S. Keith, M.E.I.C.,
General Secretary, The Engineering Institute of Canada.

Paper read before the Annual General and General Professional Meeting, Montreal, Wednesday, January 28th, 1925.

We have heard to-day a number of excellent and thoughtful papers on the subject of Engineering Education. They show that a great amount of thought and study has been given to this matter during recent years.

Discussions on this subject, reveal the fact, that there is on one hand a call from certain industries for men who are at least partially equipped to commence at once in practical work, and on the other hand, the impossibility of giving men a thorough grounding in the fundamentals combined with a special practical course in some line of engineering within the space of four years, now allocated.

There is, however, another feature of this situation as it affects an engineering society such as *The Engineering Institute of Canada*, and as it affects the profession in general, which must be considered. The fact that *The Engineering Institute* is devoting the major portion of this professional meeting to a discussion of Engineering Education shows that we as an organization are alive to the importance of the problem involved.

As an engineering body andas individual engineers this is by far the most important problem confronting us. The effort we make towards helping to solve the problem will be in direct proportion to our realization of the seriousness of the situation. And toe situation is serious. Let us get that fact clearly established in our minds.

Herein lies the seriousness of the situation. Throughout the length and breadth of the Dominion of Canada we are giving to a large number of young men as fine a training as anybody could receive; as well equipped to face the world and its problems as any body of men could be, and then we are attempting the impossibility of, in the main, directing their future lives into what we call the engineering profession which is already seriously overcrowded.

Lest this statement be misinterpreted let me emphasize my belief that this country could absorb per year twice as many technically trained men as are now being turned out of our engineering colleges; but the engineering profession itself cannot absorb a fraction of those who are leaving our colleges year by year, firm in their belief that the only way they can receive the greatest benefit from their training is to secure an engineering position in some one or other of its many phases.

While it is true that most of our professors take pains to impress upon the young man that on graduation he is not an engineer and is only prepared to enter the threshold, there is a deep-rooted conviction, possibly due to some extent to the fact that the course is called an engineering one and that he has graduated in one of the major branches, that he is either an engineer or about to become one, and no other kind of a position will satisfy his ambition.

What is the result? Last year we graduated from our engineering schools over five hundred young men and these men, no matter what argument may be used to the contrary, were nominally at least graduated into the engineering profession. In certain fields of engineering which happen to be active the great majority of graduates in those fields, secure positions. Others, finding nothing in what they call their own line, try to get a position dealing with one of the other branches of engineering. A great number go to the United States for they must needs secure an engineering position, and a number secure positions at anything that offers, cursing their luck and their engineering training.

Most of the last named class make good, and what to them was a misfortune at the time of graduation was indeed a blessing. Of those who secure so-called engineering positions not a few find themselves in a few years doing work for which a high school education would suffice, and after four or five years, if ambitious, they begin to look around for something else, preferably an executive position, for which they are not equipped, with a loss of five or six years, or whatever the time may be of the most adaptable period of their lives. In other words, there is in our present system too much lost motion, wasted effort, too many valuable years lost in the lives of too many young men at a critical period in their careers, and this is what makes the situation serious.

This has been going on year after year. If an engineer of forty or thereabouts, whose position has been such that it did not develop executive qualifications, even from no fault of his own, gets out of work, it is almost impossible for him to secure a position in Canada. There have been not a few cases of this kind in the past year, some of which were almost tragic. This situation is largely responsible for the low earning capacity of the average engineer, and his consequently low social status, and these two elements are mainly responsible for the fact that the engineering profession is not recognized as it should be, and does not occupy the high plane that we would like to see it occupy.

A change in viewpoint at least is needed. Not for a moment would the writer suggest a radical change in the technical courses we are giving, for the technically trained men of Canada to-day are not exceeded by any other group in their training or qualifications.

Does not then the main reason for the present situation lie in the fact that we call our technical training "engineering courses", and that we graduate men with a degree in civil, mining, mechanical, electrical and other branches of engineering? The very fact that this is the case stimulates the young man in the belief that he is preparing himself for the engineering profession. That on graduation he is fairly well on his way, and that it is a step backward on graduation to begin at the bottom in any phase of industry and work upward.

Industry to-day, even at a minimum of production, can absorb more young men than we are graduating if they are willing to take off their coats and go to work. Part of the fault lies far back in our general education which teaches the youth that if he studies hard he will never have to work with his hands. And the higher one goes in the scale of education the more deep-rooted this conviction becomes, with notable exceptions such as branches of the practice of medicine and dentistry.

Be that as it may, there is abundant hope for improved conditions in the fact that we are to-day discussing the situation from the viewpoint of the university, the engineering society, the manufacturer and the practising engineer.

It is not intended in this brief paper to discuss what might be considered ideal curricula, or to criticize the manner in which the various subjects are taught. It may be found as a result of the investigation now going on that the training, with slight modifications, that we are now giving young men, is the ideal one or nearly so, for an industrial career, and that the training of professional engineers will include either additional time at university or a system of pupilage such as is referred to in the report of the Committee on Apprenticeship and Training of Engineers, or both additional time and pupilage.

One point, however, is certain and that is our present system of training men for the engineering profession is far from ideal.

We realize that the engineering colleges are in a difficult position. A large number of those responsible for the courses believe that a thorough grounding in the fundamentals, giving problems based on actual practice, is as far as the engineering course can go, leaving the question of practical application largely to the time spent during the summer vacations, and to the adaptability of the men in the various positions which they may be called upon to fill after graduation, the professors developing, in as far as they may be able to, with the material available, character in the students and inspiring them with zeal for greater knowledge and a willingness to apply themselves to the best of their ability, in the belief that energy and hard work will bring them to an ultimate goal of success.

If this, (teaching only the fundamentals, were the established practice), the hard worked professors would no doubt have greater opportunity of coming in personal contact with industry and commerce to the advantage of themselves and their students. On the other hand there is a constant urge from industry for technically trained men with practical experience, and to satisfy this new demand new subjects have been added, making greater calls upon the time and energy of the professors and less time for individual attention to the students.

Let me take this opportunity of paying a tribute to the high standard of the professors in our Canadian engineering colleges. Being personally acquainted with most of the professors teaching engineering subjects throughout Canada from Halifax to Victoria, and having had the privilege of meeting them on many occasions, it is evident that they are a very superior body of men. They are devoted to their work, loyal to their institutions, well versed in their various subjects, and are exercising an influence for good on the lives of the young men in our colleges, both from the technical viewpoint and the humanities. It is having a very beneficial effect upon the profession as a whole.

They have more difficult problems to solve in connection with the decimination of knowledge than most of us realize, and if any body of men in this Dominion would appreciate an intelligent sympathetic appreciation of their problems it is our engineering professors. They have given the inspiration to many a man who has afterwards made good, and after all they must take the material in the shape of students that comes to them and make the most of it.

The Council of *The Institute* has already offered its co-operation to the Society for the Promotion of Engineering Education in the study of the investigation which is now under way. We are greatly indebted to Mr. H. P. Hammond, associate director of investigation for his kindness in coming to Montreal and giving us the benefit of his splendid paper.

In it he has reviewed the events leading up to the establishment of the present investigation and outlined the objectives of this investigation. It will indeed take many months to complete the work undertaken. Those responsible for its organization are to be congratulated. The important data being compiled and the reports in the different phases of the situation should prove of the greatest value to the engineering profession and be of great assistance to the universities, and will possibly do much to bring about the ideal condition in the engineering profession.

It is a happy augury for the future that we have men representing every phase of engineering activity gathered together at this annual meeting to discuss the whole subject with the underlying motive of presenting ideas that may prove of value.

During recent years *The Engineering Institute* has been called upon to some extent to act as liason officer between the universities and industry. At headquarters we maintain an employment bureau which endeavours to keep in closest touch with all the industries in Canada employing engineers and to know the requirements for young men leaving college, and to endeavour to secure for them positions in which they may hope to succeed. You will thus see that in addition to its direct responsibility to the welfare of the profession as a whole *The Institute* exercises a function as a means of contact between the new graduate and the world at large.

In this function it is safe to assert that considerable success has crowned our efforts, but in spite of all that may be done it is at times discouraging to know that there are no places where worthy young men who have acquitted themselves creditably and who desire an engineering position may be placed.

The obvious inference is that too many, and in fact the great majority of our graduates, insist on getting placed with engineering firms or in an engineering capacity of some sort with an industrial company, while it is well known they might function to greater capacity and with greater hope of success by taking inferior positions in any line be it engineering, manufacturing, commercial, transportation, financial, insurance, or other forms of industrial life where the technically trained man will stand out as an influential factor and in a few years make a name and place for himself which he might not hope to attain when he endeavours to compete in the field where there is already a surplus and where the surplus is increasing from year to year.

There are doubtless many members of *The Institute* who would be glad to lend a helping hand to the Society for the Promotion of Engineering Education in its investigations acting, either individually or through a committee of *The Institute.*

If as a result of this meeting a general interest in the subject will have been stimulated, and greater thought given as to what we may do individually or as an organization, to bring about more ideal conditions in the engineering profession in this country, then the meeting may be considered as having been eminently successful.

Discussion on Engineering Education

Discussion by Professor Peter Gillespie, M.E.I.C.

The major function of the engineering school is to give instruction in technology. Its graduates normally develop into technologists, (using the term in its wider significance), just as graduates of schools of law and medicine become in the course of time, lawyers and physicians. That some graduates of technical colleges develop into politicians or foreign missionaries does not alter the truth of this statement in the least, since these circumstances are incidental to the purpose for which engineering schools exist. The better the preparation of the technologist the better on the whole is the function of the engineering school being discharged. This principle I consider should not be lost sight of.

Yet, while we frequently hear of the "*mere* technologist", we seldom if ever hear of a *mere* physician or a *mere* lawyer. It would seem as though the exclusive pursuit of an engineering vocation were not in itself sufficient to admit men to the same privileges as the exclusive pursuit of other callings does. Behind this attitude of mind on the part of citizens at large and of engineers themselves, lies, I am convinced, an incorrect conception as to the contribution of the technologist to human progress.

I fear that the industries and other employers of engineers sometimes have erroneous conceptions as to the qualifications which a graduate of a college of technology may reasonably be expected to possess. That "men should be trained specially for this line of business" is an opinion that is still occasionally expressed by representative industrialists. Apparently, the beginner must learn to swim before he is permitted to enter the water. While it may be possible in the school of engineering to train men to design conveying machinery or steam turbines; to master the technique of paint manufacture, or to be skilled food analysts and thus become on graduation immediately useful in these special capacities, I am satisfied that in nearly all cases such a policy will be educationally unsound, yielding results incommensurate with the cost and effort.

Speaking a year ago at the dinner of the American Engineering Council at Washington, D.C., President Butler of Columbia University, referring to the tendency of the educator to professionalize his instruction for the supposed benefit of the student, said "He is not content to give the student the foundations, the principles, the background, the method, but he wants to give him a knowledge of the detail of the professional activities of the moment. There are two great difficulties in the way of that; the first is, it can't be done, and the second is that the things you are teaching about change while you are teaching. When we give up that notion of professional education, give it up once and for all,... then and then only will we fix an ideal which even the best and most rational institutions will be able to serve". Principles are broader in their application than instances and it is the work of the engineering school to teach principles first. The special requirements of the industry can best be obtained under commercial conditions and should present little difficulty if the foundation be good and if the learner possess a receptive mind, trained observation, patience and industry.

Concurring in this with the opinion of a well-known American publicist, recently expressed, I think it would be much better if educators talked less of "training for leadership". In the first place, the phrase is almost certain to be misinterpreted. In the second, I fear training for leadership cannot be done, — at least to any considerable extent. Finally, those who by indirect methods, are contributing to it something of value are saying little about it. Let us frankly recognize that a man's position in the world of affairs depends on a score of things of which mentality, industry, integrity, personality, heredity, opportunity and education are a few. In some cases, as witness the careers of Abraham Lincoln, Lord Mountstephen and Sir Sandford Fleming, a considerable measure of success has been achieved without much of the education of schools. The chief executive of a great Canadian transportation company recently said: "Universities can give a man much. They can give him the rudiments of knowledge. They can teach him to think logically and correctly, they can teach him to study, but they cannot make him anything. That is a responsibility he must assume and a result which he can only accomplish for himself". Of similar import is the following statement from Mr. E. M. Herr, president, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.: "There is no royal road to a place of commanding importance in industry or in any other business; nor is it the function of an educational institution to try to teach young men to be captains of industry or administrators or to occupy very great and important executive positions. That quality in man is not capable of being taught in an educational institution. It has to be developed in actual contact with human affairs."

In rather strange contrast to these opinions is the pronouncement two years ago of a committee of the deans of the engineering colleges of the middle west, who in a report on education for engineers referred to a proposed fifth year of study as a means whereby men might "become qualified to take positions among the creative leaders of the profession". Can a fifth year be a potential incubator for creative leaders in anything? Is it entirely honest to imply that it may?

Another phase of the same notion is presented by Antioch College which, through the medium of industrial equipment erected on the campus simulating commercial conditions, expects to develop out of selected youths, a somewhat larger proportion of supermen than the ordinary technical college heretofore has been able to produce. At the end of a generation, I expect President Morgan's impressive experiment will be able to claim just about the same proportion of eminent graduates as other educational institutions working on similar material. Some modern educational theories are both new and sound. Occasionally those which are new are not sound; and those which are sound are not new.

And this reflection leads me to remark that I consider there is very little point on the part of the friends of a college or university in claiming credit for all the great or near-great men who have been graduated from its halls. One hundred years ago Lord Macaulay in an essay on the University of London, discussing this practice which then seems to have been a favourite one, said: "Great men were trained in the schools of the Greek Sophists and Arabian Astrologers, of the Jesuits and the Jansenists. There were great men when nothing was taught but School Divinity and Canon Law; and there would still be great men if nothing were taught but the fooleries of Spurzheim and Swedenborg. A long list of eminent names is no more a proof of the excellence of our academic institutions than the commercial prosperity of the country is a proof of the utility of restrictions in trade."

Co-operation between the college and the industry in the education of the engineer is undoubtedly an excellent thing if rationally planned. It permits the employer whose interest, immediate or prospective, is commercial, to test the mettle and gauge the capacity of prospective assistants and it permits the student to live in an industrial atmosphere and to form some conception of an employer's problems. Of that high-frequency oscillation between the shop and the lecture room which calls upon a student, immediately he has adjusted himself to one environment to shift to another, I find it difficult to speak with approval. It sometimes involves subordinating the students' interests to those of the employer. In any event, too much energy and time are consumed in starting and stopping and the loss of momentum is too great. I am of the opinion that a system whereby a student's vacations are spent without interruption in the industry is the most satisfactory to the student and in most cases to the employer as well.

I believe that the so-called but incorrectly designated "intelligence test" should be employed with great caution. The field of its operation is restricted and the mental traits with which it is in the main concerned are of secondary rather than of primary importance. Because of this I believe its value as an educational instrument is small. It should not be forgotten moreover that most written or oral examinations by competent instructors are intelligence tests more thorough, more comprehensive and more dependable in their findings than those of their modern competitor.

That they know a few things thoroughly and that they have acquired the attitude of mind which fits them to meet new problems and unexpected situations is about all that may be expected of the graduates of an engineering college. A course of instruction that involves a hurried smattering of almost everything is not the atmosphere in which this attitude of mind develops. Our curricula, I fear, err somewhat in this respect. Courses are too kaleidoscopic. Colleges in an endeavour to meet a constant demand mostly from the outside, for new and practical instruction, have perpetuated the practice of adding to the curricula until thoroughness is precluded by the very number of subjects. In this policy sound principles of curriculum planning have been ignored.

I very much doubt the wisdom of increasing the course in engineering generally to five years as now proposed in certain quarters. That sufficient acquaintance with basic theory may be acquired in four sessions to enable the student to cope with most of the problems with which he will be confronted and that considerable time in any case, usually in subordinate positions, must be spent after graduation before work involving real responsibility is undertaken, are my reasons for holding this view. In addition, the cost of present day education is exceedingly high. Generally I consider it inadvisable to require students to attempt research during the Bachelor's course, mainly because the curriculum provides insufficient time in which to overtake it. On the contrary, I believe that a fifth year spent in the uninterrupted investigation of some specific problem may be of great profit to certain students. Through it, they gain some familiarity with scientific methods, acquire a measure of independence and self-reliance and are afforded an opportunity of applying and extending knowledge acquired during their undergraduate years. Educational discipline rather than the obtaining of results will be the major object of such work which, if of satisfactory quality, may be recognized by the granting of an advanced degree.

Discussion by Doctor R. W. Boyle, M.E.I.C.

My opinions in this discussion are in complete agreement with those of Professor Wilson, who, I observe, has confined his remarks to vital educational principles. It is to the fundamental principles and theory of education, technical or otherwise, rather than to the details of curriculum, courses, etc., that attention needs to be most devoted to-day.

For myself, I am very dissatisfied with the position of the engineer in the estimation of the public in our communities; and much of the blame for this condition, I think, lies in our defective education. One sometimes receives from engineers letters and reports not well expressed, hears speeches, (but only a few before bodies of much consequence), not well delivered, and notices that only rarely does an engineer come to a position of public leadership or represent a constituency in our parliaments, and this is in spite of the fact that the engineers, above all, belong to the safest and sanest elements of the population.

I believe the technical training of the college engineers of to-day is not good enough, or as good as we need expect; but it is our fundamental, general education which is at fault. The very great, experienced, engineers of to-day will say it is only too true that we are "over-trained but under-educated". Of the money that colleges have had to spend there has been too high a proportion and also too much time devoted to specific, technical, operational processes and courses, with their too elaborate laboratories, containing heaps of machines doomed to become old-fashioned, out of date, and unused in ten or so years. Too little time and money have been devoted to the broad educational subjects which help a man to think on the common problems of human beings and give him a chance to become subsequently a citizen who can use all instead of only a part of his powers. I make a separation in my own mind between "training" and "education" and say that we have been giving too much attention to training and too little to education.

The cause of it all, as Professor Wilson has pointed out, is in the ready response to the demands of industrial employers for workmen, salesmen, and technicians capable of making immediate practical use of technical training in the exploitation of new resources and in the rapid application of new fields of engineering for industrial and commercial purposes. This demand has coloured and influenced educational policy and practices not only in technical institutions but even down to the primary schools.

To-day, fortunately, we see a reaction from this wrongful policy, which really has been subversive of the best interests of our education. The causes of the reaction can be easily discerned. They are, first, that the advance of science and technology is so rapid, and is accumulating at such a rate, that the attempt of colleges to keep pace in offering specialized, technical courses covering everything, is becoming economically absurd and impossible. The colleges are being driven to select and stick to fundamentals, and the tax-payers and others who supply the funds for colleges and schools are beginning to revolt, as they should.

A second cause for the reaction is the increasing dissatisfaction on the part of discerning observers among the public and among the engineers themselves, that the technicians graduating from colleges are, too often, narrowly developing, ill educated, and unrefined people.

Here in this university, possibly as a result of a sense of the limitations and failings of our own education, we are trying a policy of following the full course of the present reaction, and are adopting the advice of the great engineers who have been writing on this question. For example, there is the little book, "The Engineer" by John Hays Hammond, a book which we prescribe here for the reading of our engineering students. We prescribe also a certain small amount of study in the history of science, in which there is no distinction made between pure and applied science. We demand a moderate amount of modern language study, (French or German), a little political history, and some work in English composition and literature. The last is taken with the students of the Faculty of Arts; we have no special classes in English for engineering students only. We give perhaps more attention than formerly to mathematics, physics, chemistry, geology and economics, which subjects we treat as fundamental. Drawing is given in the earlier years, but not as much as formerly.

In the last two years of the curriculum are the more specialized, technical, courses with laboratory work attached; but through these years may also run a few courses of the fundamental subjects. For instance, economics comes late, for how can a student be expected to get the bearing of economics on his specialty until he has matured? As for what is called "practical" or manual training work, we have no workshops, or "shopwork" here; I consider we have better use for our time and money. And we do not try to turn out skilled draughtsmen, knowing that a college cannot do it. We consider also that a college should not attempt the impossible task of trying to turn out an engineer, but instead a man who has a good chance to become one if he applies himself with diligence. Nevertheless we do not neglect *practical work*, and so favour what has been called the "sandwich" system, i.e. making practical work under a master and with responsibility attached, during the long summer vacation, an integral part of the engineering student's curriculum. That is why we have already adopted a regulation in our mining department that a student must have spent at least six months in or about a mine before he can obtain our B.Sc. degree in mining, and as soon as the economic conditions will permit, we shall bring in a similar regulation for the other departments of engineering. The weakness of college "shopwork" is that, altough it may give a man an inkling of what a mechanical shop process is, and thus save him from being an absolute greenhorn in such matters, it does virtually nothing in teaching him skill in the process or causing him to think about it, since the work is divorced from all responsibility beyond the acquisition of a few "marks". I believe it is far better to have the student carry out this or any other kind of skilled manual work away from the college, under an outside master, where the work is done for some commercial or industrial purpose and has to be done well. In such a position the student must think of what is being done, and acquires a sense of responsibility from the fact, which he soon discovers, that he can be praised or promoted for good work, and blamed or dismissed for bad.

We do what we can to foster independence of thinking and expression on the part of the engineering students, by encouraging their societies, inducing them to run their own club affairs, give student papers at them, and discuss the papers presented. Perhaps it is here we meet with certain discouragements, but not without encouragement also. It is hard to make students overcome the natural diffidence to say something or think aloud standing on their feet, but on the whole we find that they run the business of their clubs very well. In order to free them as much as possible for such activities and for their private reading and the like, we have shortened our curriculum as much as we dare, even to the point of dropping altogether some subjects of the more highly specialized and less fundamental kind.

Some of our engineering staff have come to be doubtful of the value of what is called "combined courses", — that is, a course in arts for the B.A. degree, combined with work in applied science for the B.Sc. degree, the whole to be completed in about six years. We have a committee of our faculty now studying this question. The doubts, where they have arisen, come, I think, from the observation that very frequently in North American universities the atmosphere, methods, and processes of the arts faculties are not specifically "cultural", but are just as professional as the avowedly professional schools of engineering, medicine, and law, and the students in them are seeking just as much only a bread and butter education for the purpose of getting a job as the students of the other faculties. If a student has the time and money to take a liberal and cultural course and degree in arts, with no reference whatever to engineering and later goes through the engineering curriculum, all well and good. But few can do this, and even if more could, I don't know that it would be advisable for a man to remain at any one college so long. It seems to me that we are driven to give at least the elements, outlook and desire of a broad cultural education, and show the student something of the art of life, simultaneously and along with the technical engineering instruction and training.

Everything of course depends on the method, and therefore on the men who are doing the teaching. This brings me to my last point, which is that everything I have so far said in this discussion, though it may have a certain importance, is of very secondary significance to the one question of the quality of men who are on the teaching staff. To-day one observes certain unhappy conditions in this respect. On account of the policy of a ready response of the universities to the demands of commerce and industry to turn out specialized technicians, and to accommodate the numbers of young men who presented themselves for training, a wrongful policy evolved of utilizing too high a proportion of college funds for erecting and equipping new buildings and laboratories, and the establishment of new departments, and leaving too small a proportion to be devoted to character and personality and ability in the teaching staff. Too often insufficient care has been exercised in selecting members of the *junior* teaching staff, and on account of the low salaries afforded, men of indifferent qualities for teaching were sometimes retained. I could give opinions of acute observers outside the universities on this question and mention some of their comments as to certain easily observable consequences, but I must desist.

It is sufficient to say that we must not allow in the professorate and under-professorate of the universities any process to set in which would lead to a falling-off in the social and intellectual qualities of the entrante. Above all importance of the curriculum, buildings, equipment, etc., is the character, personality and ability of the teacher to attract and influence the lives of young men, and this applies just as much to the junior as to the senior ranks of the staff. Junior men should be engaged on probation only, until it has been determined that in them is the proper professional timber. If to attract by higher pay both junior and senior men of the requisite personality and ability, we have to get along with less buildings and equipment, by all means let us have less.

Discussion by Professor R. S. L. Wilson, A.M.E.I.C.

William B. Rogers, the first president of the Massachusetts Institute of Technology, defined the aims and methods of that Institute. He stated that "Material prosperity and intellectual advancement are inseparably associated. Systematic training in the applied sciences is essential to the economic structure of civilization. Such a training should not only impart knowledge and develop habits of exact thought; it should also help to extend more widely the elevating influences of a generous scientific culture."

This is a clear conception of the function of engineering schools. The translation of this idea into practice resulted in those curricula of forty and fifty years ago which included the fundamental sciences and a generous allowance of humanistic studies on which the practice of professional engineering was to be built.

It is interesting to examine the detailed curricula since those brilliant beginnings. They show evidences of a steady change from courses in broad foundational sciences and humanistic studies to more specialized courses in application of science. This change was due to, first, the rapid addition of new fields of engineering and, second, the desire to meet the employers' demands for graduates capable of making immediate practical use of their school training. The period of school was lengthened from three to four years and the class-hours in the school year increased. This additional time was devoted to additional specialized courses in most cases. Continued pressure of specialized courses encroached seriously on the time previously devoted to English, history and the languages. About ten or fifteen years ago the tide of specialization in engineering courses reached its high mark. Since then two courses are producing a reaction which is all too slow. The first of these is "the awakening of the engineer" which we have all witnessed during the past decade. The second is the despair of the schools in trying to meet all the demands for specialties and at the same time refrain from extending the school period. Combination of two or more specialties into one course is being resorted to with the accompanying consequence of broader treatment of such combination courses.

Much has been said and written in recent years concerning the engineer's place in the social economic structure. The repeated efforts to obtain recognition of engineering as a profession are slowly producing results and many engineers of large practical experience state freely that our professional status can be obtained and held securely only when our standard of qualification is placed on a sounder basis than at present. Individual analyses of the question, "What is the matter with engineers", in too many cases discloses a lack of balance in his formal education. Too much time was spent in study of the *applications* of science at the expense of a more thorough study of the fundamentals of science and, what is just as serious, at the expense of a *liberal* education. One engineer of high standing says, "We are over-trained and under-educated."

Further changes of curricula are needed. Most of the specialties in undergraduate courses should be gradually dropped and replaced by more courses, in English, economics and history. The fact that engineering practice can best be learned in the field and office should be frankly faced and curricula revised accordingly. Such changes would result in graduate engineers with a few years' experience having ability to express themselves and to take their proper share in discussions and actions pertaining to matters of public interest.

It has been stated in earlier papers and discussions that there is cause for alarm in the large number of students taking engineering courses these days. Competition affords a ready means to raise qualifications and standards of practice. Further, why should we indirectly assume that a training in applied science may be good only for making a living at engineering? If we believe in the value of a scientific education as a mental training and intellectual development why should we confine the application of such an education to engineering? Is there any scheme of education which can have a wider application than a *well* balanced curriculum in applied science? Answers to these questions can only show that the field for applied science graduates is big enough to accommodate many times the present day graduating classes.

Discussion by Professor I. F. Morrison

The Object of an Engineering Education

From the point of view of the applied science curriculum the object of education is threefold. In order of importance the three items are as follows:—1. To train the student to think clearly and logically. 2. To impart to and equip the student with a certain amount of fundamental information. 3. To train the student in scientific technique and the proper use of scientific language.

Under the first item, the scientific subjects, especially mathmatics, form the best training ground. I think, for instance, that geometry is most important when taught with this point of view in mind; the practising engineer really uses comparatively few of the propositions of Euclid; and in this connection the solution of numerous original exercises is best. The same applies to other branches of mathematics.

Under the second item, every engineering student must have a knowledge of the properties of matter, of the properties of materials used in construction, etc.

And under the third item, the student must be trained in technique as much as time will permit. He must learn to draw and make sketches, to use and adjust engineering and scientific instruments, to test materials etc. However, it takes considerable time to make students proficient in such technique, and the amount of time that can be devoted at present to such subjects is small. This training, however, provided the student has some start, can be acquired after graduation. No student ever learned to be an expert draughtsman at school.

The Ideal Engineering Education

I believe that the ideal education for a student who intends to go into the engineering profession is an arts education in classics, history, literature, and mathematics followed by a training in applied science. The arts education would endow the student with a background and a sense of appreciation which is a very desirable quality in a professional engineer. I have in mind for such an engineer a career which may ultimately lead him into an executive position and possibly into public life, and not that of the technical expert. In fact it might be well to have separate schools, such as technical schools, which would have as their object the training of expert technicians.

However, at present this ideal situation cannot be worked out. It would take seven and possibly eight years for such a training and the student should be sufficiently young and have enough money so that he does not become impatient or have to drop out on account of financial reasons before his full training has been completed. Such a course as the above only half completed is not satisfactory for a young man going into the engineering profession. There is an idealism in science and applied science which can be secured only by prolonged study of scientific subjects. Without this an engineer is seriously handicapped. At present a four or five-year course seems most advisable.

The Ultimate Object of Engineering Education

The ultimate object of applied science education is a thorough training in the use of the fundamental principles of science. In general there are three types of such courses:—1. Foundation courses such as elementary mathematics, physics, chemistry, etc. 2. Theoretical applied science courses such as applied mechanics, hydraulics, applied thermo-dynamics, etc. 3. The professional courses such as railroad engineering, surveying, structural design, machine design, etc.

I believe that item two above is the most important. It should have for its ultimate object a thorough knowledge of the following:—

The motion or flow of gases, liquids, heat and electricity.

The mechanics of solid bodies.

These subjects should be taught from a theoretical point of view and not, as is too often done at present, as a mere matter of substitution in formulae secured from an engineer's pocket book. There are too many engineer's pocket or hand-books in the hands of our students. On account of the short time which at present can be devoted to an engineering course the cutting down should come on the subjects under item two. Thus at present the object of our efforts seems to be a thorough training in the fundamentals and an illustration of the application of those fundamentals by professional courses *in so far as time permits.* At present there is not sufficient time to turn out expert technicians, draughtsmen, surveyors, etc. Obviously the foundation courses are very important.

General Training

Along with the courses in applied science there should be courses in English, history, economics, business law, sanitary science, and hygiene, and the modern languages.

Discussion by Professor H. J. MacLeod

In reply to your request for some views on what ought to be done to improve our methods of teaching engineering I submit the following:

An opportunity for an informal conference for each department of engineering to have at least one representative of that department of engineering from each university in Canada. This would not make a large committee and they could discuss in detail *just what is being taught* in each university in, say electrical engineering for example. The names of courses in a calendar give little or no information of the subject matter of the course in detail.

Even one meeting would enable an instructor to get acquainted with men in the same line in other universities. It would tend to create a uniform standard in the universities which would be an incentive to better work.

At least once in seven years a teacher in engineering should be given leave of absence with pay so that he could visit works and plants and gain an up-to-date knowledge of those things which actual contact with the above alone can give. This is more necessary at universities which are at some distance from the most progressive undertakings in any particular branch.

With regard to studies I feel that our course is too crowded and yet it all seems essential. In the rush and endeavour to cram students with a certain amount of knowledge I am afraid we sometimes forget the training of those qualities which are important as knowledge to an engineer. I am of the opinion that in the senior years especially the actual context of a course is not more important than the enthusiasm and the ideals and ideas and methods of attack of the instructor who gives it. If he can create on the part of the students a proper attitude towards the subject he has half the battle won.

I regret that I have not time to note other points, but they will no doubt all be mentioned by others.

Discussion by Professor Charles A. Robb, M.E.I.C.

Engineering Education

In accordance with your suggestion it is a pleasure to set down briefly some thoughts on the above subject without specific reference to any particular institution.

The general review of the curricula in engineering schools following the war has, in many cases, resulted in a recast of both the time and the material of the whole course. The new time-tables are drawn with a view to providing the student with a more liberal education by reducing the total number of class hours and thus leaving a reasonable time for reading, student activities and athletics.

There seems to be a persistent tendency to reduce and even omit training in the manual arts, and the substitution of practical experience in the field or factory before graduation commends itself.

The recent formation of the Associations of Professional Engineers and the stimulation of the profession should assist in the problem of suitable employment and practical training of the engineering students during the summer vacation.

Occasional lectures on general subjects by eminent practising engineers to the students, preferably under the auspices of their own societies, produce excellent results.

The choice of a purely engineering educational institution for a substantial gift which was placed recently with the idea of promoting the public welfare is very gratifying as an indication of the importance of engineering education in relation to the welfare of the public.

Experiments in extending the facilities of the staff and equipment of engineering schools to the industries through the solution of research problems have been successful.

Discussion by Professor N. C. Pitcher

Re: University Education for Engineers

I do not know whether it is pertinent to Mr. Keith's enquiry, or not, but in looking through a year's numbers of the Engineering and Mining Journal-Press, (of which T. A. Rickard is one of the editors, and he, you know, never fails to take a slap at university graduates), I note that in articles which they publish from time to time, headed, "Mining Engineers of Note", or sometimes, "Metallurgists of Note", in giving the biographies of sixteen such men, fourteen are specifically mentioned as graduates of universities, while two are doubtful, one being the City College of San Francisco, and one South Kensington.

No doubt if we perused these journals further back we would find that the engineers and metallurgists of note the world over are in just about this proportion.

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Studying Engineering Education

As a sequel to the wide spread interest aroused in connection with the subject of Engineering Education and its effect upon the profession, both present and future, its importance was recognized by the entire day's discussion at the annual meeting. While the papers presented and the discussion thereon were listened to with interest there was no evidence as a result of the meeting that the average member attending became fully imbued with the responsibility that rests upon an organization such as this in connection therewith.

As already recorded in the minutes of the annual meeting a resolution was drafted by a group representing most of the universities in Canada which pointed out the need for constructive action by *The Institute* in connection with this problem. During the past year *The Institute* applied for corporation membership in the Society for the Promotion of Engineering Education and the Council of the year endorsed the policy of that society and promised its support. The resolution of the annual meeting which reads:—

> "RESOLVED that this meeting of *The Engineering Institute of Canada* record its appreciation of the fact that the subject of Engineering Education has been given prominence by the Council, resulting in a discussion during one day of the professional meeting.
>
> And, to the end that further action in dealing with the subject of Engineering Education be given the consideration its importance warrants by *The Institute*, this meeting recommends that the Council at its next meeting appoint a committee to ensure the co-operation of *The Institute*, with the Society for the Promotion of Engineering Education.
>
> And that this committee be composed of corporate members who are not engaged in teaching."

is being dealt with by this year's Council. This committee should be one of the most active committees of *The Institute* during the year and has a programme already outlined for it.

Three definite proposals have been made by the Society for the Promotion of Engineering Education as a basis for the co-operation of *The Engineering Institute* in the study of Engineering Education.

1. As evidenced by the nature and requirements of the work of members of *The Institute*, what proportion of engineers should be trained for the following fields of work:

1. Engineering Research
2. Engineering Design
   a. of appliances and machines
   b. of structures
   c. of plants and systems
3. Engineering Supervision
   a. manufacture (materials, machines and appliances)
   b. construction, erection or installation
   c. operation
4. Engineering Management
   a. manufacture
   b. construction
   c. operation
5. Engineering Sales
   a. of materials
   b. of services (transportation, power, etc.)
   c. of machinery
   d. publicity
6. Engineering Teaching

2. As evidenced by the nature and requirements of the work done by members of *The Institute*, to what extent should training in the principles and applications of economics and business methods form a part of engineering curricula?

3. To what extent and in what manner should the organized body of the engineering profession and the colleges of engineering mutually co-operate to the ends that the standards and usefulness of engineering education and of the profession of engineering may be elevated?

The members of *The Institute* are also free to make suggestions as to how this organization can be of additional service in the study of this most important subject.

Presentation of Leonard Medal

Arrangements have been made by The Canadian Institute of Mining and Metallurgy for the presentation of the Leonard Medal to Dr. W. L. Uglow at the divisional meeting of the Mining Institute to be held in Vancouver on February 18th to 20th, inclusive. This medal is for the year 1924 and, as announced at the annual meeting of *The Engineering Institute of Canada* in Montreal, was awarded to Dr. Uglow for his paper on "The Undiscovered Mines of British Columbia" which was published in the Bulletin of The Canadian Institute of Mining and Metallurgy of October, 1923.

OBITUARIES

William Francis Richardson, M.E.I.C.

William Francis Richardson, B.C.L.S., M.E.I.C., died at Chase, B.C., on December 29th, 1924.

Mr. Richardson was born at Staffordshire, England, on October 19th, 1876, and was educated at George Watson's College, Edinburgh, Scotland, and, after serving an apprenticeship as a mechanical engineer in Edinburgh, he came to Canada about 1899, where he qualified as a British Columbia land surveyor.

The greater part of Mr. Richardson's work in this country was in connection with surveys and, for a number of years subsequent to 1907, he was with the department of public works engaged on hydrographic surveys in various parts of Canada. Since April 1921, he has been in practice as land surveyor and civil engineer in Chase, B.C. He served in the Great War in No. 2 Tunnelling Company and rose to the rank of Major. He was mentioned in despatches and awarded the Military Cross for conspicuous service in France.

He was predeceased by his wife and is survived by a daughter, Gwyneth Frances Richardson, aged fourteen; a brother, Bernard H. Richardson, of the Accounts Branch, War Office, London England; and a sister, Mrs. Anita Turnbull Bradford, of La Serena, Chile, South America.

Mr. Richardson was elected Member of *The Institute* on October 14th, 1913.

Francis Leslie Brinkman, Jr.E.I.C.

Sincere regret is expressed at the death of Lieut. Francis Leslie Brinkman, Jr.E.I.C., which occurred at the Snow Hospital, New Orleans, following his return from Barbadoes and South America, where he had gone in the interests of his health. The late Mr. Brinkman was an honour graduate of Queen's University, where he received the degree of B.Sc. in 1917. He was born at St. Thomas, Ontario, on August 28th, 1893, and received his early education in that city. Almost immediately after graduating Mr. Brinkman joined the Overseas Forces and saw almost two years of active service with a Canadian engineering battalion. Following his return from overseas in May 1919, he became assistant engineer of Sarnia, Ontario, and in October of that year was appointed assistant engineer with the Department of Public Highways in charge of 28 miles of provincial highway construction. In June 1920 he was placed in charge of the Ottawa-Point Fortune highway. In 1923 he left the government service to enter the contracting field on his own account but was forced to abandon this work during the same year owing to poor health. Mr. Brinkman joined *The Institute* as a Junior on March 22nd, 1921.

Robert Frederick Harvey Bruce, M.E.I.C.

Robert F. H. Bruce, M.E.I.C., civil engineer of the Ottawa Public Works Department, and formerly superintendent of the Ottawa River Works, died on December 27th, 1924, at his residence, 40 Henderson avenue, Ottawa, Ont., following a brief illness. Mr. Bruce, who was sixty-one years of age, had been in splendid health until a short time before his death.

Mr. Bruce was born at Liverpool, England, on June 3rd, 1863, and received his engineering education at Glasgow University, Scotland. In 1889 he was engaged on surveys in connection with navigation works at Warren Point, Ireland. Coming to Canada about twenty-five years ago, his first work was as leveller on a trial line for the location of the Adirondack and St. Lawrence Railway. During the following three years he continued on railway location work. From 1894 to 1897 he was in charge of 61 miles of construction work for the Ottawa and Parry Sound Railway under Geo. A. Mountain, M.E.I.C., then chief engineer of that railway. In 1898 he was appointed assistant engineer on the Canada Atlantic Railway.

Left to mourn his loss are one son, Mr. George Bruce, of Ottawa, and four brothers, Messrs. Stewart, Donald, Reginald, and Ernest Bruce, all in Londonderry, Ireland. Mr. Bruce had also two brothers, Mr. Arthur Bruce and Mr. Henry Bruce, who lived in Ottawa, but who predeceased him a number of years ago. His wife, formerly Miss Eleanor Bonfield, daughter of the late Mr. James Bonfield, M.L.A., for Eganville, predeceased him by nineteen years. He attended St. Joseph's Roman Catholic Church and was a devout and faithful member of the parish. He possessed a wide circle of friends in the Capital who will hear of his death with regret.

Mr. K. M. Cameron, M.E.I.C., chief engineer of the Public Works Department, expressed sincere sorrow over Mr. Bruce's death. "He was a most valued employee of the Government", said Mr. Cameron, "and one of the most faithful, efficient and finest men we had in the Public Works Department. His death will leave a vacancy that will not easily be filled. While my associations with Mr. Bruce have been only of recent years, I feel, and the department feels, deep and genuine regret for the passing of a man of this type".

Mr. Bruce was admitted to *The Institute* as an Associate Member on May 25th, 1899, and was transferred to Member on January 14th, 1904.

Malcolm James MacMillan, Jr.E.I.C.

Malcolm James MacMillan, Jr.E.I.C., of Halifax, Nova Scotia, died at Somerset, Pennsylvania, on September 4th, 1924. The late Mr. MacMillan was a graduate of Dalhousie University of 1915, and of the Nova Scotia Technical College, from which he graduated in 1921, with the degree of Bachelor of Science. Prior to graduating science from the Nova Scotia Technical College, he was employed at various times with the Dominion Iron and Steel Com pany at Sydney, Nova Scotia, the Canadian National Railways at the Halifax Ocean Terminals and in the city engineer's office at Halifax.

Mr. MacMillan served in the Great War with the 2nd Company Canadian Overseas Railway Construction Corps. He was later employed as structural engineer with the American Consolidation Company. He was a son of Rev. Angus and Mrs. MacMillan, formerly of Marion Bridge, now of Halifax.

Mr. MacMillan was admitted to *The Institute* as Junior on June 22nd, 1920.

PERSONALS

George R. Holmes, S.E.I.C., recently with the Dominion Coal Company, Limited, Glace Bay, is now residing with his parents in Hamilton, Bermuda.

Arthur Barlow, Jr.E.I.C., of the engineering staff of the Dominion Coal Company, is on leave of absence, and is at present in Halifax, taking a special course in the Royal School of Infantry.

C. M. Arnold, M.E.I.C., has for some months past been located at Pulashi, Tennessee, as locating engineer on permanent highway location with the State Highway Department of Tennessee.

Bernard H. Hughes, A.M.E.I.C., has sent greetings to headquarters from Kakuri, Nigeria, West Africa, where he is engaged on the construction of the Eastern Railway, Kakuri, Northern Provinces, Nigeria, West Africa.

L. W. Jackson, S.E.I.C., has joined the staff of the Canadian Westinghouse Company, Limited, and is located at their Toronto office. Mr. Jackson is a graduate of McGill University of the year 1923.

K. B. THORNTON, M.E.I.C.,
Elected vice-president of the Institute representing Zone "c".

John S. Whyte, M.E.I.C., who was, until recently, chief engineer of the Dominion Coal Company, Ltd., Glace Bay, is now residing at St. Petersburg, Florida. Mr. Whyte, with Mr. Vincent McFadden, has formed a partnership and entered the contracting field.

C. F. Phipps, S.E.I.C., is with the North Shore Power Company, a subsidiary of the Shawinigan Water and Power Company, at their operating office at Three Rivers. Mr. Phipps was previously located in Shawinigan Falls, Quebec.

F. J. Ellis, S.E.I.C., until recently combustion engineer with the Abitibi Power and Paper Company, Iroquois Falls, Ontario, has joined Vickers and Combustion Engineering, Limited, having been appointed erecting and service engineer with the company.

A. L. Farnsworth, S.E.I.C., has joined the engineering staff of the Spanish River Pulp and Paper Company, Limited, at Sault Ste. Marie, Ontario. Mr. Farnsworth was formerly with Price Bros. and Company, Limited, at Kenogami, Quebec.

S. H. Hawkins, A.M.E.I.C., is with Price Bros., and Company, Limited, at St. Joseph d'Alma, Quebec. Mr. Hawkins was formerly with the Irrigation Branch, Department of the Interior on irrigation surveys in western Canada with headquarters at Calgary, Alta.

E. G. Richards, A.M.E.I.C., who is engaged in railway construction work at Seccondee, Gold Coast Colony, British West Africa, in a recent letter advises that all the members in that locality are enjoying the best of health and that there is plenty of work being carried on there.

C. S. Boyd, A.M.E.I.C., has accepted a position on the engineering staff of the Horton Steel Works, Limited, at Bridgeburg, Ontario. Mr. Boyd, who is a graduate of Queen's University of the year 1917, was formerly with the Canadian Des Moines Steel Company, at Chatham, Ontario.

M. P. BLAIR, M.E.I.C.,
Recently elected to the Victoria City Council.

D. J. Ludgate, Jr.E.I.C., who for the past four and one-half years has been with the Schroeder Mills and Timber Company at Pakesley, Ontario, as resident engineer and manager of the Key Valley Railway, has been appointed to the engineering staff of the Detroit United Railways in connection with special designs.

R. L. Peek, M.E.I.C., formerly refinery manager of the British American Nickel Corporation at Deschenes, Quebec, is now with the International Nickel Company at Port Colborne, Ontario. Mr. Peek was for many years connected with the Coniagas Reduction Company, Limited, and was engaged as superintendent of the smelting and refining works at Thorold, Ontario.

Ira P. MacNab, M.E.I.C., is making an inspection of the plant at Maracaibo, Venezuela, which was recently acquired by the Royal Securities Company, of Montreal. Mr. MacNab was formerly superintendent of the tramways department of the Nova Scotia Tramways and Power Company, and for the past two years has been located in Calgary, Alta.

Capt. G. H. Cagnat, M.E.I.C., of the Department of Public Works of Canada, has been transferred from Winnipeg to Ottawa and is resident engineer for the department with headquarters at the Hunter building, Ottawa. Capt. Cagnat has been with the Public Works Department for the past seventeen years, first in Ottawa and later in Edmonton and Winnipeg.

E. G. W. Montgomery, M.E.I.C., formerly of Regina, Saskatchewan, is designing structural engineer with the Western Electric Company at their Hawthorne works, Chicago, Ill. Mr. Montgomery was for many years connected with the Board of Highway Commissioners of the province of Saskatchewan prior to which he was for nine years engineer to District Board, Gurdaspur District, Punjab, India.

Norman D. Wilson, A.M.E.I.C., of the firm of consulting engineers of Wilson and Bunnell, left on February 5th,

A. S. DAWSON, M.E.I.C.
Vice-President of the Institute representing Zone "a".

for Rio de Janeiro and Sao Paulo, Brazil, in connection with the preparation of a report on the street railway situation from a traffic standpoint in those cities. The report is being prepared by Mr. Wilson's firm at the request of the Brazilian Traction Light and Power Company.

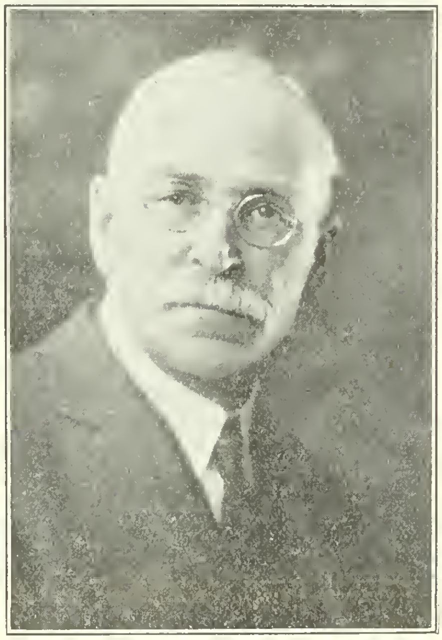
R. M. Hannaford, M.E.I.C., acting chief engineer of the Montreal Tramways Company, has been appointed engineer of maintenance of way and structures for the company, the office of chief engineer having been abolished, according to a recent announcement. Mr. Hannaford's connection with this company dates back to 1902 when he was assistant engineer with the Montreal Street Railway Company.

George Morrison, A.M.E.I.C., district manager of the Sydney, N.S., office of the English Electric Company of Canada, has been temporarily transferred to Montreal, where he is in charge of that company's interests. Mr. Morrison joined the Canadian Crocker Wheeler Company, later the English Electric Company of Canada, Limited, in 1919, prior to which he had been with Brown, Boveri and Company, Limited, London, England, as superintendent of erection department and later in charge of their contract department.

Fred V. Seibert, M.E.I.C., of the Natural Resources Intelligence Service, Department of the Interior, was the chief speaker at the annual banquet of the American Canoe Association held recently at Chicago. During his stay in Chicago he addressed a number of other out-of-doors clubs as well as business organizations. He reports that our neighbours across the line have very keen interest in Canada's out-of-doors, and in her business development. Thousands of Americans are looking to Canada for their holidays and are desirous of obtaining reliable information of our unexcelled opportunities for canoeing, hunting, fishing and the camera.

A. S. Dawson, M.E.I.C. Vice-President for Zone "a".

Alex. S. Dawson, M.E.I.C., whose election to the vice-presidency of *The Institute*, representing Zone a, the four western provinces, is chief engineer of the department of natural resources, Canadian Pacific Railway,

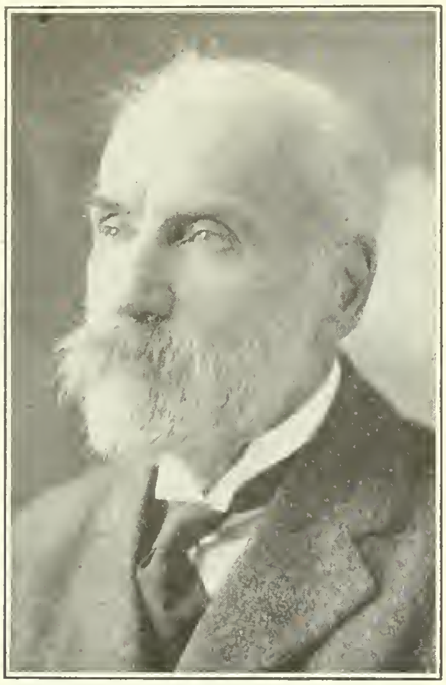


J. H. HUNTER, M.E.I.C.
Newly-elected Councillor for Montreal Branch District.

with headquarters at Calgary, Alberta. He is a native of Nova Scotia, having been born at Pictou on September sixth, 1871. He received his degree of B.A.Sc., in civil engineering from McGill University in 1894. For three years following graduation, he was engaged in hydraulic work in the state of Massachusetts but returned to Canada in 1898 to join the Canadian Pacific Railway at Winnipeg in the maintenance of way department. In 1903 he was appointed chief engineer, western division, of the C.P.R. with headquarters at Calgary and in 1910 was transferred to the irrigation department as chief engineer. Two years later, Mr. Dawson was appointed chief engineer of the department of natural resources which position he still holds. Mr. Dawson has for some time been actively engaged in educational and civic affairs in Calgary, having been at various times a member of the Calgary School Board, Council Board of Trade, executive of the Western Canada College and member of the board of directors of the Calgary Y.M.C.A. He is also an executive of the Calgary Automobile Club and of the Alberta Good Roads Association. He is prominent in engineering circles in Calgary having been chairman of the Calgary Branch E.I.C. in 1917-18 and was on the Senate of the University of Alberta, 1920-24, representing the Association of Professional Engineers. He has been a member of the American Society of Civil Engineers since 1912 and he was elected president of the Canadian Pacific Association of Calgary for the year 1924-1925.

J. H. Hunter, M.E.I.C. elected Councillor

J. H. Hunter, M.E.I.C., recently elected councillor, representing the Montreal Branch district, has been engaged in private practice as consulting engineer in Montreal since 1896, during which period he has designed and supervised construction for the Boston Rubber Company; North River Power Company; St. Jerome Electric Light Company; Wiarton Binder Twine Works; and the concrete and steel coal pockets for the Dominion Coal Company in the harbour of Montreal; the Cardinal Electric Light and Power Company's plant; an 800-foot concrete dock at Fort William; a concrete grain elevator at Fort William; and the Canada Starch Company's plants at Fort William and Cardinal, Ontario.



H. K. WICKSTEED, M.E.I.C.
Councillor for Toronto Branch.

Mr. Hunter was born at Sorel, Quebec, in 1865, and in his earlier work was connected with the Canadian Pacific Railway Company, the Montreal Harbour Commissioners and the Wood Saxon Company, hydraulic engineers of New York, with whom he was engineer in charge. In 1889 he was engaged in railway construction work with the Baltimore and Ohio and Staten Island Rapid Transit Railway. His work with this company was in connection with the electric block signal installation. In 1893 he was with the Danbury Electric Light and Power Company, and for the following two years, until entering private practice, he was engineer in charge of the Saguenay river improvements, Department of Public Works Canada. At present Mr. Hunter is engineer for the St. Paul Land and Hydraulic Company; Baldwins Montreal, Limited; and the Canada Starch Company; and consulting engineer to the Smith Marble and Construction Company and the Fred Thomson Electrical Company and associated with Corn Products Refining Company, U.S.A.

H. K. Wicksteed, M.E.I.C., Councillor for Toronto

Henry K. Wicksteed, M.E.I.C., was elected to the Council of *The Institute* as representative of the Toronto Branch District, announcement of which was made at the annual general meeting. Mr. Wicksteed who is engaged in private practice has been almost continuously connected with railway work in various parts of Canada as well as in foreign countries.

From 1874 to 1885 he was engaged on surveys and location work with the Canadian Pacific Railway, and in 1887 he was chief engineer of the Brantford, Waterloo and Lake Erie Railway, (now the Toronto Hamilton and Buffalo). He was later with the Grand Trunk Railway on double tracking and other works. In 1894 he was on location in connection with the Nipissing and James Bay Railway. From 1899 to 1921 Mr. Wicksteed was chief locating engineer for Messrs. Mackenzie and Mann and the Canadian Northern Systems in Quebec, Ontario, New Brunswick and Nova Scotia.

G. B. MITCHELL, M.E.I.C.
Chairman of Victoria Branch.

Other systems with which Mr. Wicksteed has been engaged include the Duluth, Winnipeg and Pacific; the Halifax and South Western and the Port Arthur, Duluth and Western. He has been engaged in terminal problems at Montreal, Toronto, Hamilton and other centres and has at various times been retained by the Caribbeau Coal Company, the Rosedale Collieries in Alberta, Toronto Suburban Railway and Quebec and Lake Saint John Railway. In 1921 he investigated and reported on Brazilian Railway System.

Mr. Wicksteed was elected Fellow of the Royal Society of Arts in January 1922 and of the Royal Geographical Society in 1923. He is a member of *The Canadian Institute*, the Royal Canadian Yacht Club, the Albany Club, Toronto, and the University Club of Montreal. In 1923 he was on a special mission as consulting engineer for the Canadian National Railways, Mr. Wicksteed has contributed a number of professional papers to *The Institute* and to various technical journals.

G. B. Mitchell, M.E.I.C., Victoria Branch Chairman

George Breck Mitchell, M.E.I.C., who was elected chairman of the Victoria Branch for the present year, is the western manager of the P. Lyall and Sons Construction Company, Limited, at Victoria, B.C., prior to which, from 1917 to 1922, he was with the Foundation Company; first in charge of the construction of the 150,000-k.w. steam power house in Kansas City, Montana; later in charge of the company's ship repairing yard at Port Huron, Michigan, and during the last three years in Peru, South America, first as assistant manager and later as manager for the company.

Mr. Mitchell is a graduate of the Colorado State School of Mines, from which he received the degree of Civil Engineer. In 1897 he was with the William Cramp and Son Ship and Engine Building Company, Philadelphia, Pa. Subsequently he was assistant engineer on the United States Deep Waterways Commission at Ogdensburg, New York, and Detroit, Michigan; assistant engineer with the United States Ishmian Canal Commission in Nicaragua, Central America, and office engineer with the same commission in Washington, D.C. In 1902 he was in private practice as a member of the firm of A. J. Norris and Company, Amsterdam, New York. The following two years he was assistant engineer, Canadian Pacific Railway, in charge of construction of the Angus Shops, Montreal. In 1905 he was with the engineering department of the same company in connection with mechanical matters on the eastern lines. The following year he was superintendent of buildings for the New York, New Haven and Hartford Railroad, with headquarters at New Haven, Connecticut. From January 1907 to February 1915 he was with C. E. Deakin Limited, general contractors, Montreal, and of which company Mr. Mitchell was vice-president. For the next two years he was engaged in general contracting business in Montreal under his own name until joining the Foundation Company in 1917.

G. G. MURDOCH, M.E.I.C.
Elected to represent St. John Branch on Council.

G. G. Murdoch, M.E.I.C. to represent St. John Branch on Council

G. G. Murdoch, M.E.I.C., the newly elected representative of the St. John Branch district on the Council of *The Institute* is engaged in private practice as land surveyor and engineer and maintains an office at St. John N.B. He has charge of right-of-way surveys for Atlantic Division, Canadian Pacific Railway, and is also engaged on town planning and township surveys, and recently on a plan of the city of St. John. As Municipal Engineer to parishes outside city limits of St. John, he is retained chiefly in connection with sewerage and highway work for these parishes. He is engineer for the Union Sulphur Company of New York, deputy land surveyor of New Brunswick, former president of Association of Professional Engineers of New Brunswick and past chairman St. John Branch of *The Institute.*

J. Muirhead, M.E.I.C., Chairman of Vancouver Branch

J. Muirhead, M.E.I.C., the chairman of the Vancouver Branch for the present year, is a B.Sc. of Glasgow University in electrical and mechanical engineering, and has been on the electrical engineering staff of the Glasgow Corporation Tramways, Bruce Peebles and Company, Edinburgh, and the British Thomson Houston Company of Rugby, England. With the latter company he was engaged on the design of electrical machinery for five years. Since 1911 he has been resident in British Columbia and for three years was on the engineering staff of the British Columbia Electric Railway Company. For the past ten years Mr. Muirhead has been with the provincial government of British Columbia, and at present occupies the position of electrical engineer with the Department of Public Works and chief inspector of electrical energy under the "Electrical Energy Inspection Act". During the past three years he has been on the council of the Association of Professional Engineers of British Columbia.

J. MUIRHEAD, M.E.I.C.
Vancouver Branch Chairman for 1925.

Alex. M. Lindsay, A.M.E.I.C., joins Montreal Tramways

Alex. M. Lindsay, A.M.E.I.C., whose appointment as superintendent of rolling stock, Montreal Tramways

Company, has been announced, is a graduate of McGill University of the class of 1909. He was born at Waimate, New Zealand, and served part of his apprenticeship in mechanical engineering at Southland Engineering Works, Invercargill, N. Z. completing his time at John Brown and Company's works at Clydebank, Scotland, where he worked on the first large turbine installation on the Carmania and Mauretania. He came to Canada in 1905 and took the electrical engineering course at McGill. He entered the service of the Montreal Tramways Company in 1908 and was assistant to D. E. Blair, A.M.E.I.C., from then until 1912, when he was appointed chief inspector at the Canadian Steel Foundries on track work and general railway equipment. On resigning this position in 1915 he became general manager of the Record Foundry and Machine Company, shell department, at Moncton, N.B. From 1919 to 1923 he was factory manager with the National Acme Company, Montreal, and until his recent appointment he was in charge of the inspection department of the J. T. Donald Company, Montreal.

Major W. G. Swan, D.S.O., M.E.I.C., enters Private Practice

Major W. G. Swan, D.S.O., Croix-de-Guerre, M.E.I.C., chief engineer of the Vancouver Harbour Commission, has resigned from that position and has entered private practice as consulting engineer in Vancouver. Mr. Swan's resignation, which took effect the end of January last, terminates a service of five years in the position of chief engineer of the Harbour Commission, during which period he had the supervision of the construction of works costing approximately fifteen million dollars.

Major Swan was born at Kincardine, Ontario, in 1884, and after receiving his primary education at the public and high schools of Kincardine, he attended Toronto University, graduating with the degree of B.A.Sc., in 1906. In 1911 he received his degree of C.E., from Toronto University. His early work was with the Canadian Northern Railway on the transportation service, with which he was consecutively transitman, resident engineer, bridge engineer, terminal engineer and district engineer.

Major W. G. SWAN, D.S.O., M.E.I.C.

His conspicuous service overseas during the Great War included twenty-seven months of continuous service in France, during which he was awarded the D.S.O., and was mentioned twice in despatches for distinguished service at Ypres and was awarded the Croix-de-Guerre while serving with the Armée-du-Nord. He was Lieutenant of the 104th Battalion and later Captain and Adjutant, and during 1915 and 1916 he was Captain of the 131st Battalion C.E.F. and was subsequently Major of the 31st Battalion. During 1916 and 1917 he was Major of the 2nd Battalion of Canadian Railway Troops and later was appointed chief engineer and in charge of maintenance of light railways with the 2nd British Army in France. During the period 1917-1919 he supervised the building of over 400 miles of railways.

Major Swan is now specializing on reports and appraisals of all kinds of construction.

K. H. Smith, M.E.I.C. on Special Mission to South America

K. H. Smith, M.E.I.C., of Halifax, Nova Scotia, has obtained leave of absence from the Nova Scotia Power Commission and the Dominion Water Power and Reclamation Service, Department of the Interior, and has left on a mission to South America in connection with investigations on public utility properties in that country on behalf of Canadian financial interests.

Mr. Smith is chief engineer of the Nova Scotia Power Commission, district chief engineer for the maritime provinces, for the Dominion Water Power and Reclamation Service and consulting engineer to the New Brunswick Electric Power Commission. He is a graduate of the University of Toronto, and has been engaged in hydro-electric power investigations, surveys and construction continuously since the year 1911, and has been in charge of the power investigations and development work in the maritime provinces since the appointment of the power commissions in those provinces. Mr. Smith is on the executive of the Halifax Branch of *The Institute* and was one of the official delegates at the World Power Conference in London, England, last July.

The

Year Book

of the

Institute

is being revised and will be issued about the last week in April.

THIS means that all changes in the membership lists must be received not later than March 20th.

IF you are not sure that your present address and official position are on record - please send correct listing to be checked.

Use special blank on page 39 of the Advertising Section of this month's JOURNAL.

Changes in B. C., Public Works and Railways Departments

As part of the British Columbia provincial government's economy programme the following changes were made last fall in the personnel of the administrative and engineering branches of the Department of Works, and Department of Railways respectively.

The Hon. Dr. Wm. H. Sutherland, minister of public works was also appointed minister of railways (portfolio previously held by Hon. Dr. McLean now appointed minister of finance). J. E. Griffith, C.E., M.E.I.C., formerly deputy minister of public works was appointed chief engineer and deputy minister of railways, the appointment of railway engineer previously held by R. W. McIntyre having been abolished. Patrick Philip, M.E.I.C., public works engineer, was made deputy minister of public works and public works engineer.

EMPLOYMENT BUREAU

Situation Vacant

Junior Radio-Electrical Engineer

Junior radio-electrical engineer for the Radio Branch, Department of Marine and Fisheries, Ottawa. Initial salary $1,680 per annum, plus bonus provided by law. Maximum $2,040 per annum. Candidates must be graduates in electrical engineering from a recognized university and preferably have two years' experience in radio or other electrical engineering work. They must be British subjects with at least three years' residence in Canada. Apply to the Civil Service Commission, Ottawa, not later than March 19th, 1925.

Situations Wanted

Civil Engineer

Civil engineer, M.E.I.C., twenty-five years experience in railway and harbour construction, and contracting and operating superintendent of department of large industry, wishes engagement in executive capacity. Is good organizer. Apply box No. 172-W.

Civil Engineer

University graduate 1922, experienced draughting, municipal and topographical surveying, highway and construction. Desires work with any concern with future prospects. Willing to go anywhere and begin at the bottom. At present in B.C. Canadian; married; age 28. Apply Box No. 173-W.

Sales Engineer

Active sales engineer desires permanent connection with progressive firm in Montreal. Speaks French and English; technical graduate; age 30; engineering and sales experience; capable correspondent. Apply box No. 174-W.

Designer

A.M.E.I.C., age 33, experienced designer, checker, etc., with bridge companies and engineers is open for position. Apply box No. 175-W.

Members' Exchange

December 1924 Journals Wanted

A number of enquiries have been received for copies of the December 1924 issue of *The Engineering Journal*, and as this number is out of print any spare copies that members may forward to the headquarters will be appreciated.

Canadian Standard Specifications

Recent publications which have been issued by the Canadian Engineering Standards Association include the following:—

E13–1924 Railway Wire-fencing and Gates, viz: (a) Woven wire-fencing and wire-fence material, and (b) wire-fence gates.
C14–1924 Reinforced Concrete Poles.
C15–1924 Eastern Cedar Poles.
A16–1924 Steel Structures for Buildings.
C17–1925 Alternating Current Watthour Meters.

These specifications may be secured through the headquarters of *The Institute* or upon application direct to the secretary of the Canadian Engineering Standards Association at Ottawa. A detailed description of these specifications may be found in the report of the Canadian Engineering Standards Committee, presented before the annual meeting of *The Engineering Institute* in Montreal in January last, and published on page fifty-four of the February nineteen twenty-five *Journal*.

Steel Construction

"Steel Construction" is the title of a booklet just issued by the American Institute of Steel Construction, which contains the Institute's Standard Specification, and Code of Standard Practice. The introduction of the book consists of a mathematical explanation of the development of the various formulae recommended in the specification, for the proper reduction of working stresses. Accompanying this explanation is a set of charts which eliminate a vast amount of mathematical calculation in connection with structural steel design. An interesting feature of the booklet is the data given on action of structural steel members under varying conditions.

Copies of the booklet may be obtained from the executive offices of the American Institute of Steel Construction, 350 Madison Avenue, New York, or the engineering department, 1052 Leader-News Building, Cleveland, Ohio.

ELECTIONS AND TRANSFERS

At the meeting of Council held on February 24th, 1925, the following students were admitted:—

ABBOTT, Arthur Caldwell, 299 Pine Avenue West, Montreal, Que.
ANDERSON, J. Carl Leopold, Mount Allison University, Sackville, N.B.
BAILEY, Francis Arthur Albert, 364 Kensington Avenue, Montreal, Que.
BERESKIN, Abram I., 462 Talbot Avenue, Winnipeg, Man.
BOSTOCK, William Norman, 304 Prince Arthur Street, Montreal.
BREMNER, Douglas Orrin, 374 Roslyn Avenue, Westmount, Que.
CHALKER, Chauncey Richard, 810 University Street, Montreal.
CHEN, Tee-Yung, 579 Union Avenue, Montreal, Que.
CONNER, Gordon Myron, 851 University Street, Montreal, Que.
DYMENT, John Talbot, 8 High Park Gardens, Toronto, Ont.
ETHIER, Jos. E., B.L. (Loyola College), 1073 Mount Royal Avenue West, Montreal, Que.
FRASER, John Douglas, 128 Bishop Street, Montreal, Que.
GODWIN, Harold Brandon, Ste Anne de Bellevue, Que.
HENDERSON, Ian Gordon, 301 Ontario Street West, Montreal.
HENDERSON, Walter Armstrong, 211 University Avenue, Kingston, Ont.
HIGGINS, Joseph Alexander, 391 Earl Street, Kingston, Ont.
JOHNS, Charles Frederick, Mount Allison University, Sackville, N.B.
LEADLAY, Frank Robert, Queen's University, Kingston, Ont.
MALONE, Willis Peyton, 1366 Greene Avenue, Westmount, Que.
McMASTER, Francis White, 596 Lansdowne Avenue, Westmount, Que.
MILLS, Cecil Gordon, 884 Durocher Avenue, Montreal, Que.
MILLIGAN, James Alexander, 108 Edison Avenue, St. Lambert, Que.
PERRAS, Camille, 1001 St. Antoine Street, Montreal, Que.
SEVIGNY, Joseph Alfred, 123 Laverendrye Street, Three Rivers, Que.
SHORTALL, Wilbert Joseph, 704 Cote St. Antoine Road, Montreal, Que.
SMITH, Hamilton Ellesmere, 4191 Sherbrooke Street West. Montreal, Que.
SOMERVILLE, Karl Roger, 17 Harbord Street, Toronto, Ont.
STEVENS, Walter Oscar, 621 Dorchester Street West, Montreal.
TASCHEREAU, Charles, B.A. (Laval Univ.), 10 St. Louis Square, Montreal, Que.
TOUPIN, Valerien, 6 Souvenir Avenue, Montreal, Que.
VICKERSON, George L., 277 Regent Avenue, Montreal, Que.
WOOD, James, Strathcona Hall, Montreal, Que.
YOUNG, Ross Alexander, 416 Maryland Street, Winnipeg, Man.

Abstracts of Papers read before the Branches

A Mechanical Explanation of Einstein's Theory of Relativity

Wm. Gore, M.E.I.C.
Border Cities Branch, February 13th, 1925.

"It might be questioned as to the interest of engineers in subject so obscure as that of relativity" said Mr. Gore, in opening his remarks, "But let me remind you that relativity takes its rise in the refinement of measurement and accurate measurement is first and last the foundation of engineering. It is to our precision that wheels of commerce are kept turning and naturally we are interested in anything which partakes of its nature. It is true that pragmatic considerations lead us in our work to consider only measurements in which units corresponding to our own dimensions are used such as the foot and the stride but that does not inhibit us from spreading out on the one hand to the infinitely great and on the other hand to the infinitely small. We hold the balance of sanity between these two extremes.

"The subject of natural science about which relativity is hung received a remarkable advance by one of our ancestry in the person of Sir Isaac Newton, of whom it was said, solved all the problems that could be solved at his period which was about two and a half centuries ago." Mr. Gore then asked to be pardoned for quoting two couplets. The first, which was on Sir Isaac Newton, was written by Pope is as follows:

> Nature and nature's laws lie hid in night,
> God said let Newton be and all was light.

Since that time many scientists have added to our knowledge and we now have another remarkable man in Einstein, a German this time, and a couplet about him has been written by a Toronto professor, wishing to emulate Pope. This goes as follows:

> Too much light dazzles the eyes of man,
> God said let Einstein be and all was dark again.

This couplet is an interesting and partially true commentary upon the obscurity that surrounds the subject of relativity. It is said that the subject is one which the general public for want of necessary training cannot understand but this can hardly apply to engineers who have the proper training to understand anything which has its source in measurement. The case of relativity is best made plain by taking an example and the Border Cities is quite a suitable place for the example". With the aid of a map of the Border Cities Mr. Gore went on to say, "Relativity states that all our system of measurements involving yards and hours are true only when we are dealing with things fixed in relation to ourselves. Thus our yard stick and stop watches are true on the dry land of the Border Cities, but the one appears to shorten and the other to slow up if we transfer them to the water of the Detroit river or the ships that ply thereon. Suppose we take a ten-mile strip of the shore and view it from a ship which travels the ten miles in one hour, that is at the rate of 10 miles per hour, then the ten-mile strip of shore based on the yard stick which we have with us will appear to shorten up by the extraordinary amount of one one-hundredth part of an inch and the clocks on shore have gone slow in the same proportion.

The whole effect is so small or obscure that it does not affect everyday life at all. Then why regard it? It is the desire to be precise and the fact that changes become important when the velocity's relation are considerable. Thus, if we travelled on a beam of light instead of a river steamer than the ten miles would be reduced to nothing and the clocks on the shore would appear not to change and every thing except ourselves and the beam of light would cease to exist.

In order to understand the thing we must consider a little geometrical problem on the Detroit river. Imagine a return journey across the stream and another return journey of the same length up and down the stream. The geometry of the problem shows the up- and down-stream journey takes longer than the cross journey in a certain ratio which forms the basic expression of relativity and it was discovered in this way. It was sought to discover the absolute motion of the earth through the ether in the same way as with log on board ship or as we might the velocity of the Detroit river by the experiments of the journeys. In determining the velocity of the earth, the velocity of light takes the place of the velocity of the ship. A light wave was split into two beams, one sent to and fro, crossways, and the other lengthwise, and then brought together and there produce interference bands. As the absolute direction of the motion of the earth was as uncertain as its amount, the apparatus was turned slowly about a vertical axis so as to get a component in the right direction. The result of these experiments showed no evidence of motion whatever, the interference bands did not move as the apparatus was turned about.

This is where Einstein's relativity started. Absolute motion could not be discovered and the only thing that mattered was relative motion and the reason why zero was obtained is that time and space of one direction, say travelling with or against the ether was different from that travelling across it, the change being in accordance with the afore mentioned ratio of one to the square root of one minus v squared over c squared or in other words there was a shortening of length in one direction which just balanced the required shortening in time. This experiment has been performed again and again, except in one place on Mount Wilson near Los Angeles where a small change has been noted with the same apparatus that showed no change at Cleveland. The reason for the change has not been demonstrated and we will proceed as if no change had been observed."

From this point Mr. Gore demonstrated by means of lantern slides of his theory of the composition of the ether as shown in a diagram of a cube of ether. This diagram showed a system of columns collected together in three co-ordinate planes. Other plates showed the strains in space due to one and two bodies at rest as well as in motion. A very interesting plate shown was that of Bohr's hydrogen atom.

Bringing his subject down to more concrete matters, Mr. Gore showed some most interesting pictures of eclipses of the sun taken in 1898, 1900, 1922, and also of the much talked of recent eclipse. These pictures together with some of the stellar systems showed how these were all diminishing by throwing off electrons of which matter is composed.

Main Highway Organization

C. A. Davidson.
Calgary Branch, January 28th, 1925.

Mr. Davidson commenced by elucidating the objects being aimed at by his department. Present finances would not permit of any but gravel roadways, and for many years to come we must be content with such. The future alone would decide what surfacing would eventually be used. The public generally do not realize the amount of work necessary in instituting a road making programme and expect that as soon as money is appropriated contracts would immediately be let, and forget that preliminary investigations are necessary and cost money. The question of location has to be considered with a view that such must be established for all time. Such matters as soil investigation, alignment for minimum curvatures, avoidance of railroad crossings, drainage, fewest bridges, and the eventual superimposing of a better class of roads have to be considered to their fullest extent.

The speaker pointed out the hazards that must be contented with and avoided as far as possible. These were principally level crossings, poor surfacing, excessive crown, unprotected fills, excessively convex vertical curves and sharp curves. He stated that too narrow roadbeds and blind curves at intersections were other matters of importance to be dealt with.

Mr. Davidson referred to the $3,500,000. that was appropriated by the provincial treasury to put in shape some 2,500 miles of main highway, which, however, was not to be of a permanent or even semi-permanent nature. Such permanency would in the future depend on the amount and type of traffic to be accommodated.

Owing to the variable nature of the soils in southern Alberta, ranging from muskeg and gumbo to drifting sands, no standard or universal process could be devolved in the construction of the roads. On the proposed Sunshine trail alone, from Edmonton to the south boundary, some 450,000 cubic yards of gravel will be required and 1,500,000 cubic yards of earth will have to be excavated. Above the cost of this work the department has to bear the cost of bridge replacements, right of way, culverts, removal of telephone poles, and compensation in many ways.

The commissioner then touched upon the question of responsibilities of bidders and showed what disadvantage we in the west were in on account of lack of equipment and long distances. They had to guard against indiscriminate subletting of contracts to small contractors in which case the government might be virtually paying the first contractor more than the work warranted.

One problem was the study of the motor vehicle traffic to show what type of such would be used mostly on any particular road. During his discussion of the preservation and maintenance of roadbeds and the causes of damage, the speaker claimed that 500 vehicles a day was about the limit under which gravel would stand up, beyond which it might readily fail. He advocated the institution of a limit of weight per wheel base that should be permitted on any road, also a limit to the loading of wagons, so that tire width is sufficient to permit the roadbed to properly sustain the nominal load. He claimed that superintendence would amount to about eight per cent of the total cost of the road. As regards a maintenance system he had advised the employment of properly trained patrol men along all main highways.

During the discussion, the question of filling potholes and other bad places, was raised. The speaker explained that a thorough scarifying of the road was best, and the surface should be left slightly loose in preference to a firm bedding. His observations had shown that a wavy effect was noticeable from fast running traffic when the roadbed had been too firmly packed down during construction.

Prospecting

Professor DeLury.
Winnipeg Branch, January 8th, 1925.

Professor DeLury, in opening his address said that men in all walks of life are prospectors, — the doctor, lawyer, and businessman, are all prospectors, even the undertaker.

To be a prospector as we ordinarily know it a man must be an unbounded optimist and usually is a profound liar. There is the intentional liar and the unconscious liar, — he who dreams to such an extent that he finally comes to believe his own dreams.

Each mining district has its own prospecting history, and the element of accidental discovery has entered into most camps. Sudbury and Cobalt were accidental discoveries, in fact the whole of the Northern Ontario fields were more or less the direct or indirect result of accidental discovery. A man in one field pitched his tent, and when lifting rocks to weight down the guy ropes noticed that they were rather heavy. Upon investigation the tent was found to be pitched in the middle of the outcropping. Undoubtedly this outcropping would have been discovered during the prospect, but nevertheless the actual discovery was an accident.

However, careful prospecting on the whole leads to the greatest number of discoveries. The Cordilleran was due to the careful search for placer mines. Nine out of ten of the gold and silver mines in that region were started as placer camps.

Mining and prospecting are young in North America. In Europe Asia and North Africa the history of prospecting goes back to the bronze age; tin being carried away from Cornwall several centuries before the Roman Invasion. This tin was all produced from placer mines and to-day also the bulk of tin still comes from placer mines. Mining may have been carried on even in the Paleolithic age, for we know that precious stones were collected then.

There was some vein mining in early times, but it was limited by the lack of explosives and machinery. This necessarily limited it to the softer rocks and to shallow depths. The cheapness of slave labour could not compensate for this lack of equipment.

In the Iron Age the problems were not mining and prospecting problems but rather metallurgical. Iron was fairly plentiful on the surface and the demand comparatively small, so that extensive prospecting was not necessary.

In comparing prospecting in America in the early days with to-day, we know that any man could equip himself and learn to pan gold. To-day placer mines are decreasing and it is necessary for the prospector to look for the mineral in place. In the early American days every prospector looked for gold and silver. Now a prospector must know much of minerals and rocks and general geological history. Twenty or thirty years ago a man could not get definite rules and guides to go by, but to-day concrete facts are obtainable. It is now recognized that the prospector should be trained.

The Ontario government has had a prospecting school in all camps at intervals for many years for the purpose of teaching prospectors.

The first application of the use of a device for finding minerals was undoubtedly the divining rod, which was first used in the search for tin. Many doodle bugs have followed it and are even now on the market, but none are of any value.

Pure science has given definite things which can be of assistance. With compass and dip needle it is possible to map underground iron deposits. While the diamond drill could be considered a prospecting device, it is used more for developing. The plumb-bob can be used, but requires very, very accurate determination; it is used extensively to test the theory of Isostacy.

Electricity has been used only in recent years with the discovery of radio activity. It may be useful for prospecting for radio active minerals. Before the war a Frenchman developed a scheme for mapping ore bodies by electricity. From a central point he passed a current through the rock and measured the difference of potential — thus establishing equi-potential lines about the point. If an ore body was present in the field mapped, it tended to bend these lines.

A Toronto University man has recently used a method whereby he mapped fairly accurately some known covered ore bodies in Northern Ontario. His method depends on the fact that a small current continually flows about many ore bodies.

Much of South and North America has been surface prospected. When all these surface prospects are exhausted, how will prospecting be carried on? The time will come when there will be a shortage of metals. Can they be located without actually being seen?

In some cases the geologist has already done his work. He has given a definiteness to coal deposits, and will furnish more detail as time goes on. He has also done much in locating oil deposits. Twenty or thirty years ago there was a doubt as to whether oil was organic or inorganic and it was a common belief that oil resources were inexhaustible, but now the geologist has no doubt but that it is of organic origin and that the oil resources of the world are nearing their exhaustion.

It is now well known that Alberta has some of the best oil resources in the world, and when the great oil pools are exhausted the Alberta oil sands may make that province one of the world's oil centres.

Iron ore of the tenor demanded to-day will be exhausted sometime, but rock with but 5 per cent of iron, which may then be concentrated, is practically inexhaustible.

Twenty years ago the economic geologists were at sea with regard to the origin of lead, tin, copper, zinc and the precious metals. In the last two or three years much progress has been made. All these metals have been associated with igneous intrusion and there is evidence of a zonal arrangement. Some metals are found close to the mother rock and others farther away. Tin lies close and antimony farthest away, with the other metals spread between. This theory may in the future, be usefully applied for the location of ore bodies in covered areas, where the surface is not exposed for prospecting. For example, in New Brunswick traces of tin and tungsten are found near a granite intrusion and at some distance deposits of antimony are found. Then according to the zonal arrangement the other metals should lie in the country between.

This zonal theory gives an accurate basis of information and is unlike some of the dreamland theories you hear about, such as connecting Cobalt, northern Manitoba and the Klondike.

In conclusion it may be said that the prospector of the future will likely be a trained geologist using many appliances and all available information, and things that are now theories will be developed into more or less concrete facts, with quantitative limitations and measurable elements.

Ceramics

Professor W. G. Worcester, M.E.I.C.
Calgary Branch, February 9th, 1925.

Professor Worcester commenced by tracing the origin of the word ceramic from the Greek word keramos meaning potter's earth, and pointed out that from the engineer's standpoint ceramics was more or less a new branch. In fact the course at the university was only instituted four years ago and he was proud to say was the first and only technical engineering course of its kind in the British Empire. There were, however, trade courses in other countries and a few technical courses available in the United States, France and Germany. He stressed these points, and emphasized the importance of the ceramics course available at the university. He then referred to the very close relationship existing between the ceramic engineer and every other branch of engineering. His field was wide and general in its scope, extending from household porcelain and bricks to the sparkplug in an automobile engine. He said the art of clay writing was one of the oldest, and it was only some thirty years ago that state action could be stirred up to interest in the service of ceramics. It remained for Edward Orton, Jr., to establish a department of ceramics in the Ohio University, presumably the first of its kind.

Referring to the term ceramic engineer, he felt that he might perhaps better be called a silicate engineer, in that the whole of his work has to do with the investigation and treatment of the silicates. He not only decides the consistency of the body to be fabricated, but also determines the nature of the materials to be used by the artist in decorating the body.

He then explained the important part the ceramist plays in the manufacture of carborundum from the bauxite imported from the southern States and treated electrically at Niagara; in the composition, manufacture, and testing of fire bricks; and the porcelain to withstand minimum non-expanding and non-contracting properties.

The speaker related how $70,000. worth of material had been imported from the States to equip the laboratories at the University of Saskatchewan, and when spare parts were required these had been made at the university and had proved the equal of the imported articles in every way. Canada, he said, is dependent on outside points for nearly all raw refractory materials; the comparatively small deposits of the necessary clays found in Saskatchewan being entirely inadequate to meet the demands of the Dominion, — something like a ten million dollar per annum industry. He advocated strongly the development of refractory clay deposits in Canada to meet the ever-growing demand for a material which played so important a part in our every day existence.

His audience were enthused with the idea that this year would see a substantial production of tiles for locomotive fire-boxes from the claybank deposits of Saskatchewan. These tiles have hitherto been entirely supplied from across the line, and arrangements have been made for manufacturing in Canada on a royalty basis with the patentees. This in itself, he considered, was a big feature, and effectively corroborated the success that had met the efforts of the university faculty.

ANNOUNCEMENT OF MEETINGS

Further information may be secured from the secretaries of the various branches, whose addresses may be found under "Officers of Branches" on page 104 of *The Journal.*

MONTREAL BRANCH:—

Secretary-Treasurer, C. K. McLeod, A.M.E.I.C.

Mar. 5th. Address on "Invisible Radiations" by Dr. L. E. Parizeau.
Mar. 12th. Address on "Improvements in Design and Appearance of Highway Bridges" by C. J. Desbaillets, M.E.I.C.
Mar. 19th. Address on "Air Preheaters" by A. J. T. Taylor.
Mar. 26th. Address on "Reconditioning Frogs and Rails by Oxy-Acetylene Under Traffic" by G. P. MacLaren.
April 2nd. Address on "Underground Electrical Work-City of Montreal" Dr. L. A. Herdt, M.E.I.C.
April 9th. Address on "Financial Aspect of the Decongestion of Traffic in Montreal" by S. Ouimet, A.M.E.I.C.
April 16th. Address on "Consideration of Rainfall and Run-off in Connection with Sewer Design" J. G. Caron.
April 23rd. Address on "Transformers" by C. E. Sisson, M.E.I.C.

VICTORIA BRANCH:—

Secretary-Treasurer, E. P. Girdwood, M.E.I.C.

Mar. 11th. Address on "Comparative Geography, etc., as Applied to Transportation", by G. G. Aitken.
Mar. 25th. Address on "Problems of Town Planning", E. G. Marriott, A.M.E.I.C.
April 8th. Address on "Dominion Drydock", by J. P. Forde, M.E.I.C.

WINNIPEG BRANCH:—

Secretary-Treasurer, P. Burke-Gaffney, A.M.E.I.C.

Mar. 4th. Address on "Steam Storage and Steam Accumulators", by A. J. T. Taylor, Vickers and Combustion Engineering Limited, Toronto, Ont.
Mar. 18th. Address on "New Koppers Gas Plant", by Hugh McNair, Winnipeg Electric Railway.
April 1st. Address on "Central Steam Heating", by N. W. Calvert, and J. W. Sanger, A.M.E.I.C.
April 15th. Address on "Application of Compressed Air to Industry", (Moving Picture). Ingersoll-Rand Company.
May 6th. Annual Meeting — Report of Committees.

ST. JOHN BRANCH:—

Secretary-Treasurer, W. J. Johnston, A.M.E.I.C.

Mar. 19th. Address by H. G. Acres, D.Sc., M.E.I.C., on "Deterioration of Turbine Runners".
April 16th. Address by H. O. McInerney, K.C., on "Law of Contracts as it Affects Engineers".
Details of Dates and Subjects to be announced later:—
A visit to the Admiral Beatty Hotel, under the direction of John B. Stirling, A.M.E.I.C.
Illustrated Lecture, "The Mount Royal Hotel", by Walter J. Armstrong, M.E.I.C.
Address on "Engineering Education" by W. E. Wickenden, Society for the Promotion of Engineering Education.
Address by Prof. Hammond, Polytechnique Institute, Brooklyn, N.Y.
A meeting during the winter to be held at Fredericton, N.B.

CALGARY BRANCH:—

Secretary-Treasurer, G. P. F. Boese, A.M.E.I.C.

Mar. 9th. Annual Meeting.
Mar. 23rd. Prize Competition.

Montreal Town Planning Commission

An announcement has been made of the members of the provisional city planning commission of Montreal. This committee has been chosen from among representatives of public bodies, industrial organizations, transportation experts and others interested in town planning and civic improvement. Those on the temporary board are: — H. A. Terreault, A.M.E.I.C., chairman; Joseph Beaubien, mayor of Outremont; H. V. Duggan, Shawinigan Water and Power Company; E. E. Cunningham, efficiency engineer, C.P.R.; James Ewing, M.E.I.C., vice-president, Town Planning Institute of Canada; R. A. C. Henry, M.E.I.C., director, Bureau of Economics, C.N.R.; Colonel J. E. Hutcheson, vice-president and general manager, Montreal Tramways Company and K. B. Thornton, M.E.I.C., assistant general manager, Montreal Tramways Company; Raoul Lacroix, architect; H. Lawson, architect; Dr. W. D Lighthall; Geo. R. MacLeod, M.E.I.C., Public Works Department, City of Montreal; Paul Seurot, M.E.I.C., chief engineer, Montreal Tramways Company; C. M Shaw, superintendent of transportation, Montreal Tramways Company; Frank M. Simpson, engineer of fundamental plans, Bell Telephone Company.

RECENT ADDITIONS TO THE LIBRARY

Transactions, Proceedings, etc.

Presented by the Societies:
Minutes of Proceedings of the Institution of Aeronautical Engineers, No. 12.
Transactions of the Engineering Association of Malaya, Vol. 3, 1923.
Transactions of the Institution of Engineers and Shipbuilders in Scotland, vol. 77, 1923-24.
Proceedings of the Royal Society of Canada, 1924.
Journal of the Royal Society of Arts, Index to Vols. LXI-LXX, 1912-22.

Reports

Presented by McGill University:
Annual Report of the Governors, Principal and Fellows, Part I, Report of the Principal, 1922-23.

Presented by the Dominion Water Power and Reclamation Service of the Department of the Interior:
Water Resources Papers Nos. 42 and 43.

Presented by the Natural Resources Intelligence Branch of the Department of the Interior:
Natural Resources of Quebec.

Presented by the Smithsonian Institution:
Niagara Falls and Its Power Possibilities.

Technical Books

Presented by McGraw—Hill Book Company, Incorporated:
Structural Engineers' Handbook, by M. S. Ketchum.

Presented by the Industrial Press:
Machinery's Handbook, (revised and enlarged).

Presented by John Wiley & Sons:
American Civil Engineer's Handbook, by Mansfield Merriman.

Presented by the Kansas City Testing Laboratory:
Handbook of Petroleum, Asphalt and Natural Gas, by Roy Cross.

Presented by Edmond Marcotte:
Les Lignites et leurs Applications Industrielles, by E. Marcotte.
Communications scientifiques et faits industriels de l'année, by E. Marcotte.

Presented by Wallace R. Harris, President Concrete Products Association:
Concrete Products: Their Manufacture and Use, by W. R. Harris.

Presented by E. & F. Spon, Limited:
Steam and Other Useful Tables, by P. W. McGuire.
Electric Circuits and Installation Diagrams, by W. S. Ibbetson.
Spon's Electrical Pocketbook, by W. H. Molesworth.
Civil Engineers' Cost Book, by T. E. Coleman.

Presented by the Portland Cement Association:
History of the Portland Cement Industry in the United States, by R. W. Lesley.

Presented by the Delaware River Bridge Joint Commission of Pennsylvania:
Contract Book and Drawings of Contract No. 20 for Camden Approach, Third Street to East of Fifth Street, Philadelphia.

Presented by the Canadian Manufacturers Association:
Canada, Trade Index, 1925.

Presented by C. A. Mullen, M.E.I.C.:
Laboratory Investigation of a New Theory of Asphalt Paving Mixtures, by H. F. Macnaughton.

Presented by Joseph W. Hays and Associates:
How to Build Up Furnace Efficiency, by Joseph W. Hays.

Presented by Combustion Publishing Corporation:
Combustion in the Power Plant: A Coal Burner's Manual, by T. A. Marsh.

Presented by the MacLean Publishing Company, Limited:
Financial Post Survey, 1925.

Other Text Books added to the Library

Codes of Ethics: A Handbook, by Edgar L. Heermance.
Free Press Printing Company, Burlington, Vt.
The Manufacture of Pulp and Paper, Vol. 5.
McGraw-Hill Book Company, Incorporated.
Coal Resources of the World.
Morang and Company, Toronto.

Specifications

Presented by the Canadian Engineering Standards Association:

E13–1924	Railway Wire-Fencing and Gates, viz: Woven Wire-Fencing and Wire-Fence Material and Wire-Fence Gates.
C14–1924	Reinforced Concrete Poles.
C15–1924	Eastern Cedar Poles.
A16–1924	Steel Structures for Buildings.
C17–1925	Alternating Current Watthour Meters.

BRANCH NEWS

Border Cities Branch

F. Jas. Bridges, A.M.E.I.C., Secretary-Treasurer.

At 6.30 p.m., Friday 13th, the members of the Border Cities Branch turned out in large numbers to a meeting held at the Prince Edward hotel, Windsor. After the appetites of all had been satisfied the chairman, J. Clark Keith, A.M.E.I.C., called for the reading of the minutes of the previous meeting which were adopted as read. The secretary then read a letter from the general secretary, Fraser S. Keith, M.E.I.C., in which he announced his partially severing his connection with *The Institute* due to his taking a position with the Shawinigan Water and Power Co. Many very complimentary remarks were voiced by different members regarding our general secretary and the branch went on record expressing their deep regret at the step Mr. Keith felt called upon to take, and at the same time sincerely wishing him success in his new field.

The chairman then brought up a resolution prepared by the executive which called for a change in policy regarding the dinners held monthly by the branch. In the future the branch as a whole will assume one-fifth of the cost of the dinners, thereby relieving the faithful members who attend the meetings and allowing them the benefit of a surplus in the finances of the branch.

The chairman then introduced the speaker for the evening, Wm. Gore, M.E.I.C., of Toronto, who chose as his subject "A Mechanical Explanation of Einstein's Theory of Relativity"*.

Although the subject seems very obscure, some really intelligent questions were asked of the speaker at the conclusion of his talk and a hearty vote of thanks was accorded the speaker.

Cape Breton Branch

D. W. J. Brown, Jr.E.I.C., Secretary-Treasurer.

Part Played by Engineers in Railroading

On Tuesday evening, February 17th, D. W. McDonald, superintendent, Sydney and Louisburg Railway, addressed this branch of *The Institute* on the subject of "The Part Played by Engineers in Railroading". The speaker pointed out the improvements in the safety, despatch and economy of transportation brought about largely by the work of the engineer.

Mr. McDonald purposely made his paper very general with the idea of promoting discussion on subjects which particularly interested those present. The discussion which followed the paper centered chiefly around the locomotive and the air brake. Upon request Mr. McDonald described the Westinghouse air brake and its operation, roller bearings and the possibilities for their use on railway cars, grades and running and starting friction and their effect on operating conditions.

In connection with the locomotive, such improvements as superheaters, thermic syphons, arches, boosters, and feed water heaters were taken up. It was Mr. McDonald's opinion that superheaters, thermic syphons and arches had passed the experimental stage and had established their worth and he would consider them as necessary standard equipment for all locomotives where economical operation is desired. In connection with the use of pulverized fuel in locomotives, he thought that this was chiefly of advantage where it was necessary or desirable to use low grade fuels, although the saving of roundhouse labour and the much shorter time required for getting up steam might make its use advisable in other localities. The use of the electric locomotives on railroads was taken up, and Mr. McDonald stated that from an operating point of view they seem to leave little to be desired, but that operating officials were still divided as to their success from a financial viewpoint.

At a recent meeting of the executive of the branch the following appointments were made:

Appointment of Officers

Vice-Chairman —	W. C. Risley, M.E.I.C.
Papers and Meetings Committee:	W. J. Ripley, A.M.E.I.C. E. C. Tonge, A.M.E.I.C. R. Moffatt, A.M.E.I.C.

W. S. Wilson, A.M.E.I.C., was also appointed on the executive vice Geo. Morrison, A.M.E.I.C., resigned.

Edmonton Branch

W. R. Mount, A.M.E.I.C., Secretary-Treasurer.

At the regular monthly meeting held in the MacDonald hotel on January 15th, a very interesting lecture was given by R. W. Boyle, M.E.I.C., dean of the Faculty of Applied Science, University of Alberta. Dean Boyle's lecture, "A Recent Electrical Application" was profusely illustrated and was listened to by a most appreciative audience.

Calgary Branch

G. P. F. Boese, A.M.E.I.C., Secretary-Treasurer.
W. St. J. Miller, A.M.E.I.C., Branch News Editor.

Main Highway Organization

Having fully recovered from our "soup to nuts" and "other" items on the menu at the annual dinner, the members of the branch got down to things of a more serious contemplation, and listened to an address by C. A. Davidson, highway commissioner of the province of Alberta. This address was delivered on January 28th, the subject being "Main Highway Organization"*. There was a good attendance, members of the Calgary Auto Club being invited guests.

Very hearty votes of thanks were passed to Mr. Davidson for his excellent address, one that was fully appreciated and enjoyed by everyone present.

Chairman R. S. Trowsdale, A.M.E.I.C., suitably conveyed the thanks of the members and guests present to the speaker for the trouble he had gone to in preparing his address and in coming down for the meeting.

Ceramics

On February 9th, Professor W. G. Worcester, M.E.I.C., gave a most instructive and interesting address on "Ceramics"*. Professor Worcester is a member of the faculty of the University of Saskatchewan with the position of ceramic engineer, and also acts in a similar capacity for the provincial government.

R. S. Trowsdale, A.M.E.I.C., was in the chair and, following a vote of thanks tendered by W. S. Fetherstonhaugh, M.E.I.C., and seconded by W. G. Armstrong, complimented the professor on his extremely able presentation of the address and the manner in which he so willingly consented to give his paper. Professor Worcester included in his reply a warm welcome at the university to any members of the E.I.C., should they be visiting Saskatoon at any time.

Hamilton Branch

H. B. Stuart, A.M.E.I.C., Secretary-Treasurer.

A meeting of the Hamilton Branch was held in the Technical School auditorium at 8 p.m., Wednesday, January 21st, 1925, with J. J. MacKay, M.E.I.C., chairman, presiding.

After reminding the members of the annual general meeting in Montreal, the chairman introduced the speaker of the evening, W. L. McFaul, B.A.Sc., A.M.E.I.C.

Sewage Problems of Hamilton

Mr. McFaul's subject was "Sewage Problems of Hamilton". Following a short description of the topography of the city he traced the sewage requirements, both sanitary and storm, arising from the increase of population, the measures taken to meet these requirements and the works proposed to take care of the city's future development.

The lecture was illustrated by lantern slides made from the construction drawings, and from photographs taken during construction. His information with regard to costs and rate of construction was particularly clear.

His Worship the Mayor, the members of the Board of Control and the Aldermen were invited guests.

A motion that the paper be forwarded to *The Journal* for publication was carried unanimously. The discussion was brief being mostly requests for more information on certain details. After votes of thanks to the lecturer, and to Prof. Gill, M.E.I.C., by whose courtesy the branch had the use of the Technical School Auditorium, the meeting adjourned.

Kingston Branch

G. J. Smith, A.M.E.I.C., Secretary-Treasurer.

Operation of a Modern Telephone Exchange

The explanation of the operation of a modern telephone exchange was the *raison d'être* of the regular meeting of the Kingston Branch held in Carruthers Hall, Queen's University on Thursday evening, January 15th, under the chairmanship of L. F. Grant, A.M.E.I.C. There was a large attendance of Science students from the university, and citizens, in addition to the members of branch.

The subject was very capably handled by the Kingston staff of the Bell Telephone Company of Canada, the following members taking part:—

Introduction — A. J. Evans, Kingston manager.
Switchboard Operation — Misses Botting and Reynolds.
Wiring and Installation — P. McEwen.
Motion Pictures — J. H. Thompson.

Mr. Evans not only introduced the subject of the evening, but after the demonstration of the switchboard operation was kept busy

*Abstracts of these papers appear on another page of this issue.

for about one hour answering most capably the many questions which were asked. One of the interesting points brought out was the statement that, in the city of Montreal, prior to the refusal of the Bell Telephone Company to allow its operators to tell the time, about 35 per cent of the total number of calls had been time requests. Another was the fact that, though any one operator had only a limited number of phones to take numbers from, depending on various conditions, she was however able to connect any one of those numbers with any other phone on the whole exchange up to possibly ten thousand.

A complete switchboard in miniature was used for demonstration, the circuit of an ordinary telephone call being shown by means of calling and receiving phones attached respectively at the opposite ends of the switchboard. Misses Botting and Reynolds demonstrated very carefully how the calls were put through. They explained the proper manner for calling and answering for best results, showed the way to obtain the operators attention quickly, the reasons for "wrong number", "nobody waiting," etc. An interesting detail was the visual report to the operator that a call was finished by one light respective to a circuit flashing as one party put up his receiver, then the second one lighting up as the second party hung up, showing thus, when the two lights came on, that both ends had closed.

Two reels of motion pictures under the direction of J. H. Thompson were finally shown. The first entitled "Waves of Communication" was a diagramatic illustration of the transference of the sound waves into electrical energy at the calling phone, the circuit of this energy to the receiving phone, and the final reverse procedure back into sound waves yielding again the human voice in the earpiece of the second telephone. The second film "The World Behind the Telephone", dealt with the many different aspects of the operation of a large telephone exchange, showing the training classes for the operators, the actual operation of a switchboard in handling calls, the very complicated and yet quite accessible wiring, the laying of both land and marine cables, the repairing of damage, etc.

After the showing of the films, a hearty vote of thanks, moved by Prof. L. T. Rutledge, M.E.I.C., met with general approval, the whole subject having been most interesting and the Bell Company having taken great pains in every detail, to make the evening's meeting such a success.

Sault Ste. Marie Branch

A. H. Russell, Jr.E.I.C., Secretary-Treasurer.

A regular meeting of the Sault Ste. Marie Branch was held on Friday, January 31st, 1925, following a dinner at the Y.W.C.A., with Wm. Seymour, M.E.I.C., chairman, presiding.

The Modern Blast Furnace

The chairman extended a warm welcome to the visitors on behalf of the branch, and then introduced the speaker, F. Smallwood, M.E.I.C., chief engineer of the Algoma Steel Corporation, whose subject was "The Modern Blast Furnace". He gave the first paper of two which he had prepared on this subject. He dealt with the raw materials up to the furnace and the main details of Blast Furnace construction. He used detailed drawings and lantern slides to fully illustrate his talk. A very interesting discussion followed the address especially among those interested in the steel industry. Mr. Smallwood will give his second paper on the same subject in the near future.

A hearty vote of thanks was tendered to the speaker expressing the appreciation of all present.

Winnipeg Branch

P. Burke-Gaffney, A.M.E.I.C., Secretary-Treasurer.
James Quail, A.M.E.I.C., Branch News Editor.

On the evening of Thursday, January 8th, a regular meeting of the Winnipeg Branch was held at 8.30 p.m. The chairman, D. L. McLean, A.M.E.I.C., occupied the chair. A report was received from D. A. Ross, M.E.I.C., convener of the Committee on Joint Headquarters, and it was decided that hotel accommodation should be secured, if such were available, and if not, that accommodation should be secured in an office building.

Prospecting

The chairman introduced Prof. DeLury of the Geological Department of the University of Manitoba, who addressed the meeting on "Prospecting"*. He sketched the history of prospecting of the earliest days and showed how the element of luck entered very largely into the discovery of some of the major mineral deposits. In discussing the art of prospecting, he gave a very interesting account of the latest theory of the zonal occurrence of minerals, a theory which, if established by observation, would do much to eliminate fruitless and unnecessary prospecting.

*An abstract of this paper appears on another page of this issue.

Halifax Branch

K. L. Dawson, A.M.E.I.C., Secretary-Treasurer.

Sixth Annual Meeting

The sixth annual meeting of the Halifax Branch was held in the St. Julien room of the Halifax Hotel, at 6.30 p.m. on December 18th, 1924. It was a great success. Arrangements had been made to seat seventy-five people at dinner; sixty were expected; ninety arrived. For dinner the overflow was accommodated in the main dining room of the hotel.

The committee in charge consisted of Major H. W. L. Doane, M.E.I.C., chairman, Professor D. W. Munn, A.M.E.I.C., J. F. Lumsden, A.M.E.I.C., J. H. Clark, A.M.E.I.C., and L. A. Killam, S.E.I.C. There were favours at each plate from the Canadian General Electric Company and Northern Electric Company. In addition there was a door prize from the Nova Scotia Tramways and Power Company, Limited, and a prize for the Stunt Competition from the Canadian Westinghouse Company. Mrs. F. W. W. Doane and Mrs. H. W. L. Doane had very kindly assisted the committee by tastefully decorating the tables and giving suggestions as to the decoration of the room. An orchestra, led by "Jo" Mills, A.M.E.I.C., supplied music during the dinner. From time to time during the evening everyone joined in singing songs from a new song sheet prepared by Professor F. R. Faulkner, M.E.I.C. There were also vocal solos by R. M. Williams and piano and banjo selections by J. A. Welsford, H. F. Ryan and L. H. Wickwire who are all students at Nova Scotia Technical College.

Among the guests were Honourable E. H. Armstrong, Premier of Nova Scotia, A. P. Theuerkauf, M.E.I.C., and D. A. Y. Colquhoun, Jr.E.I.C., of the Sydney Branch, L. Killam, recently appointed manager of the Nova Scotia Tramways and Power Company, and E. Martilaleur of Sydney.

Address by Premier Armstrong

After the chairman, C. H. Wright, M.E.I.C., called the meeting to order, he asked Premier Armstrong to give us a few words of cheer. In reply Premier Armstrong said he felt himself privileged and honoured as a guest of a group of engineers, men of vision, believing in, and loyal to their Province, Country and Empire. In his experience, he had sought and found from engineers constructive advice in matters of public interest. He attributed to engineers a steadfastness of purpose born of their confidence in the extent and value of our natural resources which confidence was obtained from contact with their development accomplished or projected. To their knowledge of these resourced he attributed the entire absence of calamity howlers from their ranks.

In his mind professional engineers are a common necessity, and occupy a distinct and unique place in public and private life. During the dinner he had been told by a prominent engineer, not the oldest in the room, that the tramway company now employs more engineers than existed in the province not so very long ago.

Premier Armstrong interpreted the increasing number of professional engineers as a sign of progress, a sign that roads were being built and kept better, that water powers were being harnessed, that industries were being developed and were paying. He suggested that engineers should turn their minds, trained to assemble facts and interpret them correctly by the exigencies of their profession, upon the problems confronting the country. One problem which he thought engineers were specially equipped for solving was that of the farmers who desire to know a means for getting their products to market more cheaply and more quickly. He commended the "Canada Forward" editorials appearing in an Edmonton newspaper which were advocating the present as the time for a determined effort to advance Canada.

Referring particularly to Nova Scotia, he pointed out that it had many advantages, well ordered and settled systems of government and education, a healthy climate, and natural resources in fisheries, timber, minerals and water power, and showed that in the development of the natural resources engineers are taking and must continue to take the lead.

He was glad to have the opportunity of paying a tribute to the engineering staffs of the Provincial Highway Board and the Nova Scotia Power Commission.

Concluding he said that the problems of Nova Scotia will be solved by Nova Scotians who recognize they have a province of which they can be proud and who tackle them with the same faith in her future as was possessed by their forefathers.

The speaker of the evening was Professor H. F. Munro, M.A., of Dalhousie University, a recognized authority on matters of International Law. He spoke on the general subject of the League of Nations and the Geneva Protocol in such a way as to make it especially appealing to engineers.

As the chairman was concluding his complimentary remarks to Professor Munro there was a commotion in the doorway, where a policeman was asking for the name of the man in the centre of the head table, our chairman C. H. Wright, M.E.I.C. The room was crowded and it was easier for the policeman to walk to the inside of the horseshoe to the place across the table from where the chairman sat than for the chairman to get to the door. Vis-à-vis with the standing chairman the policeman regretfully announced the object of his visit, the presence of Mr. Wright was required at police headquarters to answer a legal charge. Then ensued a wordy combat between Capt. R. W. McColough, A.M.E.I.C., and Colonel F. W. W. Doane, M.E.I.C., the former suggesting that whatever was wrong should be settled without breaking up the meeting and the latter, from his knowledge of legal procedure and police court practice gained by service on "Royal Commissions" and long familiarity with the functionaries in "City Hall", urging that nothing be done to obstruct an officer doing his duty. Finally, the former asked the officer why he wanted to take Mr. Wright with him. The policeman answered "He has liquor in his possession, which you know is contrary to the laws of Nova Scotia. Although concealed from your view pedestrians can plainly see through the window a bottle under his chair". Now, Mr. Wright is superintendent of the Sunday School at the First Baptist Church, and as he handed to the policeman the long-necked, black bottle, properly labelled and corked, he stoutly denied any knowledge of either the bottle or the contents. But the evidence seemed strong against him. He had the sympathies of everyone but the whole affair was so unexpected that no one seemed able to think. It looked like we were going to lose our chairman, until Capt. McColough suggested that there was no reason why anything like this should get outside the room and offered to sacrifice himself by sampling the liquid in the bottle to see if it were really outside the law. But the policeman would not listen. He compromised, however. He knew Colonel Doane was a gentleman and a good judge of liquor. He was also sure Captain McColough was a gentleman, but he was not so sure of his judgment of liquors. He passed the bottle to Colonel Doane. The Colonel pulled the cork and because he is a gentleman he insisted that F. A. Bowman, M.E.I.C., vice-president for the maritime provinces, as the highest official of *The Institute* present, should have the honour of tasting it first. Mr. Bowman was diffident. Perhaps he suspected it was concentrated essence of mule's heels and grasshoppers. Finally he tasted it. He looked doubtful. It seemed to remind him of something long forgotten. He stood a minute, pondering. At length the light of recollection filled his eyes and suffused his countenance. He had found the answer. Water, that was it. Our chairman's character was cleared. No one knows why he had the bottle of water in his possession. The policeman disappeared. A celebrated honorary member, sitting two places from the chairman, whose literary aspirations, vocabulary, and appetite are well known, breathed a fervent "Thank God", while several younger members were overheard to remark with a sigh "I never felt so far away from a door in my life". Thus ended the first item in the Stunt Competition. It was engineered by J. F. Lumsden, A.M.E.I.C., assisted by Captain McColough, A.M.E.I.C., and Colonel Doane, M.E.I.C.

W. H. Hayes, Affiliate of the Halifax Branch, followed with a number of limericks written by himself which he recited in a way which was very pleasing and directed smiling attention to the members mentioned in them.

C. S. Creighton, A.M.E.I.C., had an ingeniously developed cross-word puzzle worked out on a large piece of cardboard. As he held it up to the view it had the conventional appearance of black and white squares which he proceeded to change by writing in words given by the audience to fit the meanings he recited. When all the white spaces had been filled with letters he pulled a couple of strings attached to some of the black squares taking them away and revealing the inscription, "*Engineering Institute of Canada, Halifax Branch, Annual Meeting and Dinner, 1924, Best Wishes for a Merry Christmas and a Happy New Year*".

Professor W. F. McKnight, A.M.E.I.C., had used his artistic abilities to prepare a number of lantern slides of more or less humourous nature, picturing well known members of the branch in characteristic attitudes. These were thrown on the screen and excited a great deal of laughter and favourable comment.

A vocal duet by Professor F. R. Faulkner, M.E.I.C., and H. F. Bennett, A.M.E.I.C., giving verses written around outstanding members of the branch, provoked great applause and at times had everybody in the room rocking with laughter.

C. A. D. MacIntosh, S.E.I.C., dressed in clerical garb and with a suitable length of face then intoned the following recitation, written by himself, (the names in parentheses are inserted by the editor):

"Brethren, I would like you to swing your instruments this way and to follow me while I make a few revolutions. If, at the end, any of you find that your current of opinion is alternating, you will have an opportunity to make public confession.

"When time was young, when professors thought they knew more than students, when professional engineers thought their knowledge was divine, there existed a society known as the E.I.C., which on being translated means, The evil that men do lives after them.

"These men at the appointed time did gather together to a feast. Their hearts did warm, their spirits did flow one to another. None could point to his neighbour and say 'Behold! the stone the builder rejected'.

"Now these men spake in different tongues, but according to the custom they did specialize in one. Great was its potential. Fire and brimstone they could rain one on another. Verily, verily, I say unto you, so long as a man calls himself an engineer, this language shall not pass away, for the provocations are many.

"In the beginning were all things made, that is, the diggers supplied the makings. They knew the world and all its faults. The works of other men may pass, but the impressions they made will last for aye. For as it is written the majors shall be miners, and the miners, majors. Many there were who did not hearken unto these sayings, but it availed them nothing to kick against the picks.

"One of the members, Ken, surnamed Dawson, (K. L. Dawson, A.M.E.I.C.), did arise and speak unto the multitude saying: 'In my company's barns are many tram cars. If it were not so, they could not hold you. Those who enter last must stand uprightly. Hold fast, thy strong right arm shall be thy deliverer. Though the path be rough, though thy shins be as scalded, for all this, thou shalt pay unto him who sitteth in receipt of customs, much fine gold.'

"Now many of those present were followers of St. Margaret. (Halifax gets its supply of electricity from the Power Commission's plant at St. Margaret's Bay.) From her they did receive their power. The dam gates could not prevail against them.

"One of the members was a professor at Dalhousie. He was beloved by all. (W. P. Copp, A.M.E.I.C.). When his students graduated, they were able to say, 'I have run a good race, I have finished the course, I have kept my text'.

"Be there any amongst you who have not heard of the parable spoken by the Prophet Munn, (D. W. Munn, A.M.E.I.C., professor of mechanical engineering, Nova Scotia Technical College), saying, 'You are admitted to life, you follow for a time, you are cut off, you expand. You pass out through the great exhaust. If ye do no work, wherein doth lie thine efficiency?'

"When the feast was over, many there were who could not enter at the straight gate. Woe, woe unto the city engineer who doth put an obstruction in his brother's way on this night, causing him to lay his head against a stone. It shall be cooler for the companies of oil and gas, on the day of reckoning than for you.

"If there be a man amongst you who has not broken all the commandments, will he please rise.

"Will you please give your attention to the following announcements: "Kilowatt" Smith (K. H. Smith, M.E.I.C.,) will sing, "All Power is Given Unto Me', by Johnston (H. S. Johnston, M.E.I.C.), Sam Lumsden (J. F. Lumsden, A.M.E.I.C.), will transmit the music.

"Professor Faulkner (F. R. Faulkner, M.E.I.C.,) is presenting his class with a quizz on the 'Book of Problems', on Friday morning, next, at nine o'clock. All members of the alumni who boast that they have never been stuck are invited to attend. Admission free. A paper collection will be taken."

Award of Prizes

A paper vote of the meeting gave the prize, a "Radiola III", radio set, donated by the Canadian Westinghouse Company, to Mr. MacIntosh. It was presented to him by Premier Armstrong.

W. P. Morrison, M.E.I.C., was the holder of the lucky number and received the door prize of a ton of gas coke donated by the Nova Scotia Tramways and Power Company.

Election of Officers

C. A. Fowler, M.E.I.C., presented the report of the scrutineers which stated that Professor W. F. McKnight, A.M.E.I.C., had been unanimously elected to the post of chairman; that H. S. Johnston, M.E.I.C., W. P. Copp, A.M.E.I.C., and E. M. Archibald, A.M.E.I.C., had been elected as members of the Executive Committee for two years to represent the members of the branch residing within twenty-five miles of the centre of the city of Halifax; that J. E. Belliveau, A.M.E.I.C., had been elected as a member of the Executive Committee to fill out the unexpired year of the term of W. F. McKnight, A.M.E.I.C., who was elected chairman; and that R. R. Murray, A.M.E.I.C., and J. G. W. Campbell, A.M.E.I.C., had been elected as members of the Executive Committee for two years to represent the members of the branch residing more than twenty-five miles from the city of Halifax.

Montreal Branch

C. K. McLeod, A.M.E.I.C., Secretary-Treasurer.
Ed. Prévost, Jr.E.I.C., Branch News Editor.

A very interesting address was delivered on January 8th by O. O. Lefebvre, M.E.I.C., chief engineer of the Quebec Streams' Commission.

Kenogami Lake Storage Works

Mr. Lefebvre described the various works now being carried on in the Kenogami Lake district to regulate the flow of both the Chicoutimi and Au Sable rivers. Important pulp and paper industries were using these rivers for power purposes, but owing to the wide fluctuations in their flow, the mills were forced to shut down for many months every year. When this enterprise is completed, a uniform flow of 1,800 f.p.s. which is the present normal rate of flow, will be assured.

Lake Kenogami empties in the Saguenay river by two tributaries, namely the Chicoutimi and Au Sable. The former has a drop of 460 feet in fourteen miles, and the other, practically the same fall in five miles.

The dams across these rivers are of concrete and the top of the Chicoutimi dam is built as a roadway. Earth dams were also built at a few points to prevent any waste of store water.

The lecture was profusely illustrated with lantern slides.

A vote of thanks was conveyed to the lecturer by P. S. Gregory, A.M.E.I.C., of the Shawinigan Water and Power Company, who presided.

Adjustment of Motor Vehicles to Railway Requirements

On January 15th, R. A. C. Henry, M.E.I.C., director of the C.N.R. Bureau of Economics, read a paper before the branch on "Some of the Economic Phases entering into the Adjustment of Motor Vehicles to Railway Requirements."

Mr. Henry compared our systems of railways and motor vehicles with those in the United States. He also illustrated how the former can expand and prosper without any hindrance to the latter. The fields in which the trucks seem to have the best chances of success, the speaker outlined under the following points:

Freight —

1. Haulage of commodities from the farmer to the rail or water shipping point.
2. In relieving congested terminals.
3. In radial operations from large cities in the delivery of L.C.L. lots of merchandise and raw materials.
4. In the haulage of perishable farm and dairy products, such as milk, fruit and vegetables.
5. Where no other transportation facilities are provided.

Passenger —

1. To replace or supplement city tram lines.
2. Interurban service.
3. Tourist service.
4. In serving sections that are not provided with steam or electric service.

D. Crombie, chief of transportation, Canadian National Railways, opened the discussion. He spoke briefly of the policy of his department, which is to give the best possible service at the lowest cost.

Amongst those who contributed to the discussion following the reading of the paper was the Honourable Mr. Perron, minister of roads of the province of Quebec, who concurred in the views expressed in the paper and gave some interesting information in connection with the transportation problems as affecting the roads of the province. He also stated that the rural transportation as handled by motor busses and trucks was not contributing its share to the upkeep of the roads.

* * *

Resolution

At a meeting of the executive of the Montreal Branch held February 9th, 1925, the following resolution was passed:—

WHEREAS the problem of distribution is of ever increasing importance in our present social and economic life; and

WHEREAS the rapid development of the motor vehicle has provided an additional transportation facility, with distinct economic advantages; and

WHEREAS the development of the motor vehicle as a transportation facility has a distinct bearing upon the policy of road improvement; and

WHEREAS the interest of the public at large would be best served by the proper and harmonious adjustment of the scope of all transportation facilities; and

WHEREAS the other common carrier transportation facilities; namely, steam and electric railways, are subject to regulation by the State in such a manner as to cover liability, service, rates, etc.; and

WHEREAS the motor vehicle as a common carrier transportation facility cannot be assigned its proper place in the general scheme of transportation unless it is subject, in so far as practicable, to regulation along similar lines to that governing other transportation facilities; and

WHEREAS it would appear desirable that the public, in whose interest these common carrier transportation facilities are operated, should be apprised, so far as possible, of all the facts entering into the economic features of the situation;

BE IT RESOLVED that the Executive of the Montreal Branch of *The Engineering Institute of Canada*, appreciating the importance of the problem and the necessity for a proper adjustment of the various transportation facilities in the light of the development of the motor vehicle, places itself on record as favouring the appointment by the government of the province of Quebec of a "Fact Finding Commission", with instructions to review the entire situation, ascertain the facts, and make a report to the government as to ways and means of co-ordinating the various transportation facilities to the end that the public may be served on an economical and sound basis.

Long Span Bridges

On the evening of February 5th, 1925, Dr. G. F. Porter, M.E.I.C., chief engineer, Canadian Bridge Company, Limited, Walkerville, Ontario, gave a paper entitled "Recent Developments in the Design of Long Span Bridges".

The speaker dealt more particularly with the history of the designs submitted in connection with the problem of a long span across the harbour of Sydney, Australia. A series of interesting slides were shown illustrating these designs. Dr. Porter also touched on the famous bridge over the Firth of Forth and the contemplated span at the Golden Gate, San Francisco.

F. P. Shearwood, M.E.I.C., in his discussion, defended some of the so-called freak designs, and criticized the modern engineer as being intolerant of things which did not conform with what had been done before. P. L. Pratley, M.E.I.C., gave some more interesting historical facts regarding the Sydney bridge and told something of the activities of the Advisory Board for the proposed South Shore bridge, Montreal. Some general discussion followed, after which a vote of thanks was proposed by Dean H. M. MacKay, M.E.I.C. Lt.-Col. C. N. Monsarrat, M.E.I.C., occupied the chair.

Some English Paper Mills

J. N. Stephenson, editor of the *Pulp and Paper Magazine* was the speaker of the evening on February 12th, 1925. Mr. Stephenson was the official representative of the Canadian Pulp and Paper Association at the British Empire Exhibition at Wembley during the summer of 1924, and during his stay in England visited a number of pulp and paper mills in that country.

The outstanding feature of the work in the English mills was the quality of the work turned out, and the care with which each operation was performed, this being particularly true in the case of the high grade hand-made papers, the process for which has not been materially altered in three hundred years.

Mr. Stephenson gave a detailed description of the various mills which he visited commenting upon the tenacity with which the Englishman holds on to the old machinery, in one plant part of the first Dickinson machine being still in operation.

E. A. RYAN, A.M.E.I.C.
Resigns Branch Secretaryship.

A discussion followed which brought out some interesting data regarding the rate at which the Canadian forests were being depleted. A hearty vote of thanks was tendered to Mr. Stephenson by the chairman of the meeting, K. G. Cameron, A.M.E.I.C.

E. A. Ryan, A.M.E.I.C., resigns Branch Secretaryship

E. A. Ryan, A.M.E.I.C., who has been secretary of the Montreal Branch for nearly three years, has resigned due to pressure of business, and is succeeded by C. K. McLeod, A.M.E.I.C., manager of the Chemical Engineering Equipment Company. Mr. McLeod has been chairman of the Reception Committee for the past year and is assured of the hearty co-operation of the members of the branch in his new activities.

The following are the new members of the Papers and Meetings Committee:

Chairman, J. L. Busfield, M.E.I.C., Vice-Chairman, W. Walker, A.M.E.I.C.; *Civil Section:* Chairman, A. Duperron, A.M.E.I.C., Vice-Chairman, C. L. Cate, A.M.E.I.C.; *Electrical Section:* Chairman, R. H. Mather, A.M.E.I.C., Vice-Chairman, G. A. Wallace, Jr.E.I.C.; *Mechanical Section:* Chairman, J. A. McCrory, A.M.E.I.C., Vice-Chairman, J. W. McCammon, A.M.E.I.C.; *Industrial Section:* Chairman, K. G. Cameron, A.M.E.I.C., Vice-Chairman, R. E. MacAfee, A.M.E.I.C.; *Municipal Section:* Chairman, Geo. R. MacLeod, M.E.I.C.; *Railway Section:* Chairman, A. R. Ketterson, A.M.E.I.C., Vice-Chairman, V. I. Smart, M.E.I.C.

Quebec Branch

Louis Beaudry, S.E.I.C., Secretary-Treasurer

The Difference between a Land Surveyor and a Civil Engineer

On Monday, January 26th, David W. Mill, Q.L.S., A.M.E.I.C., F.S.I., director of surveys of the province of Quebec, was the speaker at a luncheon-meeting held at the Chateau Frontenac.

Mr. Mill, at first, said that he was one of those who firmly believe that it is humanly impossible for one individual to be a compound of both, a hyphenated surveyor-engineer. He spoke of the public frequently confusing the civil engineer with the land surveyor, even as there is a vast difference between them, not only in their respective studies, but in their different fields of operations as well.

Speaking of the land surveying, Mr. Mill said that this profession is one of the oldest, if not the oldest in the world. As a matter of fact, a treatise on land surveying written 130 years B.C. entitled "On the Dioptra". The surveyors of the Egyptians, the Greeks and the Romans, were men exceedingly well trained in the mathematical sciences of their works as the Great Pyramid of Cheops, monument of astronomical and mathematical discovery.

From these ancient days down through the history of medieval England, France, Germany, Austria, Italy, etc., Mr. Mill noted the work carried out by surveyors.

As to our country, starting with Champlain, the works carried out by the surveyor, "the pathfinder of the wilderness," may be seen in the National Library in Paris, in London, in Ottawa, and in our own archives here in Quebec.

After having clearly described the functions of the land surveyor, the speaker passed on to those of the engineer. "Your functions," said Mr. Mill, "are also well and clearly defined by law and your field of operations is large enough to satisfy the demands of the most exacting member of your corporation."

As the fields of operations of the engineer were too numerous, the speaker limited his remarks to the railway engineer, the hydraulic engineer, the dock and harbour engineer, the mechanical engineer, the marine engineer, the mining engineer, the electrical engineer, the sanitary engineer, and the roads engineer.

After having pictured the activities of the surveyor and the engineer, and referring to the surveyors, Mr. Mill said: "Our functions are very well and very clearly defined by law and we do our outmost not to encroach upon the field of our brother-engineer. On the contrary, we believe that the best of good-fellowships and esprit-de-corps should prevail."

The speaker was introduced by our chairman, A. R. Decary, M.E.I.C., and T. C. Dennis, A.M.E.I.C., thanked him on behalf of the members.

General Discussion Meeting

On Monday, February 16th, a general meeting was held at the City Hall. The purpose of this meeting was to have all the members discuss the general affairs of *The Institute* and of the Corporation of the Professional Engineers of Quebec. Our chairman, A. R. Decary, M.E.I.C., opened the discussion by saying a few words about both societies and the relations between them. This kind of meeting proved to be of much interest to the members and mighty profitably be held more often.

Ottawa Branch

F. C. C. Lynch, A.M.E.I.C., Secretary-Treasurer.

Establishing Posts in Far North

A graphic picture of the difficulties and hardships encountered in establishing posts for the Royal Canadian Mounted Police in the far North was outlined in an address and series of still and moving pictures by F. D. Henderson, D.L.S., at the Victoria Memorial Museum on the evening of February 10th. Mr. Henderson who was senior officer in charge of the expedition of 1924 to the Arctic Islands of Canada, explained the need for these annual voyages and showed what is being accomplished through them. In this trip a Royal Canadian Mounted Police Post was established at Kane Basin which is the farthest north post established and is only 750 miles from the north pole. This lecture was under the auspices of the Ottawa Branch and was largely attended. A. F. Macallum, M.E.I.C., chairman of the branch, was in the chair.

Annual Ball

Under the distinguished patronage of their Excellencies the Governor-General and Lady Byng of Vimy, the Ottawa Branch held their annual ball at the Chateau Laurier on February 22nd. The ballroom was attractively decorated with the shield of *The Institute* placed between the long windows and draped with flags. The bright gowns added a gay note and the programme of dancing numbers provided the finishing touches to a most delightful and successful event.

The hostesses of the evening, Mrs. G. Gordon Gale, Mrs. J. L. Rannie and Mrs. J. D. Craig, received the guests at the entrance of the foyer. Supper was served from 11.15 to 12.30 in the main dining room, the tables being prettily adorned with vases of early spring flowers.

Much of the enjoyment and success of the event was due to the efforts of the committee in charge, consisting of J. D. Craig, M.E.I.C., H. M. Barton, A.M.E.I.C., V. L. Eardley-Wilmot, M.E.I.C., R. K. Odell, Branch Affiliate, and L. H. Cole, M.E.I.C., convener.

Peterborough Branch

P. Manning, A.M.E.I.C., Secretary.

W. E. Ross, A.M.E.I.C., Branch News Editor.

A regular meeting of the Peterborough Branch was held on the evening of January 22nd, at which the members, and a few friends had the pleasure of hearing Fred. B. Brown, M.E.I.C., and Fraser S. Keith, M.E.I.C., relate a few of their impressions of the World Power Conference and of the Wembley Exhibition respectively.

The meeting was presided over by P. P. Westbye, M.E.I.C., who welcomed both speakers as being old and valued friends of the branch and "almost" Peterborough men.

The First World Power Conference

Mr. Brown outlined briefly the scope of the Power Conference and read a list of the names of the Canadian delegates, making special mention of the valuable services rendered by J. B. Challies, M.E.I.C., and Mr. Keith. He made some very interesting remarks anent the impressions received by a stranger on entering London, which appealed very strongly to those in his audience who have a knowledge of the Metropolis, and then went on to describe the work of the conference and the very prominent part taken in it by the Canadian delegation, giving, as an illustration, the official list of papers, discussed at one day's meeting only, a truly formidable array of technical matter and conclusive evidence that the scope of the conference was comprehensive. Mr. Brown also gave his hearers some idea of the social functions in connection with the conference and spoke warmly of the hospitality extended to the delegates.

He then described the salient features of various plants which he visited, both in England and in Europe, stressing the different economic features and making particular reference to the case of Switzerland, which country is exporting power, which Mr. Brown compared with our own Canadian problem in respect to the proposed St. Lawrence development.

In conclusion the speaker read, from the official programme of the conference, Rudyard Kipling's poem "The Sons of Martha". The writer of these notes humbly suggests that this poem should be reprinted in *The Journal* as an inspiration to all engineers.

The Wembley Exhibition

Mr. Keith then addressed the meeting and escorted the audience, in fancy at least, on a personally conducted tour of the British Empire, through the medium of a collection of excellent lantern slides depicting the Wembley Exhibition.

Mr. Keith, in his inimitable manner, described the scenes depicted by the slides, which were arranged in such a manner, that, in conjunction with the speaker's comments, they formed a complete and consecutive record of a journey through the exhibition.

After Mr. Keith's address, both speakers were called upon to answer numerous questions from members of the audience, after which they were tendered a very hearty vote of thanks on the motion of W. E. Ross, A.M.E.I.C., and B. L. Barns, A.M.E.I.C.

Factory Methods and Mass Production

Another regular meeting was held on the evening of February 12th, when the speaker of the evening was W. R. McGie of the Engineering Department of the Ford Motor Company of Canada.

Mr. McGie, whose subject was "Factory Methods and Mass Production", gave his audience an interesting account of the development of the Ford plant in Canada, from its inception in 1904, in what was at that time the McGregor Wagon Factory, to the present time.

The output for the year 1904 was 117 cars, the present output per day in the large modern plant, which commenced operations in 1923, is 350 cars per day.

Mr. McGie described how the new plant was placed in operation without in any way affecting production and by means of some very interesting reels of film showed some of the main features of the new plant; one of these reels, which was taken by daylight in the factory, demonstrated the very effective means provided for lighting the factory. Other reels of films showed various processes and factory methods, and many of the special machine tools used by this company in the fabrication of their product, which were described by Mr. McGie as the films were shown.

The speaker gave his audience some idea of the social relations the Ford Company maintain with its employees, mentioning the completely equipped surgery with a doctor always in attendance; the educational bureau and other features of a like nature for which Ford plants are renowed.

The chair was occupied by R. L. Dobbin, M.E.I.C., and at the conclusion of the meeting a vote of thanks to the speaker was passed on motion of W. Sangster, Branch Affiliate.

London Branch

E. A. Gray, A.M.E.I.C., Secretary-Treasurer.
R. I. Olmsted, A.M.E.I.C., Branch News Editor.

The annual dinner-meeting of the London Branch was held in the Blue Dragon tea-room Wednesday, January 21st, 1925, at 6.30 p.m. The retiring chairman, E. V. Buchanan, M.E.I.C., and the incoming chairman, W. C. Miller, A.M.E.I.C., presided jointly over the meeting.

After dinner the business of the meeting was proceeded with; the secretary-treasurer and auditors presenting their annual reports for the past year, which showed a considerable improvement in the financial position of the branch over last year.

The balloting of officers for the ensuing year resulted in the following being elected:

Chairman	W. C. Miller, A.M.E.I.C.
Vice-Chairman	C. Talbot, A.M.E.I.C.
Secretary-Treasurer	E. A. Gray, A.M.E.I.C.
Executive Committee	H. A. Brazier, M.E.I.C.
	W. P. Near, M.E.I.C.
	R. Angus, M.E.I.C.
	J. R. Rostron, A.M.E.I.C.
	F. A. Bell, A.M.E.I.C.
Ex-officio	E. V. Buchanan, M.E.I.C.
	H. B. R. Craig, M.E.I.C.

The past chairman, E. V. Buchanan, M.E.I.C., delivered his retiring address introducing W. C. Miller, A.M.E.I.C., the incoming chairman.

In his inaugural remarks, Chairman Miller commented upon the functions of *The Engineering Institute* as being twofold. First, the technical function of educating the members of the branch as individuals, and second, of educating the public as to the work of the engineers and thus enhancing the usefulness of the profession to the public.

Provincial Highways

Chairman Miller introduced the speaker of the evening, George Hogarth, B.A.Sc., O.L.S., M.E.I.C., chief engineer, Department of Provincial Highways.

Speaking on the subject of "Provincial Highways" Mr. Hogarth gave the branch much interesting information as to the provincial highway system as it obtains in Ontario at the present time. He stated that Ontario has 1,825 miles of provincial highways divided amongst the different types of roads as follows: Gravel, 810 miles; macadamized, 390; bituminous penetration, 101; asphaltic concrete, 163; concrete 193. The department, he said, had built over 265 miles of roads during the past year and had resurfaced over 365 miles of macadamized roads.

Referring to the traffic census made by the department throughout the province last August, Mr. Hogarth stated that in the vicinity of London the number of vehicles per day passing all ways over roads was 1,500 to 1,700. Other figures in this connection were: Toronto, 4,000; Ottawa, 1,000; Windsor, 2,600; Hamilton and Niagara Falls, 4,000; Goderich, 382; Owen Sound, 600; and Pembroke, 400. Traffic figures on the Toronto-Hamilton highway on Labor Day, September 5, this year, totalled 16,728 vehicles. Since the highway can accommodate 50,000 vehicles there is still "a margin of safety".

Horace L. Seymour, M.E.I.C., of Toronto, introduced J. E. Ritchie of the provincial fire marshall's department, who found fault with London in that the fire losses of the city had doubled during the past nine years over every three-year period. Mr. Ritchie stated that 80 per cent of fires are easily preventable.

An excellent musical programme, arranged by J. R. Rostron. A.M.E.I.C., included numbers, both vocal and instrumental by R. J, Webster, F. Callard and H. T. Dickinson, F.R.C.O.

Toronto Branch

J. H. Curzon, A.M.E.I.C., Secretary-Treasurer.
J. A. Knight, A.M.E.I.C., Branch News Editor.

The Toronto Branch has been very fortunate during the past month, in that we have had presented a number of papers of exceptional merit.

Canadian Woods and Their Uses

On Thursday, January 22nd, W. Kynock, superintendent of the Forest Products Laboratories of Canada, addressed the branch on the subject of "Canadian Woods and their Uses". The speaker illustrated his paper with lantern slides, showing the equipment of the laboratory and the structural formation of different woods. Mr. Kynock was drawn into many side lines of the forest products question, by questions asked by members, and his ready answers were much appreciated.

Recent Developments in Steel Construction

On Thursday, January 29th, the chief engineer of the American Institute of Steel Construction, Lee H. Miller, gave a paper on "Recent Developments in Steel Construction", along with a comprehensive history of the development of steel. Progress was clearly indicated by the advance in tempered steel. The first Damascus steel blades were tempered by being passed three times through the body of a slave. This method however would hardly suit in the present day. Mr. Miller gave a very good demonstration of the line of reasoning followed in the derivation of new formulae for the analysis of column stresses, and web shear in girders. He also presented the members present with copies of the publication of the Institute of Steel Construction, which gave examples of what will be found in the new hand-book which they are producing to replace the Trade Hand-books with which all engineers are familiar.

The Coal Problem

Thursday, February 5th, Dr. E. S. Moore, professor of economic geology, University of Toronto, read a paper on this most interesting subject. Dr. Moore showed a knowledge of the coal industry from the geological aspects of the coal to the personal characteristics of the miners and operators, which was very enlightening. The speaker stressed the fact that our problem with reference to coal was in reality a transportation problem, and that the coking of soft coal provided the best substitute for anthracite at present in sight. Ontario should look to Nova Scotia coal, water borne to large clay product plants at centres of population on the Great Lakes.

The Rubber Industry

Thursday, February 12th, D. E. Beynen, of the Dunlop Tire and Rubber Company, gave an illustrated lecture on rubber, showing the complete process from the tapping of the trees to the vulcanizing of the tires. Mr. Beynen also showed samples of crude rubber, both plantation and wild. He gave illustrations of the different uses of rubber, and showed tables of relative production of plantation and wild rubber, showing that the wild product is gradually being eliminated from the market.

The New Niagara Arch

On Thursday, February 19th, H. Ibsen, bridge engineer of the Michigan Central Railroad, presented an illustrated paper on the new Niagara Arch. Mr. Ibsen told of the design, pointing out the special features and then followed through the erection with slides, showing all the difficulties encountered and how they were overcome. He stated that calculated deflection agreed with actual to one-quarter of an inch.

Victoria Branch

E. P. Girdwood, M.E.I.C., Secretary-Treasurer.

The Power Conference and Subsequent Trip to Scandinavia

A regular meeting of the Victoria Branch was held on Thursday January 15th, in the Victoria College, when E. A. Cleveland, M.E.I.C. comptroller of Water Rights, British Columbia government, delivered a lecture on "The World Power Conference and Impressions of Scandinavia".

Mr. Cleveland outlined the scope of the power conference which was attended by engineers from forty-one countries and gave an interesting description of the latest engineering exhibits at the British Empire Exhibition in London, where the conference was held.

It happened that the Lord Kelvin Centenary was celebrated by the British Engineering Institutes at the same time. Mr. Cleveland described the earlier Kelvin inventions as shown in the original models.

In company with an international group of engineers, Mr. Cleveland visited the great power plants in Norway and Sweden, going as far as the Arctic Circle in the course of this inspection. There being a considerable similarity in the Scandinavian countries to British Columbia, the description of the various plants where electrical energy is generated from water power proved most instructive to the audience. The power is used to operate pulp mills, railways, mines and logging industries, while on account of its low cost electricity is very extensively used in agricultural pursuits.

Radio Communication

On Wednesday, January 28th, Dr. Herbert Vickers, head of the department of mechanical and electrical engineering of the University of British Columbia, gave a very interesting talk to the members of the Victoria Branch on radio communication, illustrating his lecture with lantern slides. The speaker dealt with the various types of oscillation used in wireless telegraphy and telephony, illustrating differences between spark telegraphy and continuous wave telegraphy, and spoke of the advantages and disadvantages of each. He then proceeded to explain the various different factors which constitute oscillatory circuits and the high frequency alternators of Alexanderson, which are used for generating continuous waves, and also the arc method and the thermconic tube method of generating continuous waves.

Reference was then made to the characteristics required in various types of transmitting autennae, the various types used for direct transmission and the propagation of electro-magnetic waves.

The lecture was exceedingly interesting and was followed by considerable discussion of various points touched on during the course of Dr. Vickers' subject.

Bridges in British Columbia

The Victoria Branch held a successful meeting on Wednesday, February 11th, at Victoria College. A. L. Carruthers, provincial bridge engineer, gave an interesting lecture upon different types of bridges and modes of construction. Mr. Carruthers described building bridges on the principal of suspension and cantilever type. The illustrations showed different types, such as through truss, deck girder, pratt, burr truss, steel swing, suspension cable bridges and cantilever, direct lift and swing bridges under construction, and in the completed state. Some of the most notable were bridges over the following rivers — Fraser, Thompson, Buckley, Quesnelle and Columbia, and the bridge at Revelstoke minor bridges.

The wooden bridges, whitewashed in the dry belt, were an outstanding feature; the whitewashing showing to great advantage and assisting in the preservation of the bridges.

Visit to the British American Paint Works

The Victoria Branch paid a visit to the works of the British American Paint Company on Saturday, February 14th, and through the courtesy of the members of the firm, the visiting engineers were given an opportunity of inspecting the numerous features of the plant. The company's works were established over 25 years ago and the visitors were very much impressed with its extent and completeness.

The raw materials for the paints come from all parts of the world, while most of the colours are imported by the company from Europe. White lead which is the basis of all good light coloured paints and of which the company uses 200 tons per year is conveyed to a huge motor, known as a "chaser" — oil is then added and the lead is then ground by heavy wheels.

Various points regarding the manufacture of paint were explained to the visitors; for instance the different ingredients required according to the surface to which the paint was to be applied. Interior paints require different mixing to the exterior paints, and each paint must conform to a set standard of colour and quality for its specific purpose.

The company ships its products throughout Canada, to New Zealand, China and Siberia, and where they have gone they have carried the name and enhanced the reputation of Victoria.

The company has an especial claim upon the good will of Victorians this year inasmuch as its president and general manager, Mr. Carl Pendray, is the newly elected mayor of the city.

OTHER SOCIETIES NEWS

The Iron and Steel Institute

The annual meeting of the Iron and Steel Institute will take place on Thursday and Friday, May 7th and 8th, at the House of the Institution of Civil Engineers, Great George Street, London, S.W. 1. The annual dinner will be held on the evening of Thursday, May 7th, at the Hotel Cecil, Strand, W.C.

International City and Regional Planning Conference

The International City and Regional Planning Conference has been arranged to take place at New York City, April 20th to 25th, 1925. This arrangement is in accordance with the decision arrived at during the conference at Amsterdam in July 1924. The principal subjects to be discussed are: (a) decentralization within regions; (b) arterial roads; (c) planning and ploting of building sites; (d) zoning; (e) waterways and water-fronts. The meetings will be held at the Hotel Pennsylvania and, following the presentation of papers during the first four days of the conference, a number of motor tours are planned to take place during the final two days, while arrangements have also been made for study tours following the conference week.

Dominion Land Surveyors' Annual Meeting

During the two-days session of the annual meeting of the Association of Dominion Land Surveyors which was held in Ottawa, on February 4th and 5th, the election of the following officers for the ensuing year was announced: — R. H. Knight, Ottawa, was the unanimous choice for president and W. L. MacIlguham, was re-elected secretary. Other officers elected were as follows: — Vice-presidents, F. D. Henderson, Ottawa, R. H. Montgomery, M.E.I.C., Ottawa, and Lieut.-Col. A. C. Garner, M.E.I.C., Regina, and divisional councillors: — Ottawa: W. M. Dennis, M.E.I.C., E. W. Hubbell, J. F. B. Sullivan, H. B. Parry and J. E. R. Ross, A.M.E.I.C.; Quebec and the Maritime Provinces: George Côté, Quebec; Ontario: F. W. Beatty, Pembroke, J. M. Pierce, Ottawa; Manitoba: W. J. Deans, Brandon, and G. H. Herriot, M.E.I.C., Winnipeg; Saskatchewan: J. E. Underwood, A.M.E.I.C., Saskatoon, and J. E. Morrier, Prince Albert; Alberta: L. E. Harris, Calgary, and H. E. Pearson, Edmonton; British Columbia: F. S. Clements, Victoria, and G. M. Christie, Vancouver.

See Page 130
of this issue
for
Announcement
regarding the
Year Book

CORRESPONDENCE

A Hundred Years of Portland Cement

Fuel Testing Station, Ottawa,
January 21st, 1925.

The Editor,
The Engineering Journal,
Dear Sir:—

Readers of Mr. Oxley's paper on Portland Cement in the January number of *The Journal* may be interested in the publication "A Hundred years of Portland Cement 1824–1924", reviewed in *Engineering,* January 2nd, 1925, page 5.

From this it would appear that "Smeaton and others produced a hydraulic lime previous to Aspdin" and that "those who have gone carefully into the early history of the cement industry are disposed to attach very little importance to the crude efforts of Joseph Aspdin, who never showed that he recognized or understood the physical and chemical basis on which the peculiar value of Portland cement rests".

According to the author, A. C. Davis, the name of I. C. Johnson stands out prominently by reason of his "perseverance, resource, acuteness of observation, and his success in producing a reliable and uniform Portland cement".

I just draw attention to these facts in case they may appeal to those interested in the historical side of engineering in general, or the cement industry in particular.

Yours truly,
A. A. Swinnerton, A.M.E.I.C.

A Re-consideration of the Kelvin Law

Peterborough, Ontario.

The Editor,
The Engineering Journal,
Dear Sir:—

In the selection of the size of electrical conductor for a given set of conditions, the Kelvin Law states that the size should be such that the yearly carrying charges for the initial cost of the copper should equal the yearly charges for I^2R loss in the copper. This fixes the economical size of conductor.

This gives the same result as if the total yearly charges, (carrying charges plus energy loss charges), were plotted as Y ordinates, against corresponding values of X, the initial cost, the convenient scales, and the minimum value of Y selected from this curve. (See Y_1 in figure No. 1.)

The study may involve other factors, (as transformers and synchronous condensers for voltage correction), beyond the scope of the simple law, but still be susceptible of being plotted as a curve on the basis of figure No. 1. Also such a study can be made to include various voltages throughout the likely range, by plotting a curve for each voltage step, as in figure No. 2.

As a matter of fact the standardization of conductor sizes and voltage ratings of equipment will reduce the selection to a number of points separated by definite steps instead of an infinite number of points on a smooth curve. The general principle, however, remains the same.

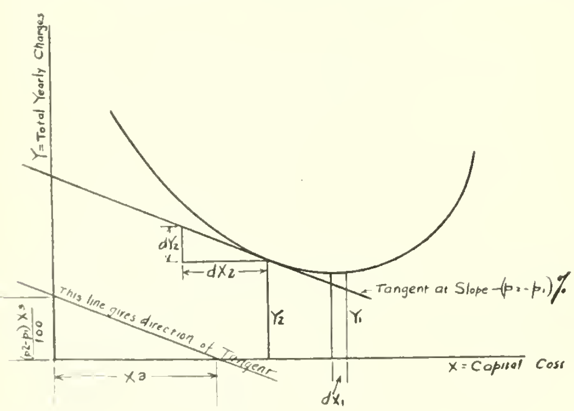


FIG #1.
Figure No. 1.

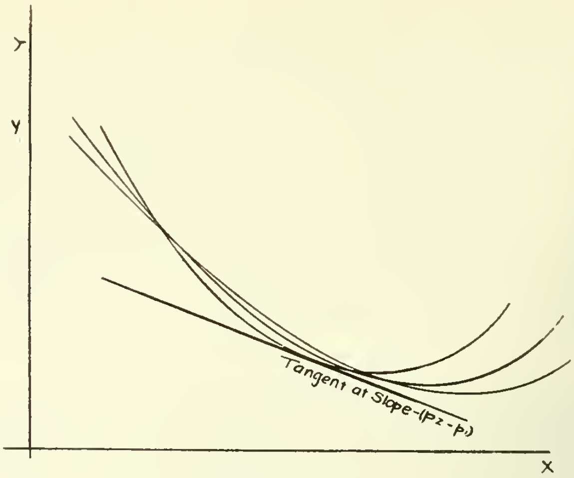


Figure No. 2.

It seems to be the common practice to make the calculations on a cost basis, and then actually use a smaller size of copper than calculated, thereby reducing the initial investment considerably at only a light sacrifice of economy in the yearly charges. It is the object of this article to illustrate on the curves the logical basis for doing this.

In figure No. 1, consider the minimum point of the curve at Y_1 An increment dX_1 in the capital investment is not attended by any reduction of the yearly charge.

The only return from the investment dX_1 is the bond interest on this amount included in the yearly charge Y_1. Call the percentage on which this is figured P_1. There would be no financial advantage in borrowing this amount dX_1 to be invested for a return no greater than P_1.

Let us assume that a somewhat greater percentage P_2 is settled on as the minimum percentage that will justify investment. Then in figure No. 1, this will exist at Y_2 if:—

$$-dY_2 = (P_2 - P_1)\ dX_2 \text{ or } \frac{dY_2}{dX_2} = -(P_2 - P_1)$$

Hence the most favourable point on the curve will be where the slope of the tangent is $-(P_2 - P_1)$

The direction of the tangent can be laid off as in figure No. 1 by joining a suitable point X_3 on the X-axis scale with a corresponding point $\frac{(P_2 - P_1)}{100} X_3$ on the Y-axis scale.

Where there are several curves as in figure No. 2 the most favourable point will be on the curve whose tangent at slope $(P_2 - P_1)$ is nearest the origin. This need not be the curve which approaches nearest the X-axis.

If the selection is confined to definite steps then the question whether it will pay to proceed from step X_1 to step X_2 depends on whether $(Y_1 - Y_2) \gtreqless \frac{(P_2 - P_1)}{100} (X_2 - X_1)$

Yours truly,
T. E. Gilchrist, A.M.E.I.C.

Interesting Information on Built-up Roofing

The Barrett Company, Limited, have just published the first volume of a series of five useful and complete booklets on built-up roofing called "Architects and Engineers Built-Up Roofing Reference Series".

The first book deals with flat roofs. Specifications are given for flat roofs having decks of wood, poured concrete, precast concrete slabs, poured gypsum and precast gypsum slabs. Specifications for roofs finished with promenade tile are also given.

The copy matter is brief and concise. The book is illustrated by sixteen full page plates colored in blue and having the appearance of blue prints.

The complete series will be published in the course of the year. The books will cover practical methods of dealing with roofing problems and will contain much information on sound roofing practice. The series is as follows:—

Volume 1 — Flat Roof Specifications.
Volume 2 — Steep Roof Specifications.
Volume 3 — Roof Flashing System.
Volume 4 — Roof Drainage System.
Volume 5 — Damp-proofing and Water-proofing.

Engineers may obtain copies free by application to the Barrett Company, Limited, Montreal.

Preliminary Notice

of Applications for Admission and for Transfer

February 19th, 1925.

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in March 1925.

FRASER S. KEITH, Secretary.

*The professional requirements are as follows:—

A Member shall be at least thirty-five years of age, and shall have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office, or a term of instruction in a school of engineering recognized by the council. The term of twelve years may, at the discretion of the council, be reduced to ten years in the case of a candidate for election who has graduated from a school of engineering recognized by the council. In every case the candidate shall have held a position in which he had responsible charge for at least five years as an engineer qualified to design, direct or report on engineering projects. The occupancy of a chair as a professor in a faculty of applied science or engineering, after the candidate has attained the age of thirty years, shall be considered as responsible charge.

An Associate Member shall be at least twenty-seven years of age, and shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years. The occupancy of a chair as an assistant professor or associate professor in a faculty of applied science of engineering, after the candidate has attained the age of twenty-seven years, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council, shall be required to pass an examination before a board of examiners appointed by the council. The candidate shall be examined on the theory and practice of engineering with special reference to the branch of engineering in which he has been engaged. This examination may be waived at the discretion of the council if the candidate has held a position of professional responsibility for five or more years.

A Junior shall be at least twenty-one years of age, and shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the council, if the candidate for election has graduated from a school of engineering recognized by the council. He shall not remain in the class of Junior after he has attained the age of thirty-three years.

Every candidate who has not graduated from a school of engineering recognized by the council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects: geography, history, (that of Canada in particular), arithmetic, geometry, euclid (books I, IV and VI), trigonometry, algebra up to and including quadratic equations.

A Student shall be at least seventeen years of age, and shall present a certificate of having passed successfully an examination equivalent to the final examination of a high school or the matriculation of an arts or science course. He shall either be pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall not remain in the class of student for more than two years after graduation; or he shall be receiving a practical training in the profession, in which case he shall pass an examination equal to that prescribed for admission to the grade of Junior in the foregoing section and he shall not remain in the class of Student after he has attained the age of twenty-seven years.

An Affiliate shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience, qualify him to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

BROWN—JOHN EDWIN, of 1116-9th Avenue West, Calgary, Alta. Born at Broadview, Sask., Oct. 27th, 1900; Educ., Bach. Engrg., Univ. of Sask. 1924; mechanic on chemistry bldg., Saskatoon, Sask., in charge of portion of laying reinforcing; inspr. C.P.R., cinder pit., Medicine Hat, Alta.; mechanic on Lake of the Woods Milling Co. extension at Medicine Hat.

References: C. J. Mackenzie, A. R. Greig, G. M. Williams, J. E. Underwood, T. D. Ruggles, H. A. Ingraham.

CUNNINGHAM—ADAM, of Kenogami, Que. Born at Edinburgh, Scotland, Aug. 23rd, 1897; Educ., B.Sc. (Mech. Engrg.), Edinburgh Univ. 1923; 1913-17, ap'ticeship with West End Engine Works Co. Ltd., Edinburgh, Scotland; 1917-20, with Imperial Army, Palestine & Egypt; 1923-24, dftsman., MacTaggart Scott and Co. Ltd., Loanhead, Scotland; 1923-24 (evenings), lecturer in engrg. maths. and mech. engrg. drawing, at Ramsey Technical College, Edinburgh; At present, asst. to engr. in charge, statistical and record dept., Price Bros. & Co. Ltd., Kenogami, Que.

References: W. G. Mitchell, H. V. Bignell, G. F. Layne, A. A. MacDiarmid, C. N. Shanly.

DUCHESNAY—ANTOINE JUCHEREAU, of Chicoutimi, Que. Born at St. Mary, Co. Beauce, Que., Jan. 30th, 1884; Educ., Classical course, Nicolet Seminary; 1904-05, rodman, 1905-06, topog'r., 1906-08, leveller, 1908-11, concrete and timber inspr. and instr'man., N.T.C. Ry.; 1911-12, instr'man., Quebec & Saguenay Ry.; 1912-13, asst. res. engr., and 1913, acting res. engr., Quebec & Saguenay Ry.; 1913-14, asst. engr., Montreal filtration plant constrn.; 1914-15, in France with P.P.C.L.I.; 1915-17, surveying and mapping all military properties in Mil. Dist. No. 5, Quebec; 1917-20, mgr., Quebec District, Board of Pension Comm. of Canada; 1920-21, surveys of towns, Val Jalbert Port Alfred and Chicoutimi, and 1921-22, in charge of hydrographic survey of the Ouiatchouan River, Lake St. John district, for the Chicoutimi Pulp Co.; 1923, chief of party on rly. location, Roberval & Saguenay Rly. Co., proposed extension; 1924, several small surveys and general engrg. work, and from Nov. 1924 to date, attached to the gen. supt. of mills dept., Chicoutimi Pulp Co., Chicoutimi, Que.

References: A. E. Doucet, J. M. McCarthy, W. D. Baillarge, E. Lavoie, F. E. Field, R. Strickland, H. B. Pelletier, J. E. A. McConville.

DUPUIS—PHILIPPE AUGUSTE, of Quebec, Que. Born at St. Roch des Aulnais, Que., April 6th, 1896; Educ., B.A.Sc. and C.E., Ecole Polytechnique, 1921; Since graduation to date, surveying, designing, estimating and inspecting bridges, bridge dept., Public Works and Labour Department, Quebec, Que.

References: I. A. Vallée, E. S. T. Lavigne, T. J. Lafrenière, H. Cimon, J. G. O'Donnell.

HENSTRIDGE, EDWARD WILLIAM GUY, of 56 York Street, St. Catharines, Ont. Born at Deseronto, Ont., April 17th, 1896; Educ., McGill Science Matric, 1914; 1913-14, evening course in mech. drawing, Montreal Tech. Sch.; 1914-15, rodman and on costs, etc., with bridge contractors on C.P.R. branch, Coronation to Lorraine, Alta.; 1916-19, overseas, C.A.S.C., & R.A.F.; 1919-20, with McKinnon Industries Ltd., St. Catharines, Ont.; 1920-21, dftsman., chiefly on design of special base castings and frames, Canadian Crocker-Wheeler Co., St. Catharines, Ont.; 1921 to date, dftsman. office of the engr. in charge, Welland Ship Canal, St. Catharines, Ont.

References: O. W. Ross, A. W. L. Butler, J. B. McAndrew, W. L. McKenzie, F. E. Sterns, G. F. Vollmer.

HEUPERMAN—FREDERICK JUSTINUS, of 211 Sixth Avenue N.E., Calgary, Alta. Born at Amsterdam, Holland, July 23rd, 1887; Educ., D.L.S. and A.L.S. 1911; 1906-08, dftsman. and field asst., Messrs. Driscoll & Knight, Edmonton, Alta; 1909, articled to L. C. Charlesworth, M.E.I.C., chairman, Irrigation Council, Edmonton, Alta; 1910, articled to Alfred Driscoll, D.L.S., Edmonton, Alta.; 1911, member of firm, Patrick & Heuperman, and 1912-13, in business under own name only; 1914 to date, asst. engr., Canadian Western Natural Gas, Light, Heat and Power Co. Ltd., Calgary, Alta.

References: W. S. Fetherstonhaugh, W. J. Gale, H. H. Moore, A. S. Chapman, A. M. Bremner, O. Inkster, L. C. Charlesworth.

JAMES—ALAN MACKENZIE, of Halifax, N.S. Born at Halifax, N.S., Nov. 8th, 1890; Educ., B.Sc. Dalhousie Univ. 1913, 3 years mining at N.S.T.C. in affiliation with pure science course at Dalhousie; 1910 (summer), engr's. helper, Scheelite Mines, N.S.; 1909 (summer), timekeeper, C.N.R., constrn.; 1911-12 (summers), rodman, recorder, etc., Can. Geol. Survey; 1913-14 (summers), instr'man., Can. Geol. Survey; 1915-19, overseas, Lieut., C.F.A.; Jan. 1919 to May 1920, mgr. and engr., small lead-silver mine, Musquodoboit Hbr., N.S.; 1920 (June-Dec.), survey party, N.S. Power Commission; Jan. 1921 to Sept. 1922, engr. in charge field surveys, and Oct. 1922 to date, lands and rights engr., N.S. Power Commission. Also, during last four years, small consulting jobs-geology and mining.

References: K.H. Smith, J.F. Lumsden, H. S. Johnston, H. W. Mahon, K. L. Dawson, C. A. D. Fowler.

OS—HARTVIK, of Port Arthur, Ont. Born at Gimsoy, Norway, May 12th, 1898; Educ., Grad. Civil Engrg., Univ. of Trondhjem, Norway, 1923; 1914-16, ap'tice to L.K.A.B. Narvik, Norway; 1917 (2 mos.), 1918 (2 mos.), trackwork, Norwegian Govt. Ry.; 1923 (summer), town surveying, Narvik, Norway; Jan. 1924 to date, dftsman and inspr. on grain elevator constrn., C. D. Howe & Co., Port Arthur, Ont.

References: W. H. Souba, R. B. Chandler, M. H. Jones, M. W. Jennings, J. Antonisen.

SMITH—JOSEPH THOMSON, of Winnipeg, Man. Born at Edinburgh, Scotland, Jan. 6th, 1898; Educ., B.Sc. (C.E.), Edinburgh Univ. 1922; 1915-19, Capt. Royal Field Art. Awarded M.C.; 1923 to date, with C.P.R. surveying, instr'man. and dftsman.

References: W. A. James, A. E. Sharpe, D. A. Livingston, C. H. Larson, C. Flint, J. A. McCoubrey, J. L. Doupe.

YOUNG-ROY, of St. Johns, Que. Born at Paisley, Scotland, July 11th, 1900. Educ., B.Sc. (Engrg.), London Univ., 1922; Ap'ticeship served, intermittently, in fitting dept. of Messrs. A. F. Craig & Co., Ltd., Paisley; 1922-23, fitter, with Messrs. Hamilton Bros., motor engrs., Paisley; 1923-24, asst. to works mgr., factory, Hart Battery Co. Ltd., St. Johns, Que.; At present engr. in charge of stationary battery dept., Hart Battery Co., St. Johns, Que.

References: R. J. Anderson, W. H. Abbott, J. B. Carswell, W. Storrie, R. Strickland.

FOR TRANSFER FROM CLASS OF ASSOCIATE MEMBER TO MEMBER

COPP—WALTER PERCY, of Halifax, N.S. Born at Sackville, N.B., August 27th, 1885; Educ., B.A. Acadia Univ. 1906. B.Sc. McGill Univ. 1908; 1907-08 (summer), C.P.R. mtce.; 1908 (Apr.-Dec.), prin. asst., Dom. Land Survey; 1909-13, dftsman., checker & Squad boss, Dominion Bridge Co. Lachine, Que.; 1913-16, asst. engr., and 1917-18, chief field inspr., Quebec Bridge; 1918-20, bridge and struct'l. engr., consltg. engr's. office, Dept. Rlys. & Canals, Ottawa; 1920 to date, professor of civil engrg., Dalhousie University, Halifax, N.S.

References: C. N. Monsarrat, M. B. Atkinson, J. Rankin, D. C. Tennant, F. P. Shearwood, F. R. Faulkner, C. H. Wright.

EARL—ERNEST ALFRED, of Bekwai, Gold Coast Colony, West Africa. Born at London, England, Oct. 15th, 1876; Educ., Articled to Bradshaw Brown, F.S.I., London, England. Articles terminated after 18 mos. by his death. Math. course at King's College, London, during articles. Also course Central Technical College, Univ. of London, and private coaching in struct'l. work etc., 1909-10; 1899-1902, dftsman., head office, C.P.R., Montreal; 1902-03, topog'r. prelim. and location, C.P.R., Ontario; 1903-04, leveller and field dftsman., C.P.R., B.C.; 1904-06, transitman, prelim. location, N.T.C.Rly.; 1906-07, instr'man. on constrn., N.T.C. Rly.; 1907-09, civil engr. in charge above and below ground, Acadia Coal Co's Mines, Nova Scotia; 1910-11, bridge office, dfting., Chicago Milwaukee & Puget Sound Ry.; 1911-12, res. engr. in charge Dewdney Dyke Land Reclamation, B.C.; 1912-14, private practice, Vancouver, B.C.; 1914-18, overseas. Capt. R.E.; 1919-22, engr. in charge of section of constrn., and from 1922 to date, district engr. in charge of a district of constrn. (deviating old line,) Gold Coast Govt. Rlys., West Africa.

References: J. R. S. Sutherland, W. F. Tye, C. E. Cartwright, A. E. Doucet, C. N. Monsarrat.

MEEK—VICTOR MAITLAND, of Ottawa, Ont. Born at Port Stanley, Ont., April 15th, 1883; Educ., B.Sc. McGill Univ. 1910; 1907-08, instr'man., Penn. Rld. New York, on Hudson River tunnels; 1910-12, mine surveyor, Mond Nickel Co., Coniston, Ont.; 1912-24, Reclamation Service, Dept. of the Interior, Calgary, as follows: 1912-13, hydrographer, 1913-16, asst. hydraulic engr.; 1918-21, office engr., 1921-24, acting commissioner of irrigation and chief engr., in charge of field administration of the Irrigation Act; 1916-18, overseas, Lieut., Can. Engrs.; 1924 to date, in charge of irrigation administration at Ottawa, under Director, Water Power and Reclamation Service.

References: J. T. Johnston, S. S. Scovil, P. J. Jennings, D. W. Hays, A. S. Dawson, J. B. Challies.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

ARMSTRONG—CHRISTOPHER GILLETTE RUSSELL, of 152 Josephine Avenue, Windsor, Ont. Born at Merlin, Ont., Oct. 8th, 1896; Educ., B.A.Sc. Univ. of Toronto, 1920. D.L.S. 1924; 1917 (summer), rodman, etc., topog'l. and underground surveys, Canadian Copper Co., Copper Cliff, Ont.; 1918 (summer), dftsman. and field engr. on bldg. constrn., Southern Ontario Gas Co., Glenwood, Ont.; 1919 (summer), instr'man., dftsman., municipal work, J. J. Newman, M.E.I.C., Windsor, Ont.; 1920 (Apr.-Aug.), chief of party, municipal work, Owen McKay, C.E., Walkerville, Ont.; 1920-21, asst., constrn. dept., Brunner Mond, Canada, Limited, Amherstburg, Ont.; 1922 (Apr.-Aug.), timekeeper, constrn. costs, etc., Archibald & Holmes Ltd., Toronto; 1922 (Aug.-Dec.). instr'man., Wells & Gray, Toronto; Sessions 1921-22 and 1922-23, demonstrator in engrg. drawing, Univ. of Toronto; Apr. 1923 to Dec. 1924, chief asst., and from Jan. 1925 in partnership with J. J. Newman, M.E.I.C., as Newman and Armstrong, Civil Engrs., & Ont. Land Surveyors, Windsor, Ont.

References: J. J. Newman, J. R. Cockburn, P. Gillespie, J. C. Keith, A. R. Holmes, M. E. Brian, G. C. Hoshal.

WALSH—WILLIAM E., of Galt, Ont. Born at Greendale, Mass., U.S.A., March 4th, 1898; Educ., Montreal Tech. School; 1915-16, mech. dftsman., Steel Company of Canada, Montreal; 1916-18, mech. designer, Roelofson Mach. & Tool Co. Ltd., Galt, Ont.; 1918-22, mech. designer, R. McDougall Co. Ltd., Galt, Ont.; 1922-23, tool engr., Canadian Crocker-Wheeler Co. Ltd., St. Catharines, Ont.; 1923 to date, engr., dfting., designing and engrg., Preston Woodworking Machinery Co. Ltd., Preston, Ont.

References: D. T. Black, M. U. Ferguson, F. H. Midgley, A. D. Porter, F. P. Adams, J. A. McFarlane.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

COOPER—PAUL EMERSON, of 63 Aylmer Avenue, Ottawa, Ont. Born at Ottawa, Feb. 8th, 1900; Educ., B.Sc. (C.E.), McGill Univ. 1923; 1916 (Summer), rodman, International Boundary Survey; 1917 (summer), precise leveller, Inter. Boundary Survey; 1918-19, instr'man., Grand Trunk lines in New England; and 1920 (summer); 1921 (May-Aug.), topog'r., Man.-Ont. Prov. Boundary; 1922 (May-Oct.), road inspr., county of Carleton, Ont.; June 1923 to date, topog'l. engr. and sr. dftsman., Singer Mfg. Co., Ottawa, Ont.

References: H. M. MacKay, F. E. Patterson, T. H. Byrne, C. S. MacDonald, C. R. Westland.

MARION—JOSEPH ALDERIC PIERRE, of 145 Dumoulin Street, St. Boniface, Man. Born at St. Boniface, Man., Oct. 24th, 1898; Educ., B.A. 1920, B.Sc. 1924, Univ. of Man.; 1914 (4 mos.), rodman, city of St. Boniface; 1918-21 (summers), ceramic engrg., Couture Marion Brickyards; 1923 (5 mos.), 1924 (3 mos.), struct'l. steel detailer, Dominion Bridge Co.; 1922 (5 mos.), instr'man., in charge of party surveying flooded areas for forebay at Great Falls, Man., for Manitoba Power Co.; 1924 (3 mos.), reinforced concrete designer, James Chisholm & Sons; engr. in charge of work for deviation of Seine River in St. Boniface for Western Steel Product Co.; At present dftsman. for C.D. Howe & Co., Port Arthur, Ont.

References: E. P. Fetherstonhaugh, J. N. Finlayson, N. M. Hall, W. M. Scott, B. S. McKenzie, J. A. Meindl.

McKAY—HUGH ALEXANDER, of London, Ont. Born at Seaforth, Ont. Aug. 23rd, 1896; Educ., B.A.Sc. Univ. of Toronto, 1923; 1921 (4 mos.), dftsman., Sarnia Bridge Co. Ltd.; 1922 (4 mos.), dftsman. and field engr., Sutcliffe & Neelands, New Liskeard, Ont.; 1923-24, dftsman., designer and estimator, Disher Steel Constrn. Co. Ltd., Toronto; 1924 (June-Oct.), asst. engr. on surveys and designs for waterworks and sewerage system for Porcupine & Schumacher, Sutcliffe Co. Ltd., New Liskeard, Ont.; Oct. 1924 to Jan. 1925, representative engr. for Standard Steel Constrn. Co., at Timmins, Ont.; Jan. 1925 to date, manager, London Bridge Works, London, Ont.

References: E. A. Gray, P. Gillespie, C. R. Young, H. W. Sutcliffe, C. H. Mitchell.

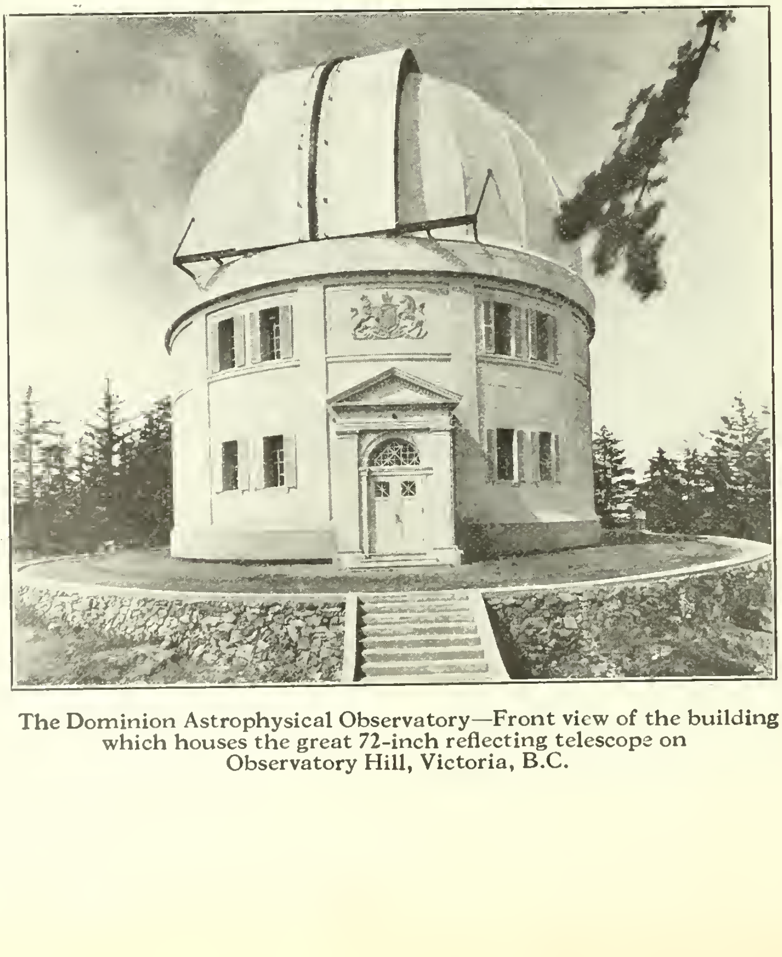
NORRIS—CHARLES ADAM, of 423 Grosvenor Avenue, Westmount, Que. Born at Montreal, Que., Nov. 23rd, 1896; Educ., B.A.Sc. Univ. of Toronto, 1923; Summers: 1919, dfting. room, Messrs. Sproatt & Rolph, Toronto; 1920, supt. of constrn. for Bremner Norris & Co. Ltd., on work for Canadian Explosives Ltd., Brownsburg, Que.; 1922, designed and built residence in Hamilton for Mr. R. L. Cummer of Toronto; 1923, (May to Nov.) supt. of constrn. at Grande Ligne, Que., for Bremner Norris & Co. Ltd., and from Nov. 1923 to date, engr. in charge of constrn. for this firm located at Montreal.

References: J. H. Norris, D. Bremner, C. H. Mitchell, C. K. McLeod, S. A. Neilson.

STERNS—LAURENCE, of 17 Tulip Street, Dartmouth, N.S. Born at Dartmouth, N.S. Dec. 17th, 1900; Educ., B.Sc. N.S. Tech. College, 1924; 1920 (summer), rodman on bldg., constrn., N.S. Constrn. Co., Halifax; 1922 (summer), surveys for Parks Commn. & C.N.R. Land Survey Dept.; 1923 (summer), student asst., Geol. Survey of Canada; May 1924 to date, topog'l. dftsman., Messrs. Pickings & Wilson, Civil and Mining Engrs., Halifax, N.S.

References: H. B. Pickings, C. St. J. Wilson, F. R. Faulkner, A. F. Dyer, W. P. Copp, J. S. Misener.

The Astrophysical Observatory at Victoria, British Columbia, is a branch of that department of the Federal Government charged with the administration of the western lands of the Dominion, the Department of the Interior. In the colonization of these lands, one of the obvious first needs was a survey of the boundaries and subdivision into townships and sections. This need led to the organization of the surveys branch of the department and out of the necessity of accurate astronomical observations to delimit the boundaries and define the position of the base lines for subdivision work arose the astronomical branch.



The Dominion Astrophysical Observatory—Front view of the building which houses the great 72-inch reflecting telescope on Observatory Hill, Victoria, B.C.

To carry on this work the Dominion Observatory at Ottawa was established in 1905. This observatory is equipped with a 15-inch refracting telescope with which important work is done. The need of a larger telescope for the purpose of extending the research work was felt so keenly that the construction of an astrophysical observatory, having a 72-inch reflecting telescope, was begun in 1913 and completed in 1916. It was originally intended to locate this telescope at Ottawa but upon further consideration it was deemed advisable to place it at a point in Canada where the best observing conditions prevail. After a series of tests this point was found to be in the vicinity of Victoria, B.C.

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ABRASIVE WHEELS

Salvage Methods. Outline Wheel Salvage Methods, F. W. Brown. Abrasive Industry, vol. 5, no. 12, Dec. 1924, pp. 293-294, 3 figs. Wheels that heretofore went to scrap pile are reclaimed and put back in stock at plant of Continental Motors Corp., Muskegon, Mich.; expensive equipment not necessary.

ACCIDENT PREVENTION

Safety Movement. A Place for Safety, L. A. Deblois. Mech. Eng., bol 47, no. 1, Jan. 1924, pp. 34-36. Discusses accident-prevention movement.

AERONAUTICS

Developments. The 13th Annual Meeting of the German Scientific Aeronautical Society [Bericht über den Verlauf der XIII. Ordentlichen Mitglieder-Versammlung der Wissenschaftlichen Gesellschaft für Luftfahrt (WGL)], G. Krupp. Zeit. für Flugtechnik u. Motorluftschiffahrt, vol. 15, no. 19, Oct. 14, 1924, pp. 198-201. Review of papers dealing with modern developments in airplane construction, especially with reference to design of very large planes; results of experiments at Aerodynamical Research Laboratories at Goettingen for study of mutual influence of propeller and plane, and investigations of Magnus effect; review of military-airplane developments the world over; protection of passengers in case of breakage; development of radiator; light airplanes; middle-weight machines, etc.

Paris Show. The Ninth Aeronautic Show, Dec. 5-21, 1924 (Le Neuvième Salon de l'Aéronautique, 5-21 décembre, 1924). Aéronautique, vol. 6, no. 67, Dec. 1924, pp. 273-328, 60 figs. A series of articles covering industrial conditions of aeronautic production, quantity production of metal airplanes, and industria production of airplanes, followed by description of the different exhibits.

AERODYNAMICS

Magnus Effect. The Magnus Effect (Der Magnus-Effekt), P. Heyn. Schiffbau, vol. 25, no. 28, Nov. 19, 1924, pp. 803-806, 4 figs. Discusses principle of action of wind on a rotating cylinder, as used in Flettner rotor ship, to explain deviation of a cannon ball from straight course.

AIR COMPRESSORS

Centrifugal, Electric Drive of. Electric Motor Drive for Centrifugal Compressors, G. Fox. Blast Furnace & Steel Plant, vol. 13, no. 1, Jan. 1925, pp. 35-37, 1 fig. General discussion of this type of centrifugal fan, with tables of power requirements and characteristic curves.

AIRPLANE PROPELLERS

Theory. The Theory of Air Propellers (Zur Theorie der Luftschrauben), Th. Bienen and Th. v. Karman. Zeit. des Vereines deutscher Ingenieure, vol. 68, no. 48, Nov. 29, 1924, pp. 1237-1242 and 1315-1318, 19 figs. Deals with calculation of airplane propellers, but results, when properly applied, also hold good for ship propellers.

AIRPLANES

Flettner Principle, Application of. The Flettner "Rotor Ship." Flight, vol. 16, no 47, Nov. 20, 1924, p. 711, 3 figs. Discussion of whether principle of "rotor ship," invention of German engineer A. Flettner, of Berlin-Schöneberg, a ship which "sails without sails," is applicable to aircraft. See also How Principle of Flettner "Rotor" Can Be Tested Out in Actual Flight, in same magazine, no. 49, Dec. 4, 1924, p. 759, 3 figs.

Flying Boats. *See Flying Boats.*

Lifting Forces. The Forces which Lift Aeroplanes, V. K. F. Bjerknes. Nature (Lond.), vol. 114, nos. 2865 and 2866, Sept. 27 and Oct. 4, 1924, pp. 472-474 and 508-510, 4 figs. Direct geometric and inverse dynamic analogy between hydrodynamic and electromagnetic fields; direct geometric analogy; theoretical airplane; automatic production of lifting circulation; induced resistance.

Naval Aircraft. *See Naval Aircraft.*

Paris Show. The Paris Aero Show, 1924. Flight, vol. 16, nos. 49, 50, 51 and 52, Dec. 4, 11, 18 and 25, 1924, pp. 753-758, 766-777, 783-791 and 791-804, 67 figs. Description of exhibits at Ninth International Aero Show in Paris. See also Aeroplane, vol. 27, nos. 24 and 25, Dec. 10 and 17, 1924, 10 pp. between pp. 533-554 and 10 pp. between 568-590, 39 figs.

Pursuit. Recent French Pursuit Airplanes Described, L. D'Orcy. Aviation, vol. 18, nos. 1 and 2, Jan. 5 and 12, 1925, pp. 12-15 and 42-45, 8 figs. Notable feature is preponderance of duralumin construction, details of Nieuport-Delage 42 plane; Bleriot-Spad planes; Spadoul; Hanriot; Wibault, Dewoitine and Courdon-Leseurre pursuit planes.

Seaplanes. *See Seaplanes.*

Wings. Aerodynamic Stresses in Airplane Wings (Sur la mesure des efforts aérodynamiques supportés par la voilure d'un avion), E. Huguenard, A. Magnan and A. Planiol. Académie des Sciences—Comptes Rendus, vol. 179, no. 22, Dec. 1, 1924, pp. 1246-1248, 1 fig. Deals with an instrument for continuously measuring deformations of wings during flight and recording them by diagrams near pilot.

ALIGNMENT CHARTS

Construction. Building Up Alignment Charts (Der Aufbau der Leitertafeln) H. Winkel. Praktische Maschinen-Konstrukteur, vol. 57, nos. 24 and 25, July 1 and 8, 1924, pp. 339-342 and 349-352, 13 figs. Logarithmic multiplication and addition, calculation of functions; technical examples.

Surfaces and Volumes. Nomograms for Rapid Calculation of Surfaces and Volumes (Der Gebrauch von Nomogrammen zur Flächen- und Massenberechnung), J. Nemosek. Organ für die Fortschritte des Eisenbahnwesens, vol. 79, no. 13, Oct. 15, 1924, pp. 294-296, 5 figs. Method for calculating surfaces of dams, cross sections of cuts, etc., based on geometric anamorphosis.

ALLOY STEELS

Development. The Development of Alloy Steels, R. Hadfield. Iron & Steel of Can., vol. 7, nos. 11 and 12, Nov. and Dec. 1924, pp. 213-221 and 245-254, 6 figs. Nov.: Importance of alloy steels; alloy steels and conservation of iron; history of alloy steels and early attempts to make them; curious properties of "Resista"; early rust-resisting steels; carbon in alloy steels; metallurgical equivalents of different elements; correlation in research; etc. Dec.: Manufacture and working of manganese steel; heat treatment and properties; silicon steel; modern alloy steels. Condensed from paper read before Empire Min. & Met. Congress, Lond.

ALLOYS

Aluminum. *See Aluminum Alloys.*

Brass. *See Brass.*

Copper. *See Copper Alloys.*

Endurance Properties. Endurance Properties of Alloys of Nickel and of Copper, D. J. McAdam, Jr. Am. Soc. Steel Treatings—Trans., vol. 7, no. 1, Jan. 1925, pp. 54-81, 17 figs. Results of investigation at U. S. Nav. Eng. Experiment Station on nickel, monel metal, constantan, cupro-nickel, ternary alloys of nickel, copper, bronze, brass, etc.; endurance tests were made by rotating-cantilever method and by alternating-torsion accelerated-fatigue method; results, presented in stress-cycle graphs, show that there is definite endurance limit for each of these alloys; effect of chemical composition on endurance properties.

Monel Metal. *See Monel Metal.*

ALUMINUM

Non-Ferrous Alloys. Determination of Aluminum in Nonferrous Alloys, G. E. F. Lundell and H. B. Knowles. Indus. & Eng. Chem., vol. 17, no. 1, Jan. 1925, pp. 78-79. Method is described in which usual alloying elements except phosphorus are separated from aluminum by first precipitating with sodium sulphide reagent and filtering, and them acidifying filtrate and again filtering; procedure is recommended for routine analysis and is not intended to replace longer and more accurate phenylhydrazine method.

Welding. Aluminum Welding, How and Why, S. W. Henderson. Welding Engr., vol. 9, no. 12, Dec. 1924, pp. 21-22. Points to be observed for success in this process.

ALUMINUM ALLOYS

Alpax. The Aluminum Alloy Alpax. Engineering, vol. 119, no. 3080, Jan. 9, 1925, pp. 46-47. Comparison of mechanical properties of various cast light alloys shows that Alpax possesses exceptional qualities.

Castings, Salvage of. The Salvage of Aluminum-Alloy Castings by Soldering and Welding, R. J. Anderson and M. E. Boyd. Metal Industry (Lond.), vol. 25, no. 24, Dec. 12, 1924, pp. 571-574, 12 figs. Salvage specifications; metallurgical aspects of salvage problem. (Abstract.) Paper presented to Am. Foundrymen's Assn.

Thermal Expansion. On the Measurement of the Coefficients of Thermal Expansion for Aluminum Alloys and Alloys of Nickel-Iron and Cobalt-Iron, K. Honda and Y. Okubo. Tohoku Imperial University—Sci. Reports, vol. 13, no. 1, Oct. 1924, pp. 101-107, 5 figs. partly on supp. plate. Results of measurement of different aluminum alloys commonly used in aeronautics in Europe and America, and of nickel iron and cobalt iron prepared in research institute.

AMMONIA CONDENSERS

Design and Operation. Design and Operation of Ammonia Condensers, N. H. Hiller. Power, vol. 61, no. 3, Jan. 20, 1925, pp. 103-105, 5 figs. Author favors top purging of condensers and gives his reasons for so doing; also shows how excessive pipe friction may be detected and discusses vertical shell-and-tube condenser. (Abstract.) Paper read before Nat. Assn. Practical Refrig. Engrs.

APPRENTICES, TRAINING OF

German Methods. New Methods in the Education of Apprentices and Mechanics in Germany, Wm. F. Turnbull. Jl. Eng. Education, vol. 15, no. 3, Nov. 1924, pp. 195-196. Under auspices of Verein Deutscher Ingenieure (Assn. German Engrs.), joint committee of delegates from engineering society and shops and drafting rooms of principal industrial plants of Germany devised comprehensive system of instruction for apprentices and also for skilled workmen.

Graduate Engineers. Duquesne Light Company Trains Engineers, R. L. Kirk. Elec. World, vol. 84, no. 26, Dec. 27, 1924, pp. 1354-1356. College graduates spend year in company departments; outline of course and results accomplished; a typical class.

Modern Methods. A Modern Apprenticeship, H. A. Frommelt. Am. Mach., vol. 62, no. 4, Jan. 22, 1925, pp. 145-148, 2 figs. Attempt to revive old tradition of apprenticeship at works of Falk Corp., Milwaukee; how boy, high-school graduate and technical graduate are handled; industry and community co-operate.

AUTOMOBILE ENGINES

Carburetors. *See Carburetors.*

Crankcase-Oil Dilution. Another Aspect of Crankcase-Oil Dilution, P. H. Schweitzer. Soc. Automotive Engrs.—Jl., vol. 16, no. 1, Jan. 1925, pp. 92-101, 11 figs. Suggested explanations of dilution are presented, references to previous experiments by several authorities are stated and these are discussed; analysis of effect of jacket-water temperature; procedure is developed that should show effect of compression upon fuel-air mixture with reasonable degree of accuracy; remedies for crank-case oil dilution.

Fuels. *See Automobile Fuels.*

New York Show. Increase of Eight-in-Line Engines Chief Power Plant Design Trend, P. M. Heldt. Automotive Industries, vol. 52, no. 2, Jan. 8, 1925, pp. 62-65, 11 figs. Features of engine design at New York Show; cylinders are being cast integral with crankcase; controlling cooling-water flow.

AUTOMOBILE FUELS

France. Automobile Fuel Problem from the French Point of View (Le problème des carburants du point de vue français), A. Mailhe. Technique Moderne, vol. 16, no. 22, Nov. 15, 1924, pp. 773-781. Discusses petroleum, synthetic petroleum, shale oils, lignite oils, vegetable oils, alcohol, and products of coal carbonization. Bibliography.

The Automobile Fuel Problem. Makhonine's Solution. (Le problème du carburant: La solution de M. Makhonine), A. Baule. Technique Moderne, vol. 16, no. 23. Dec. 1, 1924, pp. 825-827. Details of new process for producing fuel from heavy oils, using up heavy oils completely, with which any carburetor may be used.

Lead Tetraethyl Estimation. The Estimation of Lead Tetraethyl in Motor Spirit, S. F. Birch. Instn. Petroleum Technologists—Jl., vol. 10, no. 46, Nov. 1924, pp. 816-817. Describes method which gives sufficiently accurate and trustworthy results for most purposes.

AUTOMOBILE INDUSTRY

S. A. E. Standards Report. Standards Committee Division Reports. Soc. Automotive Engrs.—Jl., vol. 16, no. 1, Jan. 1925, pp. 33-43, 16 figs. Report of recommendations as follows: Bayonet-type lamp-door permitted; method of gaging nut slots; screw-thread fits; compression-type fittings; standard differentials; flexible-disk standard; truck batteries; hinge standards; headlamp standard; tap-drill reference tables; etc.

AUTOMOBILE MANUFACTURING PLANTS

Economic Tooling in. The Economic Aspect of Tooling for Interchangeable Production, Jos. Lannen. Soc. Automotive Engrs.—Jl. vol. 16, no. 1, Jan. 1925, pp. 59-61, 5 figs. Gives rules for governing economic tooling and works out illustrative problem for production of bearing caps; makes calculation by means of charts to determine comparative economy of drilling holes in 100,000 bearing caps by use of single-spindle and multiple-spindle vertical drilling machines; describes group-bonus wage-payment plan employed by Paige-Detroit Motor Car Co.

Manufacture, Use of Light Metals. Light Metals at the Automobile Show of 1924 (Les métaux légers au Salon de l'Automobile de 1924), R. de Fleury. Technique Moderne, vol. 16, no 23, Dec. 1, 1924, pp. 811-814, 2 figs. Discusses increased use of light metals in automobile construction for lightening masses in motion, such as connecting rods, pistons, wheels, brakes, etc.

Power and Gasoline Economy. Power and Gasoline Economy of Present-Day Passenger-Automobile, A. A. Straub. Soc. Automotive Engrs.—Jl., vol. 16, no. 1, Jan. 1925, pp. 102-105, 5 figs. Analyzes data obtained from road tests made with modern 6-cylinder phaeton in effort to substantiate author's belief that full capabilities of automobile will be realized if builder's instructions regarding maintenance and adjustment of engine and its accessories are adhered to rigidly; results show that CO_2 content of exhaust gas is direct index of efficiency of carburetor adjustment.

AVIATION

Civil. Civil Aviation in the United States, C. G. Grey. Aviation, vol. 18, no. 1, Jan. 5, 1925, pp. 16-17. Points out that U. S. transcontinental air-mail service is a model for world; specifications for reasonable and safe passenger machine; hopes for closer co-operation between England and America.

B

BALANCING

Turbine Rotors. Balancing L. P. Turbine Rotor on Board U. S. S. Detroit, H. C. Dinger. Am. Soc. Nav. Engrs.—Jl., vol. 36, no. 4, Nov. 1924, pp. 648-654, figs.2 Gives example showing possibilities to which balancing machines of Akimoff type may be put.

BEAMS

Continuous. Graphical Method of Solving Continuous Beams, F. W. Davey. Concrete and Constr. Eng., vol. 19, no. 12, Dec. 1924, pp. 751-754, 3 figs. Discusses Claxton Fidler's method of "characteristic points".

Influence-Line Diagrams. Influence-Line Diagrams for Shearing Force, Bending Moment, Alop, and Deflection for Single-Span Girders, W. N. Thomas. Concrete and Constr. Eng., vol. 19, no. 11, Nov. 1924, pp. 687-696, 8 figs. Shows how influence lines may be derived in case of simple beam, simply supported at its two ends, encastered, encastered at one end and supported at other, and encastered at one end and unsupported at other.

BEARINGS

Anti-Friction. Operating Characteristics of Anti-Friction Bearings. Wood Worker, vol. 43, no. 8, Oct. 1924, pp. 57-59. Discusses, friction, reliability, lubrication, precision, thrust loads, and proportions.

Babbitted. Tests Show Breakdown Pressure of Oil Films in Babbitt Bearings, L. N. Linsley. Automotive Industries, vol. 51, no. 26, Dec. 25, 1924, pp. 1084-1085, 2 figs. Results of experimental work carried out at Johns Hopkins Univ. show that limiting bearing load in pounds per square inch of projected bearing surface increases with circumferential speed of journal and with viscosity of lubricant; effect of adding oleic acid. (Abstract.) Paper read before Am. Soc. Mech. Engrs.

Mitchell Journal. Notes on the Mitchell Journal Bearing. Machy. (Lond.), vol. 25, no. 638, Dec. 18, 1924, pp. 371-376, 7 figs. From data presented it is quite clear that there is most marked economy in use of Michell journal bearing so far as frictional losses are concerned.

BEARING, BALL

Friction in. Coefficient of Friction of Bearing Pins (Wie kommt es, dass die Reibungszahl eines Walzlagers so gering ist), H. Stellrecht. Praktische Maschinen-Konstrukteur, vol. 57, no. 41, Oct. 28, 1924, pp. 555-556. Discusses friction in bearings generally and in ball bearings particularly. Shows that if ball impressions keep within limit of elasticity, balls will never be injured.

Heat Treatment. Heat Treatment of Ball and Roller Bearings, Jos. K. Wood. Am. Mach., vol. 61, no. 24, Dec. 11, 1924, pp. 929-931. Required properties of materials for ball bearings; chrome steel for bearings and its heat treatment; manufacturing processes; shortcomings of stainless steel.

Housings. Making Housings for Ball Bearings. Am. Mach., vol. 62, no. 2, Jan. 8, 1925, pp. 67-70, 12 figs. Preliminary grinding operations; simple fixtures used; special boring bars and cutters.

Motor. Ball Bearings for Motors, C. Huey. Am. Soc. Nav. Engrs.—Jl., vol. 36, no. 4, Nov. 1924, pp. 624-647. Presents advantages, disadvantages, limitations and design data.

Roller and. Do Ball and Roller Bearings Justify Their Cost, H. Maxwell. Indus. Engr., vol. 83, no. 1, Jan. 1925, pp. 12-16, and review of other papers on bearings, pp. 16-18, 7 figs. Discusses justification of their use in general-purpose motors, and points of comparison between ball, roller, and sleeve bearings. Discussion presented at joint meeting of Chicago Section of A.S.M.E. and West. Soc. Engrs.

BELTING

Standardization. How Belting was Standardized in a Large Automotive Plant, H. A. Flogaus. Belting, vol. 24, no. 6, vol. 25, nos. 1, 2, 3, 4 and 5, June, July, Aug., Sept., Oct. and Nov., 1924, pp. 19-24, 17-21, 19-22, 25-27, 23-25 and 17-20, 25 figs.

BLAST FURNACES

Practical Management. The Practical Management of Blast-Furnace Plants in Cleveland, H. G. Scott, Iron & Coal Trades Rev., vol. 119, nos. 2959 and 2960, Nov. 14 and 21, 1924, pp. 784-785 and 826-828. Examines means of obtaining control of furnace; notes on the water evil; soft and dirty coke; Cleveland blast-furnace practice. Paper read before Cleveland Instn. Engrs.

BLASTING

Methods. Blasting as a Fine Art, W. Weiss. Explosives Engr., vol. 2, no. 9, Sept. 1924, pp. 306-308, 7 figs. Describes three examples of problems explosives engineer is called upon to solve, viz., blasting of stone bridge situated close to occupied houses, blasting of iron blocks for shipment, and quarry chamber shooting.

Safe Firing of Charges. The Safe Firing of Blasting Charges in an Inflammable Atmosphere, E. Audibert. Colliery Guardian, vol. 128, nos. 3333 and 3335, Nov. 14, and 28, 1924, pp. 1251-1252 and 1374-1375, 6 figs. Nov. 14: Mechanism of explosive reactions; detonation of nitroglicerine, Nov. 28: Gases produced by detonation; mechanism of decomposition; application of results. Translated from Industrie Minérale.

BOILER FEEDWATER

Treatment. The Chemistry of Interior Boiler Water Treatment, E. M. Partridge. Am. Water Wks. Assn.—Jl., vol. 12, no. 3, Nov. 1924, pp. 288-294. Cause and prevention of scale in steam boilers by use of compound.

BOILER FIRING

Wet Fuel. High-Pressure Steam and Boiler Firing with Special Reference to Wet Fuel (Hochdruckdampf und Kesselfeuerung unter besonderer Berücksichtigung der nassen Brennstoffe), D. J. Hudler. Feuerungstechnik, vol. 13, no. 2, Oct. 15, 1924, pp. 9-14, 3 figs. Discusses predrying of fuel by means of flue gases as most favorable, and gives calculations for lignite and peat.

BOILER FURNACES

Arches. Flat Furnace Arches. Eng. and Boiler House Rev., vol. 38, no. 6, Dec. 1924, pp. 243-244 and 246, 3 figs. Principal features of flat suspended arch in comparison with ordinary sprung arch for boiler furnaces.

Pulverized-Coal Burning. Test of Pulverized-Fuel Fired Boilers at the Lake Shore Station. Cleveland, J. Wolff. Mech. Eng., vol. 47, no. 1, Jan. 1925, pp. 25-29, 10 figs. Results of tests to compare results with guarantees and to determine general economy and detailed characteristics of installation.

Walls, Reconstruction of. Reconstruction of Boiler Furnace Walls. Elec. World, vol. 84, no. 25, Dec. 20, 1924, pp. 1312-1313, 1 fig. Complete sidewall and front-wall patches, using crushed linings from old furnaces as refractory base, are being successfully used on oil-burning boiler furnaces at Glenwood power station of N. Y. Central R. R. Co.

BOILER HOUSES

Smoke-Abatement Equipment. Manchester Smoke Abatement Exhibition. Eng. and Boiler House Rev., vol. 38, no. 6, Dec. 1924, pp. 231-236, 10 figs. Notes on boiler-house exhibits in relation to smoke abatement.

BOILER PLANTS

Fuel Economy. Fuel Economy in Steam Boiler Plants, Power Station Design and Operation, J. B. C. Kershaw. Power Engr., vol. 19, no. 224, Nov. 1924, pp. 411-413, 3 figs. Impartial examination of arguments for superpower stations.

Operation. Rules for Operating Steam Boiler Plants (Betriebsvorschriften für Dampfkesselanlagen), M. Guilleaume. Wärme, vol. 47, nos. 10 and 11, Mar. 7 and 14, 1924, pp. 97-99 and 107-110. Union of Large Scale Steam Boiler Users has collected operating rules among its members and examined them critically with result that legal regulations are found to require addenda, as well as rules of boiler manufacturers. Rules observed in individual boiler plants.

BOILER PLATES

Punching and Shearing. Why A.S.M.E. Code Prohibits Punching, and Shearing. Power, vol. 60, no. 25, Dec. 16, 1924, p. 982, 5 figs. Gives reasons for prohibition of punching and shearing of boiler plates.

BOILERS

A.S.M.E. Codes. A.S.M.E. Boiler Code Committee. Mech. Eng., vol. 47, no. 1, Jan. 1925, pp. 56-57. Interpretations of Committee. Modification in report on code for unfired pressure vessels.

Corrosion. Tests for Corrosion of Boiler Material at High Pressure, W. Lulofs. Elec. Times, vol. 66, no. 1730, Dec. 11, 1924, pp. 689-690, 3 figs. Results of tests carried out in author's laboratory, from which it is concluded that there is more corrosion at 40 than at 16 atmos.

Electrically-Heated. Using Intermittent Energy of Hydro-electric Plants for Electric Boilers (Utilisation par les chaudières électriques de l'énergie intermittente des usines hydro-électriques), Bergeon. Société Française des Electriciens—Bul., vol. 4, no. 37, July 1924, pp. 653-657. Cites various examples in France where such energy is being successfully employed.

Gas-Fired, Feed System for. Gas-Fired Boiler Feed System. Gas Age-Rec., vol. 54, no. 24, Dec. 13, 1924, pp. 835-836, 1 fig. Notes on operating procedure of new automatic elect rically-operated return feedwater system for gas-fired boilers developed by Thomas Pump Works, Inc., of New York City.

Water-Tube-Fire-Tube. The Findlay Boiler. Power Engr., vol. 19, no. 224, Nov. 1924, pp. 427-428, 3 figs. Special features of new design of water-tube-fire-tube boiler.

BRASS

Cadmium in, Estimation of. The Estimation of Cadmium in Brass, A. T. Etheridge. Analyst, vol. 49, no. 585, Dec. 1924, pp. 572-576. Describes use of electrolytic method which is said to have great advantages over chemical methods.

Pressed. Pressed Brass in Place of Red Brass and Bronze for Metal Parts of High Load (Pressmessing anstelle von Rotguss und Bronzen für hochbeanspruchte Metallteile), Peter. Maschinenbau, vol. 3, no. 28, Nov. 27, 1924, pp. 1071-1074, 9 figs. Discusses tensile strength, machinability, conductivity, economic production and uses.

BRICKMAKING

Sand-Lime Brick. The Utilization of Spent Shale. Oil Eng. and Finance, vol. 5, no. 104, Dec. 1924, pp. 676-678, 4 figs. Discusses methods for manufacture of bricks on sand-lime (calcium-silicate) principle, for efficient utilization of spent shale residues.

BRIDGE PIERS

Construction. Foundations for Bridges in Pueblo Flood Control Project (Colo.). Eng. News-Rec., vol. 93, no. 23, Dec. 4, 1924, pp. 903-905, 5 figs. Diversion requires 8 new bridges; substructures in main channel built in caissons sunk to rock.

BRIDGES, STEEL

Girder. Replacing Railway Truss Span with Two Girder Spans. Eng. News-Rec., vol. 93, no. 22, Nov. 27, 1924, pp. 870-871, 4 figs. New masonry built clear of old span; falsework supported old deck while new girder spans were erected in renewal of Bluff Creek bridge on Chicago, Rock Island & Pac. Ry. near Caldwell, Kan.

BRUSHES

Position against Commutator. Brush Angle and Direction of Commutator Relation, W. C. Kalb. Power, vol. 60, no. 25, Dec. 16, 1924, pp. 973-975, 5 figs. Answers question whether commutator should rotate against or away from sharp angle of brush face, and shows that specific direction of rotation is preferable for almost every individual case.

BUILDING CONSTRUCTION

Concrete, Cold-Weather. Costs and Precautions in Winter Construction of Concrete Buildings, R. E. Egelhoff. Concrete, vol. 25, no. 6, Dec. 1924, pp. 211-215, 10 figs. Cost data, precautions to be taken, including use of canvas covers, and suggested specification for winter protection.

BUILDING MATERIALS

Structolite. Structolite, a Gypsum Concrete. Rock Products, vol. 27, no. 25, Dec. 13, 1924, pp. 26-27, 2 figs. New plastic material especially adapted for walls of dwellings and one-story commercial structures.

C

CABLES, ELECTRIC

Installation. Armored Cable Installation Methods, A. L. Abbott. Elec. News., vol. 33, no. 23, Dec. 1, 1924, pp. 37-39, 7 figs. Results of investigation carried out with co-operation of 35 contractors; materials and installation methods for armored cable; installation of boxes; cost records.

Supertension. Super-Tension Cables, M. C. Timms. Elec. Engr., vol. 1, no. 8, Nov. 15, 1924, pp. 285-289, 3 figs. Considers features of design when single-core cables are intended for operation at supertensions.

CABLEWAYS

Construction. Cableways and Their Importance (Drahtseilbahnen und ihre Bedeutung), W. Landgraeber. Fördertechnik u. Frachtverkehr, vol. 17, no. 23, Dec. 3, 1924, pp. 321-324. Discusses development and construction of overhead cableways, suspended railways, cableways for mine conveying, and overhead railways for mountains.

CAMS

Heat Treatment of. The Heat Treatment of Steel Cams, Jos. K. Wood. Am. Mach., vol. 62, no. 2, Jan. 8, 1925, pp. 47-49. Severe requirements on material used in cams; carbonizing and non-carbonizing steels and their heat treatment; advantages of alloy steels for certain types of cams.

CANALS

Welland. Welland Canal Construction Progress. Can. Engr., vol. 47, no. 26, Dec. 23, 1924, pp. 617-624, 11 figs. Historical review of Welland canals; progress on ship canal during past 12 months; principal features of remaining sections to be constructed.

CARBON MONOXIDE

Poisoning. The Use of Carbon Dioxide as a Remedy in Gas Poisoning, J. S. Haldane. Colliery Guardian, vol. 128, no. 3339, Dec. 24, 1924, pp. 1633-1634, 2 figs. Describes experiments, points out how results may be applied practically in treatment of gas poisoning, and demonstrates main experiments and an apparatus for using carbon dioxide in treatment. Paper read before So. Staffordshire and Warwickshire Inst. Min. Engrs.

CAR DUMPERS

Rolling. Denver & Rio Grande Western Uses Car Dumper. Ry. Age, vol. 77, no. 25, Dec. 20, 1924, pp. 1115-1116, 3 figs. Details of rolling car dumper at Salida, Colo., to transfer coal, ore and other bulk materials from narrow-gage to standard-gage cars.

CAR WHEELS

Chilled-Iron. The Chilled Iron Car Wheel as an Economic Factor in the Development of Railways in China, E. S. Way. Assn. Chinese and Am. Engrs.—Jl., vol. 5, no. 18, Oct. 1924, pp. 17-28, 3 figs. Analysis of individual items of economy of chilled-iron wheel.

CARS

Dynamometer. New York Central Dynamometer Car. Ry. Age, vol. 77, no. 25, Dec. 20, 1924, pp. 1109-1112, 5 figs. Design and equipment of all-steel car in service on N. Y. C. for more than a year.

Straightening Frame for Steel. Steel Car Straightening Frame. Ry. Rev., vol. 75, no. 26, Dec. 27, 1924, pp. 1028-1030, 4 figs. Describes frame introduced for purpose of facilitating straightening of bent parts on steel cars; reduces cost of repair work.

Steel, Reclaiming and Scrapping of. Electric Arc Process of Reclaiming and Scrapping Steel Freight Cars, A. M. Candy. Am. Welding Soc.—Jl., vol. 3, no. 11, Nov. 1924, pp. 24-31, 4 figs. Results of comparative tests made by one railway in cutting rivets using air guns, oxy-acetylene torches and arc process. Notes on typical installations, time required to cut up a car, size of pieces into which a car must be cut, etc. Factors to be considered in planning an electrical installation for rivet cutting or car scrapping work.

CARS, PASSENGER

Articulated. The Articulated Car, W. G. Gove, N. Y. Railroad Club—Proc., vol. 35, no. 1, Nov. 21, 1924, pp. 7441-7461, 17 figs. Description of its design, history, character and methods of construction and operation. Bibliography.

CAST IRON

Chemical Equilibria during Solidification. Chemical Equilibria during Solidification and Cooling of White Cast Iron, H. A. Schwartz and Anna N. Hird. Min. and Metallurgy, vol. 6, no. 217, Jan. 1925, p. 3738. Results of experiments warrant conclusion that during freezing of ternary system iron-carbon-silicon, silicon will be rejected to liquid and will all be found in cutectic cementite, if cooling is slow enough to permit attainment of equilibrium. (Abstract.)

High-Tensile. High Tensile Cast Iron, A. Marks Foundry Trade Jl., vol. 30, no. 436, Dec. 25, 1924, pp. 545-547, 2 figs. Discusses methods of improving tensile strength of cast iron; influence of section; improving matrix; production of pearlitic cast iron.

Melting and Casting. The Melting and Casting of High-Duty Irons, F. Hudson. Foundry Trade Jl., vol. 30, no. 434, Dec. 11, 1924, pp. 495-501, 14 figs. By high-duty irons is meant that material used for manufacture of castings which have to withstand both pressure and friction, as in locomotive cylinders; melting in cupola; cupola reactions; carbonizing of metal during descent in cupola; superheating cast iron; conditions for carburization; methods in casting; pouring temperature.

Titanium in. The Analysis of Grey Iron Foundry Alloys. Foundry Trade Jl., vol. 30, no. 434. Dec. 11, 1924, pp. 503-504, 1 fig. Titanium in cast iron; estimation of titanium.

CEMENT

Tests. Experiments with High-Grade Cements (Versuche mit hochwertigen Zementen), K. Benn. Beton u. Eisen, vol. 23, no. 21, Nov. 5, 1924, pp. 281-283, 3 figs. Particulars of bonding tests with two slabs 3.62 m. by 12 cm. and 10 mm. thick, 1.5 in volume cement: gravel sand, hand mixed, theoretical load 150 kg-m2, increased to 225 kg/m2.

CEMENT MILLS

Fuel Economy. Fuel Economy in the Portland Cement Industry, Rob. W. Lesley. Engrs. & Eng., vol. 41, no. 11, Nov. 1924, pp 293-295. American and foreign practice; points out that future problem of cement industry is proper utilization of fuels near to plant itself, whether they are bituminous shale, lignite, low-grade coals or other such materials; and it depends upon proper distillation to recover oils, ammonia, gas, etc., leaving "spent" materials, containing ideal material for cement making, to be used in industry.

CEMENT, PORTLAND

Constitution. On the Constitution and Burning of Artificial Portland Cements, of hydraulic cementing materials other than artificial cements. Translated from Revue des Matériaux de Construction.

CENTRAL STATIONS

Auxiliary Control. Factor in Central Station Auxiliary Control, H. L. Smith. Power House, vol. 17, no. 20, Oct. 20, 1924, pp. 71-76, 1 fig. Explains importance of continuous service in steam-power station operation. Considers each auxiliary separately-insofar as types of drive are concerned.

Davenport, Ia. Riverside Station of the United Light & Power Co. (Davenport, Ia.). Power, vol. 61, no. 2, Jan. 13, 1925, pp. 46-51, 9 figs. Initial 25,000-kva. single-unit installation of 150,000-kw. ultimate plant; maximum use to be made of steam bled at four different points from main turbine for feedwater heating and air preheating; plant will have evaporator and combination convection and radiant superheaters.

Demand and Output Prediction. Predicting Central Station Demand and Output, F. C. Ralston. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 1, Jan. 1925, pp. 38-44, 10 figs. Investigation of nature of seasonal variations in daily load curve of company with which author is connected, as they affect output and peak demand; analysis of variation of kilowatt-hour output; factors for determining output on holidays, Sundays, Mondays and Saturdays, as compared with adjacent "normal" mid-week days.

Design. Some Considerations in Power Station Design, F. W. Lawton. Jr. Instn. Engrs., vol. 35, Pt. 1, Oct. 1924, pp. 1-17, 4 figs. Discusses some of the leading factors which contribute to economical design and operation of large central generating stations, employing steam turbine as prime mover.

Load Analysis, United States. Central-Station Load Analyzed. Elec. World, vol. 85, no. 1, Jan. 3, 1925, pp. 30-36. Iron and steel industry leads in consumption of electrical energy; statistical data on distribution of central-station energy in United States during 1923.

Producer-Gas-Engined. The Salisbury Producer Gas Engine Electric Plant. S. African Power Engr., vol. 9, no. 79, Nov. 1924, pp. 3-7, 6 figs. Describes new municipal producer-gas engine plant erected at Salisbury, S. Africa. Saving of 75 per cent in fuel costs; big increase in overall thermal efficiency.

State vs. Private Ownership. State versus Private Ownership of Electrical Utilities. A. T. Hadley. Nat. Elec. Light Assn. Bul., vol. 11, no. 10, Oct. 1924, pp. 613-617. After a dispassionate review of subject from standpoint of a student of political economy, author is of opinion that as electrical industries constitute a field where there is exceptional room for progress in immediate future, both on operating and on commercial side, it seems most undesirable that electric power generation should become a government monopoly. From paper before World Power Conference, Lond.

Wainwright Falls, Canada. Power Development at Wainwright Falls, J. S. Wilson. Can. Engr., vol. 47, no. 25, Dec. 16, 1924, pp. 595-599, 7 figs. Describes plant built on Wabigoon river for Dryden Paper Co., Ltd. Capacity 1400 hp. at 29-ft. head; total area of drainage basin 870 sq. mi.; details of Moody turbine and other equipment installed.

CHAINS

Malleable-Link. Mauufacture of Malleable Chain, H. R. Simonds. Abrasive Industry, vol. 5, no. 12, Dec. 1924, pp. 307-309, 7 figs. Chain links are molded carefully and finished by grinding on vitrified and rubber wheels; automatic machines are used for assembling.

CHIMNEYS

Reinforced-Concrete. Reinforced-Concrete in Stack Construction (Der Eisenbeton im Schornsteinbau), E. Lupescu. Beton u. Eisen, vol. 23, nos. 14 and 15, July 20 and Aug. 5, 1924, pp. 188-190 and 201-204. Discusses reinforced-concrete stack failures; critizes faulty constructions and proposes specifications for design and construction.

Standardization of Reinforced-Concrete Stacks (Zur Normung des Eisenbetonschornsteins), J. Hingerle. Beton u. Eisen, vol. 23, no. 21, Nov. 5, 1924, pp. 283-285, 3 figs. Discusses a wall unit of stack small enough to be heated as straight beam unit, and calculates bending moment and tension at edge due to temperature in connection with reinforcing, and crack formation in stacks, and makes corresponding suggestions for standard construction proposed in article by Lupescu.

CITY PLANNING

Canada. A Review of Recent Town Planning Accomplishment in Canada, H. L. Seymour. Contract Rec., vol. 38, no. 53, Dec. 31, 1924, pp. 1297-1301, 1 fig. Public interest in movement is being fostered and importance of subject impressed upon municipal bodies. Kitchener, Waterloo and Point Grey are most advanced in town planning progress.

CLUTCHES

Friction. Formulas and Data for Friction Clutches, Geo. W. Drake. Am. Mach., vol. 61, no. 25, Dec. 18, 1924, pp. 955-957, 4 figs. Formulas and data for cone, split-ring and disk friction clutches; practical examples of application of formulas.

COAL DEPOSITS

Correlation Problems. Some Coal-Seam Correlation Problems in Alberta, R. L. Rutherford. Can. Inst. Min. and Metallurgy—Monthly Bul., no. 152, Dec. 1924, pp. 942-951, 3 figs. Discusses difficulties involved in securing correlation information, and points out salient factors upon which correlation is dependent.

COAL HANDLING

Underground Transportation. Four-Mile Belt Line Carries 9,426 Tons of Coal in One Day at Frick Company Mine, Thos. W. Dawson. Coal Age, vol. 26, no. 26, Dec. 25, 1924, pp. 897-905, 5 figs. Methods employed by H. C. Frick Coke Co. in transporting coal; nineteen 48-in. belts and one 60-in. deliver to river dump all coal from three mines formerly entered by shaft; 35 cars discharged at one time by each of two revolving dumps.

COAL MINING

Machine Loading. Machine Loads 377 Tons into 2-Ton Cars in 8 hours from room Workings, A. F. Brosky. Coal Age, vol. 26, no. 25, Dec. 18, 1924, pp. 857-863, 9 figs. In mine at Braznell, W. Va., loading machines are applied successfully to room-and-pillar mining; average production per month in 289 tons; pillar coal is loaded mechanically.

Railway Transportation. The Railway's Part in Coal Mining, D. W. McDonald. Can. Inst. Min. and Metallurgy—Monthly Bul., no. 152, Dec. 1924, pp. 871-874. Outline of problem and general policy of taking care of normal traffic, and suggestion of ways in which, by means of co-operation, still greater efficiency could be obtained.

"V" System. Notes on Mining by the "V" System in West Virginia, J. C. Nicholson. Can. Inst. Min. and Metallurgy—Monthly Bul., no. 152, Dec. 1924, pp. 866-870, 1 fig. Advantages of system are enumerated.

COAL WASHING

Sand Flotation. Application of Sand flotation Process to the Preparation of Bituminous Coal, T. M. Chance. Min. and Metallurgy, vol. 6, no. 217, Jan. 1925, pp. 34-35, 2 figs. Describes method and apparatus used. (Abstract.)

COFFERDAMS

Stress Computation in Single-Wall. A Novel Method of Computing Stresses in a Single-Wall Cofferdam, H. A. Davies. Cornell Civ. Engr., vol. 33, no. 2, Nov. 1924, pp. 31-35, 2 figs. Method for designing structural elements of cofferdam, when sheeting is of uniform cross section, which can be applied to those calculations involved in determining stress distribution in a framed structure resisting lateral pressure, intensity of which increases directly as the depth.

COKE OVENS

Waste Heat and Gas Utilization. The Utilization of Waste-Heat and Surplus Gas from Coke-Ovens, I. C. F. Statham. Instn. Min. Engrs.—Trans., vol. 68, Pt. 3, Dec. 1924, pp. 234-261 and (discussion) 261-270, 16 figs. Composition of coke-oven gas. Discusses some of the methods employed for utilization of waste heat and surplus gas and summarizes results obtained in practice.

COLD

Production of. The Production of Cold, C. W. Kanolt. Optical Soc. Am.—Jl., vol. 9, no. 4, Oct. 1924, pp. 411-453, 7 figs. Freezing mixtures; cooling with solid CO_2 and by sprayed liquid; principles of mechanical cooling; thermodynamic charts; Carnot cycle; reversed Joule cycle; cycle with throttle expansion; heat interchange; Joule-Thomson effect and theory of Hampson liquefier; precooling and "cascade" system; Linde and Claude systems; construction and operation of Hampson liquefier; liquefaction of hydrogen and other gases; gas compressors; etc.

COLUMNS

Reinforced-Concrete. The Effect Upon Cost and Size—Using More Cement in Reinforced-Concrete Columns, J. T. Thompson. Concrete, vol. 25, no. 5, Nov. 1924, pp. 180-181, 4 figs. Gives curves demonstrating that considerable savings in both money and floor space can be effected by making reinforced-concrete columns of a richer concrete than is customarily used in building practice.

CONCRETE

Field Tests. Report on Field Tests of Concrete Used on Construction Work, W. A. Slater and S. Walker. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 1, Jan. 1925, pp. 3-61, 28 figs. Results of series of tests with object of determining whether recommendations of Joint Committee on Standard Specifications for Concrete and Reinforced Concrete were practical, especially as regards provisions for control of quality of concrete in field.

CONCRETE CONSTRUCTION

Winter Construction. Reminiscences of Winter Construction in British Columbia, A. M. Bouillon. Eng. News-Rec., vol. 93, no. 26, Dec. 25, 1924, pp. 1030-1032, 6 figs. Many bridge piers and other concrete structures on Grand Trunk Pac. Ry. constructed in sub-zero weather, often at reduced cost.

CONCRETE CONSTRUCTION, REINFORCED

Formwork Design. Design of Formwork for Reinforced Concrete Construction, A. E. Wynn. Concrete and Constr. Eng., vol. 19, nos. 9, 10, 11 and 12, Sept., Oct., Nov. and Dec. 1924, pp. 568-573, 639-644, 717-731 and 788-794, 11 figs. Sept.: Form building in general. Oct.: Materials, loads, pressures and stresses. Nov.: Theoretical design of forms. Dec.: Design tables.

CONCRETE, REINFORCED

Stresses in Circular Members. Determination of Bending and Shearing Stresses in Circular Reinforced Concrete Members, B. Wallach. Commonwealth Engr., vol. 12, no. 3, Oct. 1, 1924, pp. 89-93, 3 figs. Determination of stresses due to bending and shear in both hollow and solid circular sections when combined direct and bending stresses produce tension in section, exceeding allowable tensile stress in concrete.

CONDENSERS, ELECTRIC

Synchronous or Static. Control of Wattless Current in Power Systems, S. Q. Hayes. Power Plant Eng., vol. 29, no. 2, Jan. 15, 1925, pp. 141-145, 6 figs. Deals with synchronous and static condensers and their relative use.

CONVERTERS

Rotary. Rotary Converters, C. E. Bisdee. Elec. Engr., vol. 1, nos. 7 and 8, Oct. 15 and Nov. 15, 1924, pp. 241-248 and 293-298, 10 figs. Notes on voltage limitations and variation. Starting methods; telephonic disturbances; flashing.

Synchronous Rotary Converters. Power Plant Eng., vol. 29, no. 1, Jan. 1, 1925, pp. 35-38, 8 figs. Principles and methods of operation; motor generators; mercury-arc and vacuum-tube rectifiers.

CONVEYORS

Feeders for. The Importance of Feeders for Conveyors, M. W. Potts. Indus. Mgt. (N. Y.), vol. 69, no. 1, Jan. 1925, pp. 56-62, 12 figs. How proper feeding of materials affects conveyor operation.

COOLING TOWERS

Theory. A Theory of Cooling Towers Compared with Results in Practice, B. H. Coffey and Geo. A. Horne. Refrig. Eng., vol. 11, no. 6, Dec. 1924, pp. 187-192 and (discussion) 192-194 and 205, 5 figs. The Omega total-heat relation; cooling surface and heat transfer.

CO-OPERATIVE SOCIETIES

Developments. Co-operation. Monthly Labor Rev., vol. 19, no. 6, Dec. 1924, pp. 150-170. Co-operative banking; co-operative housing; failing co-operative societies; relations with trade-union organizations; relations between different forms of co-operation; question of extension of co-operative production; place of women in movement; employees' co-operative buying.

COPPER ALLOYS

Copper-Tin. On the Equilibrium Diagram of the Copper-Tin System, T. Isihara. Tôhoku Imperial University—Sci. Reports, vol. 13, no 1, Oct. 1924, pp. 75-100, 44 figs. partly on supp. plates. Results of experiments and conclusions; equilibrium diagram of copper-tin system is obtained by means of electric resistance measurement.

The Hardness of Copper-Tin Alloys (Die Härte der Kupfer-Zinnlegierungen), O. Bauer and O. Vollenbruck, Zeit. für Metallkunde, vol. 16, no. 11, Nov. 1924, pp. 426-429, 5 figs. Results of hardness determinations from heretofore published works; new plotting of complete hardness curve; hardness of bronze after quenching.

CORONA

Direct-Current. A Study of Direct-Current Corona in Various Gases, F. W. Lee and B. Kurrelmeyer. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 1, Jan. 1925, pp. 16-23, 13 figs. Critical corona intensities have been determined for helium, hydrogen, oxygen, nitrogen, air and CO_2 for pressures ranging from 2 to 760 mm.; influence of temperature on critical corona was investigated for hydrogen; it is shown that data obtained do not permit explanation of corona as process of ionization by collision, unless further assumptions are made, nature of which is not evident.

COST ACCOUNTING

Manafacturing Costs. Notes on Manufacturing Costs, J. de Boisgrollier. Foundry Trade Jl., vol. 30, no. 436, Dec. 25, 1924, pp. 543-544. Points out danger of quoting average prices; basic conditions for fixing cost; method advocated for control of manufacturing costs. Translated from paper presented to Assn. Technique de Fonderie.

No-Par-Value Stock. Some Questions on No-par-value Stock, F. H. Hurdman. Jl. Accountancy, vol. 39, no. 1, Jan. 1925, pp. 9-18. Discusses question as to whether earned surplus should be segregated on balance sheet and not shown as part of capital or capital surplus.

Standard Costs. Costs for Executives, N. A. Hall. Indus. Mgt. (N. Y.), vol. 69, no. 1, Jan. 1925, pp. 24-27. Defines standard costs and points out advantages of standard-cost system.

COUPLINGS

Safety, for Machine Drives. Safety Couplings for Machine Drives, F. Osgood Hickling. Am. Mach., vol. 61, no. 24, Dec. 11, 1924, pp. 921-923, 7 figs. Devices to prevent damage to machines when drives or feeds are overloaded, and which take place of "breaking pin" in light machines.

CRANES

Electric Tower. 5/13⅓-Ton Fixed Electric Tower Crane. Engineering, vol. 119, no. 3079, Jan. 2, 1925, pp. 13-14 and 16, 1 fig. Details of large crane erected at Hebburn shipyard of Wm. Arrol & Co., Glasgow.

D

DAMS

Failures. The Failure of the Gleno Dam. Engineer, vol. 138, no. 3598. Dec. 12, 1924, pp. 663-664. Findings of commissioners appointed to report on collapse and some independent criticisms.

Rock-Filled. The World's Highest Rock-Filled Dam, T. Marvin. Explosives Engr., vol. 2, no. 9, Sept. 1924, pp. 311-318 and 323, 18 figs. Construction work on dam being erected by Ky. Hydro-Electric Co. on Dix River. Blasting and transportation of 1,600,000 cu. hd. of rock are main factors.

DIES

Car Replacement Parts. Jigs and Dies to Reduce Shop Costs, Chas. Gordon. Am. Mach., vol. 62, no. 2, Jan. 8, 1925, pp. 55-58, 13 figs. Chicago surface lines use special tools to make many parts in punch presses; automatic stripping and ejection of finished parts speeds up production.

Roller-Bending, for Channels. A Roller Bending Die for Channels, E. Parsons. Forging—Stamping—Heat Treating, vol. 10, no. 12, Dec. 1924, pp. 455-456, 5 figs. Pieces are produced which are not marred in any way by bending die; material is plated and polished before bending operation, greatly reducing cost.

DIESEL ENGINES

Central Stations. The Diesel Engine in Small and Medium-Sized Power Plants, R. C. Burrus. Mech. Eng., vol. 47, no. 1, Jan. 1925, p. 18. Summary of points which should be considered in comparing Diesel installation and steam plant of same brake-horsepower rating. (Abstract.)

Compressorless. Compressorless Diesel Engines. Eng. Progress, vol. 5, no. 12, Dec. 1924, pp. 249-253, 11 figs. Antechamber Diesel engines; engines with jet atomization.

Problems of Development. Some Problem in Oil Engine Development, O. P. Robinson. Tech. Eng. News, vol. 5, no. 5, Dec. 1924, pp. 178-179 and 188, 2 figs. Discusses difficulties encountered in development of Diesel engines.

DREDGES

British Types. Some Recent British Dredgers. Engineer, vol. 138, no. 3599, Dec. 19, 1924, pp. 694-696, 6 figs., partly on p. 698. Describes examples of dredgers shown in model form at Wembley Exhibition, built by three Scottish firms. Including suction type, dipper dredger, and rock cutter.

DRILLING MACHINES

Design. A Study of Drilling Machines, Jos. G. Horner. Machy. (Lond.), vol. 25, no. 636, Dec. 4, 1924, pp. 297-298. Details of design and developments, with reference to geared speeds and feeds, high-speed steel, spindles, tables, etc.

DRYDOCKS

Repairing Leaks. Repairing Leaks in a Drydock by Grouting, W. Mach. Angas. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 1, Jan. 1925, pp. 62-79, 7 figs. Describes how serious leakage which was eroding foundations of 1022-ft. dry dock at Philadelphia Navy Yard was successfully stopped in 1921; grouting by pneumatic process while pressure below dock was relieved through vent in floor was decided on as most practical method of repairing dock; repair work consisted not only of stopping leaks through construction joints, but also of closing fissure in clay stratum that was feeding leaks, and of filling cavity which had been eroded under floor of dock.

E

ECONOMIZERS

Efficiency. Examination and Opinion on Economizers (Beitrag zur Untersuchung und Begutachtung von Bauchgasherzkörpern), G. Poloich. Feuerungstechnik, vol. 13, no. 5, Dec. 1, 1924, pp. 45-47. Report of experiment station of Technical Institute in Vienna on efficiency of economizers applied to house heating, showing that no advantage is derived from their application if stoves are properly constructed.

EDUCATION, ENGINEERING

Professional Training, and. College Education and Professional Training, W. E. Wickenden. Jl., Eng. Education, vol. 15, no. 3, Nov. 1924, pp. 180-183. Characteristics of collegiate education and professional training.

Professional Training beyond Undergraduate Course. The Four-Years Course and after, J. B. Whitehead. Jl. Eng. Education, vol. 15, no. 3, Nov. 1924, pp. 184-189. Points out that industry must do more to emphasize importance of continuance of formal professional training beyond undergraduate years, and that for correction of present unfortunate conditions, some kind of united action on part of industry is necessary, in offering encouragement to certain number of promising young men each year to go forward into advanced work.

Selective Sectioning in Thermodynamics. Selective Sectioning in Thermodynamics. A Progress Report on a Continuing Pedagogical Experiment, Geo. W. Munro. Jl. Eng. Education, vol. 15, no. 3, Nov. 1924, pp. 202-213. In June 1924, Purdue Univ. completed third semester of experiment in selective sectioning of students in thermodynamics; author, who is professor of thermodynamics at University, sets forth object sought, methods employed, difficulties encountered and results secured.

ELECTRIC DISTRIBUTION SYSTEMS

Artificial Representation. Artificial Representation of Power Systems, H. H. Spencer and H. L. Hazen. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 1, Jan. 1925, pp. 24-31, 11 figs. Work done by authors in Research Laboratory of Mass. Inst. Technology in designing, building, and testing apparatus for setting up miniature networks, using generating station powers of 100 watts or less; complete voltage, current, and power solutions were made on several arbitrary networks.

Fault-Resistance Determination. The Measurement of the Fault Resistance of a 2-Wire Direct-Current System, G. W. Stubbings. Elec. Rev., vol. 95, no. 2452, Nov. 21, 1924, pp. 769-770, 2 figs. Describes test which is particularly applicable to 2-wire networks working with negative permanently earthed through low resistance.

Protective Gear for. Protective Gear for Electric Power System, H. Trencham. World Power, vol. 2, no. 12, Dec. 1924, pp. 328-333. Its justification and application; protective gear for generators and transformers; radial or dead-end feeders; alternative and parallel feeders; ring feeders.

Three-Wire. Three-Wire Generating Systems. Power Plant Eng., vol. 29, no. 1, Jan. 1, 1925, pp. 24-26, 13 figs. Different methods of supplying 3-wire systems; use of balancer sets; methods of connecting field.

ELECTRIC FURNACES

Bronze Foundry. Electric Furnace Practice in the Bronze Foundry, F. C. Heath. Am. Electrochem. Soc.—advance paper for mtg. Oct. 2-4, 1924, pp. 451-454. Foundry installed in Detroit, Mich., has installed 5 Detroit electric furnaces of indirect arc, rocking type.

Granular Resistor. The Granular Resistor Furnace, O. P. Watts. Optical Soc. Am.—Jl., vol. 9, no. 6, Dec. 1924, pp. 705-707. Useful for heating tubes and crucibles to temperatures attainable only by electric furnace, and where greater uniformity of heat is required than can be obtained by arc; it is most convenient method of melting metals and alloys in amounts of 100 to 1000 grams; voltage and power requirements; Operation.

Heat-Treating. Electric Heat Treating, A. M. Perry. Elec. World, vol. 85, no. 3, Jan. 17, 1925, pp. 145-147, 2 figs. Automobile manufacturer strongly indorses it, basing his opinion on long experience; compares it with fuel-fired process; furnace construction, operation, replacement of heating units, cost of operation.

Metals Refining. Refining Metals Electrically, L. J. Barton. Foundry, vol. 52, nos. 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23 and 24. June 1, 15, July 1, 15, Aug. 1, 15, Sept. 1, 15, Oct. 1, 15, Nov. 1, 15, Dec. 1 and 15, 1924, pp. 427-432, 460-462, 506-509, 542-547, 606-610, 640-642 and 652, 671-674, 726-729, 782-784 and 788, 813-815, 861-864, 897-899, 932-936 and 951, and 967-970 and 977, 29 figs. June: Compares electric melting with other and earlier methods of producing steel for castings. June 15. Primary consideration which should govern selection of electric furnace. July 1: Compares basic and acid lined furnaces. July 15, Aug. 1, 15 and Sept. 1: Discussion of furnace installation, maintenance and operation, from practical standpoint, Sept. 15: Points which should be watched in buying scrap. Oct. 1: Two-slag and one-slag methods of making basic plain carbon steel. Oct. 15: Chemical reactions. Nov 1: Advantages and methods of using fluorspar and other slags. Nov. 15: Determining final pouring temperature; making ladle additions. Dec. 1: Slag basic process; making acid steel; melting down charge. Dec. 15: Analysis controlled by slag manipulation; causes of oxidation.

Steel-Melting. Operating Data for an Electric Steel-Melting Furnace, F. L. Landon. Jl. Electricity, vol. 53, no. 12, Dec. 15, 1924, pp. 434-436, 8 figs. Operating results from a 6-ton 3-phase Heroult furnace in Sacramento shops of Southern Pac. Co.

ELECTRIC GENERATORS

Electromotive Force, Production of. Production of E. m. f.'s in a Generator. Power Plant Eng., vol. 29, no. 1, Jan. 1, 1925, pp. 4-7, 21 figs. Alternating e.m.f. of single turn; effect of distributed coil; phase relations of separated coils; production of direct e.m.f.

ELECTRIC GENERATORS, A. C.

Parallel Operation. Parallel Operation of A. C. Generators. Power Plant Eng., vol. 29, no. 1, Jan. 1, 1925, pp. 33-35, 4 figs. Points out that care must be used in synchronizing and in properly distributing load between machines to reduce cross currents.

ELECTRIC LOCOMOTIVES

Industrial. Electric Industrial Locomotives, F. E. Fisher. Iron and Steel Engr., vol. 1, no. 12, Dec. 1924, pp. 628-633, 4 figs. Points out problems which must be considered in selecting type or design of locomotive.

Switching. High-Power Battery Locomotives for Shunting Purposes, M. Hiertzeler. Brown Boveri Rev., vol. 11, no. 10, Oct. 1924, pp. 215-219, 6 figs. Battery locomotive, class E 421, supplied to Italian State Railways; battery locomotives for Swiss Federal Railways.

ELECTRIC MOTORS

Types and Practice. A. C. and D. C. Electric Motors. Power Plant Eng., vol. 29, no. 1, Jan. 1, 1925. Group of articles, as follows: Operation, Design, Control and Uses, pp. 54-55, 3 figs.; Types of Direct Current Motors, pp. 56-58, 10 figs.; Methods of Controlling Speed of D. C. Motors, pp. 58-60, 8 figs.; Characteristics of A. C. Motors, pp. 60-62, 8 figs.; Methods of Controlling Speed of A. C. Motors, pp. 62-65, 8 figs.; Types of Motors for Different Uses, pp. 65-67, 2 figs.; Details of A. C. Motors, pp. 68-70, 9 figs.

ELECTRIC MOTORS, A.C.

Squirrel-Cage. Squirrel-Cage Induction-Motor Core Losses. T. Spooner. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 1, Jan. 1925, pp. 32-37, 11 figs. Experimental method for segregating various no-load losses of squirrel-cage induction motor; it is shown that for insulated rotor bars losses consist principally of stator fundamental-frequency losses, rotor-surface losses and eddy-current losses in rotor bars due to radial and tangential slot-leakage fluxes in rotor slots caused by reluctance pulsations in air gap between stator and rotor teeth.

Synchronous. Complete Synchronous Motor Excitation Characteristics, J. F. H. Douglas, E. D. Engeset and Tob. H. Jones. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 1, Jan. 1925, pp. 11-15, 12 figs. Shows complete synchronous motor characteristics, experimentally determined, differing materially from published curves determined by theory; these differences are discussed, and their cause attributed to variations in synchronous impedance; experimental data showing factors on which synchronous impedance depends, and how it varies with current, saturation and power factor.

ELECTRIC TRANSMISSION LINES

Construction Cost Keeping. Line Construction Cost Keeping, F. H. Miller and F. W. Fackle. Elec. World, vol. 84, no. 26, Dec. 27, 1924, pp. 1349-1351, 4 figs. Simplified records determine continuous status of work under progress; foremen's reports constitute bases of accounting system followed by auditor serving with the force in field.

Long. Stability of. Stability of Long Transmission Lines, C. D. Gibbs. Elec. World, vol. 85, no. 3, Jan. 17, 1925, pp. 143-145, 2 figs. Depends on speed with which reactive kva. can be added to system; illustrative problems and data necessary to determine stability limits; general solution offered.

Sectionalizing High-Voltage. Sectionalizing of High-Voltage Lines, Geo. H. Middlemiss. Elec. World, vol. 84, no. 26, Dec. 28, 1924, pp. 1363-1365, 5 figs. Describes automatic apparatus developed by Ala. Power Co.; switch has several unusual design features.

ELECTRIC WELDING

Machines. The A. I. Electric Welders. Engineering, vol. 118, nos. 3075 and 3077, Dec. 5 and 19, 1924, pp. 764-765 and 827-829, 14 figs. Describes electric welder for stator windings, and types of spot, butt and seam welders manufactured by A. I. Elec. Welding Appliances Co., London.

ELECTRIC WELDING, ARC

Optical Projection of. Optical Projection of Arc Welding, F. Davis. Am. Welding Soc.—Jl., vol. 3, no. 11, Nov. 1924, pp. 18-20, 2 figs. Brief description of machine built in order to more clearly bring out details of arc welding and to make it possible for a large audience to witness a demonstration. Used in connection with any stereopticon or moving-picture screen, only other apparatus needed being outfit for semi-automatic welding or hand welding.

ELECTRICAL APPARATUS

Control. Electrical Control Apparatus. Power Plant Eng., vol. 29, no. 1, Jan. 1, 1925. Group of following articles: Switches, Circuit Breakers, Reactors, Relays, Voltage Regulators and Remote Control, pp. 84-86, 7 figs. Use of Switchboards and Protective Devices, pp. 86-91, 12 figs.; Signal Systems and Remote Control, pp. 91-93, 1 fig.

ELECTROMETALLURGY

Applications. Electro-Metallurgical Applications, J. L. McK. Yardley. Blast Furnace & Steel Plant, vol. 12, no. 12, Dec. 1924, pp. 532-535, 1 fig. and vol. 13, no. 1, 1925, pp. 20-25 and 30, 11 figs. Discussion of electric-power utilization developments which are based on fundamental principles of physical chemistry and electrochemistry; deals only with metals which are ordinarily employed in construction or manufacture and in production of which large quantities of electric power are employed; compares smelting and electrolytic methods; data and illustrations on plants and equipment for production of iron, zinc, copper, aluminum, etc.

ELEVATORS

Traction-Type Equipment. Operation of Electric Elevator Machines—Traction Type Equipment, F. A. Annett. Power, vol. 61, no. 2, Jan. 13, 1925, pp. 54-57, 8 figs. Construction of drum-type and traction-type elevator machines; operation of traction type.

EMPLOYEES

Safeguarding Health. Take Care of the Workman, H. S. Riggs. Am. Mach., vol. 62, no. 1, Jan. 1, 1925, pp 17-19, 7 figs. Work of General Safety Committee of Lodge & Shipley Machine Tool Co., Cincinnati, in safeguarding health.

EMPLOYMENT MANAGEMENT

Stimulating Efficiency in Personnel. Building Permanency into Personnel, Wm. Davenport. Power, vol. 61, no. 3, Jan. 20, 1925, pp. 105-106. Points out importance of giving a man the right attitude in early stages of his employment; stimulating employee to work efficiently; working out wage scale.

ENTROPY

Absolute Value Calculation. Calculation of Absolute Value of Entropy by Means of Third Law of Thermodynamics (Die Berechnung des absoluten Wertes der Entropie mit Hilfe des 3. Wärmesatzes), Schmolke. Warme, vol. 47, no. 40, Oct. 3, 1924, pp. 465-468, 1 fig. Shows under what conditions third law may be used for determination of entropy.

EXPLOSIVES

Progress in. Twenty-Five Years' Progress in Explosives, Chas. L. Reese. Franklin Inst.—Jl., vol. 198, no. 6, Dec. 1924, pp. 745-768, 4 figs. Deals particularly with developments in America; progress in black powder; dynamite; nitroglycerine; separation of nitroglycerine; low-freezing and non-freezing explosives; permissible explosives; substitutes for nitroglycerines.

F

FEEDWATER HEATERS

Locomotive. Feed-Water Heaters Difficult to Machine. Iron Age, vol. 114, no 25, Dec. 18, 1924, pp. 1605-1607, 5 figs. Cost-saving practices of Worthington Pump & Machy. Corp. in manufacture of locomotive feedwater heaters and pumps.

FIREPROOFING

Timber. The Oxylene Timber Fireproofing Process. Engineering, vol. 119, no. 3079, Jan. 2, 1925, pp. 11-13, 5 figs. Describes method of Timber Fireproofing Co. and gives details of disposition and nature of plant employed at Market Bosworth Works of Company.

FLOORS

Factory. Choosing the Factory Floor, B. R. Magee and H. K. Ferguson. Indus. Mgt. (N.Y.), vol. 69, no. 1, Jan. 1925, pp. 28-32. Analysis of various types of flooring and their application to specific conditions.

What is the Best Factory Floor Surface? A. B. MacMillan, Contract Rec., vol. 38, nos. 49, 50, 51 and 52, Dec. 3, 10, 17 and 24, 1924, pp. 1188-1190, 1208-1210, 1228-1230 and 1228-1254, 7 figs. Discussion of the various kinds of flooring and advantages, disadvantages and special uses of each.

FLOW OF FLUIDS

Theory. A New Theory of Fluid Flow, A. B. Cox. Franklin Inst.—Jl., vol. 196, no. 6, Dec. 1924, pp. 769-793, 12 figs. Examination of velocity-distribution curves accompanying this paper shows that whether rate of flow is above or below critical, elements of flow at different distances from center line of pipe have different forward velocities, and that these elements must be considered to "slide" or otherwise move relative to one another in this direction; author states there is a force by which molecules of various elements of flow are each enabled to affect speed of others; this phenomenon is cause of characteristic shape of curve of velocity-distribution, and upon it a mathematical proof of logarithmic form of curve can be based. Bibliography.

FLOW OF WATER

Measurement. New Methods of Calculation in Hydraulics (Neuere Berechnuntgsmethoden aus dem Cebiete derH ydraulik), E. Meyer-Peter. Schweizerische Pauzeitung, vol. 84, nos. 1 and 2, July 5 and 12 1924, pp. 1-5 and 15-18, 31 figs. Details of newformula for calculating velocity of flow, coefficient of roughness; artificial water conduit with free water level. Graphic method of determining hydraulic data for design of high-pressure plants.

Pipes. The Flow of Water in Pipes and Channels, F. Heywood. Engineering, vo. 119, no. 3080, Jan. 9, 1925, pp. 41-42. Account of attempt to co-ördinate much of available data relating to flow of water in conduits with entirely satisfactory results of tests on small-scale experimental pipe lines. (Abstract.) Paper read before (Brit.) Instn. Civ. Engrs.

FLUIDS

Pressure Measurement. The Measurement of Pressure, J. L. Hodgson. Inst. Mar. Engrs.—Trans., vol. 36, Dec. 1924, pp. 487-522 and (discussion) 522-563, 51 figs. Methods of pressure measurement; fundamental and secondary methods; notes on use of fluid manometers; Bourdon gage; recording pulsating pressures. Bibliography.

FLYING BOATS

Canadian Royal Air Force. Canadian Government Requirements for Aircraft. Aviation, vol. 18, no. 2, Jan. 12, 1925, pp. 49-50, 1 fig. Describes three types which Roy. Can. Air Force have decided are most suitable for their present requirements, namely, forest-fire-suppression type, photographic boat, and fire-detection type, the first two being flying boats, and the third a single-float seaplane.

FLYWHEELS

Explosions. Causes of Flywheel Explosions Revealed, Edw. Ingham. Power, vol. 61, no. 2, Jan. 13, 1925, pp. 58-59, 4 figs. Generally caused through wheels running at greater speed than that at which they are intended to run; function of governor; electric stop motions.

FOUNDATIONS

Underpinning. Underpinning Printing Plant for New Deep Foundations. Eng. News-Rec., vol. 93, no. 25, Dec. 18, 1924, pp. 982-985, 6 figs. Large newspaper presses carried by jacks and blocking while wells for concrete piers are sunk 120 ft. through clay to rock in supporting building which contains printing plant of Chicago Tribune.

FOUNDRIES

European Continental Practice. Some Further Reflections on Continental Foundry Methods, A. S. Beech. Foundry Trade Jl., vol. 30, nos. 435 and 436, Dec. 18 and 25, 1924, pp. 515-518 and 537-541, 19 figs. Notes on pattern drawing; double-faced pattern plates; ramming of sands; refers also to what is known in France as "rehausse inférieure", and in Great Britain as down-sand frames; sand considerations and comparisons; sand preparation, milling and disintegrating.

General Expenses, Allocation of. The Allocation of General Expenses. Foundry Trade Jl., vol. 30, no. 434, Dec. 11, 1924, p. 504. Belgian Commission appointed to consider manufacturing costs has recommended that overhead expenses, should be divided into sectional costs and general expenses, common to all orders, or general cost of administration. Translation of report presented by Belgian Foundrymen's Assn. to Congress of Assn. Technique to Fonderie.

FOUNDRY EQUIPMENT

Sand-Handling and Mixing. Equipment Speeds Output. Foundry. vol. 52, no. 24, Dec. 15, 1924, pp. 971-977, 17 figs. Continuous system, in use at foundry of Wilson Bros., Pontiac, Mich., involves mechanical equipment for handling sand, molds, iron and castings, resulting in increased production from decreased floor space in auto shop.

FUELS

Gaseous. Fuel of the Future. What Shall It Be?, I. Ginsberg. Am. Gas Jl., vol. 121, nos. 20, 24 and 28, Oct. 18, Nov. 15 and Dec. 13, 1924, pp. 1081-1082 and 1095-1098; 1173-1174 and 1189-1190; 1261-1262 and 1275-1277. Oct. 18: Value of gas as a fuel and its calorific power. Nov. 15: Heat treatment of metals. Dec. 13: Heat treatment of metals; general details of process.

Heating Value. Relative Heating Value of Fuels, R. O. Wynne-Roberts. Can. Engr., vol. 47, no. 27, Dec. 30, 1924, pp. 643-644. Important factors to be considered when comparing value of fuels. Kitchen and furnace tests. Paper read before Can. Gas Assn.

Oil. *See Oil Fuel.*

Pulverized Coal. *See Pulverized Coal.*

FURNACES

Malleable, Pulverized-Fired. Pulverized Fired Malleable Furnaces, S. Westberg. Blast Furnace & Steel Plant, vol. 13, no. 1, Jan. 1925, pp. 46-47, 2 figs. Search for closer economics has focused attention upon regenerators.

FURNACES, CRUCIBLE

High-Temperature Solid-Fuel. A High Temperature Fuel Furnace for Crucibles, Wm. Mason. Chem. Eng. and Min. Rev., vol. 17, no. 194, Nov. 5, 1924, pp. 55-57, 7 figs. Details of solid-fuel high-temperature furnace for melting alloys.

FURNACES, HEATING

Oil-Burning. Furnace Installation for Heating Nickel, Geo. Ellerton. Jr. Iron Age, vol. 114, no. 25, Dec. 18, 1924, pp. 1595-1597, 4 figs. Double-chamber oil-fired units for heating slabs for rolling and for annealing, installed in plant of Am. Nickel Corp., Clearfield, Pa.; automatic control provided.

Regenerative. New Furnaces Serve Forge Press. Iron Trade Rev., vol. 75, no. 25, Dec. 18, 1924, pp. 1648-1650, 3 figs. Unit completed by A. Finkly & Sons Co., Chicago, forging manufacturer, is equipped with five oil-fired, regenerative-type heating furnaces and 1000-ton steam-hydraulic press; finishing department is included.

FURNACES INDUSTRIAL

Combustion Devices. Combustion Devices for Gaseous Fuels, W. Trinks. Fuels & Furnaces, vol. 2, nos. 10, 11 and 12, Oct., Nov. and Dec. 1924, pp. 1035-1038, 1157-1160 and 1249-1252, 31 figs. Their classification and description of those types mixing gas and air inside furnace. Burners which induce air from atmosphere with varying degrees of premixing. Burners which work with complete mixing of gas and air before mixture enters furnace proper.

G

GAS ENGINES

Compression in. Experiments on Compression in Gas Engines (Etude expérimentale de la compression dans les moteurs à gaz), A. Jadot. Revue Universelle des Mines, vol. 4, nos. 2 and 3, Oct. 15 and Nov. 1, 1924. pp. 62-88 and 122-148, 20 figs. Discusses phenomena produced during period of compression, determining gas mixture in cylinder. Measurement of leakages; research on law of variation of leakages; influence of leakages on final pressure of compression; effect of cylinder walls; theoretical laws of compression. Investigation of law of compression by means of indicatord iagrams. Effect of compression on efficiency of engine. Full load and no load compression.

Piston and Exhaust-Valve Temperatures. Gas Engine Piston and Exhaust Valve Temperatures, F. R. B. Watson. Engineering, vol. 139, no. 3079, Jan. 2, 1925, pp. 1-2, 1 fig. Results of series of 11 tests, at constant engine speed and using normal charges throughout, on 12-i.hp. Crossley gas engine, which, show variation in piston and exhaust-valve temperatures in this engine brought about by changes in conditions of running.

GAS PRODUCERS

Mechanical. The Wellman Mechanical Gas Producer. Engineering, vol. 119, no. 3080, Jan. 9, 1925, pp. 37-40, 14 figs. Describes gas producer in which mechanical operation is developed to fullest extent, and rotating parts are producer body and ash pan, while top supporting coal feed remains stationary.

GEAR CUTTING

Sykes Generator. Gear Shaping, with Particular Reference to the "Sykes" Generating System, O. H. Medcalfe. Eng. Production, vol. 7, no. 147, Dec. 1924, pp. 349-352, 6 figs., and (discussion), vol. 8, no. 148, Jan. 1925, pp. 22-24, 1 fig. Deals principally with straight spur, single, double helical, and internal gears connecting parallel shafts; describes Sykes double helical gear generating machine S. D. H. 12.

GEARS

Planetary. Planetary Gearing, F. DeR. Furman. Machy. (N.Y.), vol. 30, no. 12, and vol. 31, nos. 1, 2, 3 and 4, Aug., Sept., Oct., Nov. and Dec. 1924, pp. 398-941, 6-9, 95-98, 175-178 and 311-314, 22 figs. Complete treatise on simplified solutions of various planetary-gear problems, including reliable graphical method of checking calculations. Sept.: Review of principles; racks as driving and fixed members; double planet wheels; multiplying and reversing actions. Oct.: Combinations in which arm for planet wheels is keyed to driving shaft; methods of solution when planet wheel arm is an idler. Nov.: Analysis of planet-wheel motion. Dec.: Effects of using different pitches for different pairs of mating gears. See also Machy. (Lond.), vols. 24 and 25, nos. 623, 625, 629 and 634, Sept. 4, 18, Oct. 16 and Nov. 20, 1924, pp. 705-708, 802-805, 65-68, and 233-236, 17 figs.

Teeth, Strength of. The Effect of Inaccuracy of Spacing on the Strength of Gear Teeth, L. J. Franklin and Chas. H. Smith. Mech. Eng., vol. 47, no. 1, Jan. 1925, pp. 29-32, 8 figs. Results of tests made in order to obtain definite data as to effect of inaccuracy of spacing on strength of teeth at high speeds; it was found that, in broad way, at pitch velocities of 1000 ft. per min. and upward, gears whose inaccuracies of spacing do not exceed 0.001 in. will carry twice load that those having inaccuracies of spacing of 0.006 in. will; and strength of gears having inaccuracies of spacing of order of 0.002 in. is about half-way between two.

Testing. Gear-Testing. Machine Designed for A.S.M.E. Research Work, Mech. Eng., vol. 47, no. 1, Jan. 1925, p. 24, 1 fig. Describes machine designed by W. Lewis as result of research activities of A.S.M.E., purpose of which is primarily to determine effect of varying degrees of tooth accuracy and varying velocities on strength of gear teeth.

Gear-Tooth Testing, Jos. Horner. Engineering, vol. 118, nos. 3073 and 3077, Nov. 21 and Dec. 19, 1924, pp. 696-698 and 821-823, 21 figs. Discusses methods and machines.

GIRDERS

Shear, Effect of Taper on. The Effect of Slight Taper on Shear in a Girder, L. N. G. Filon. Engineering, vol. 118, no. 3076, Dec. 12, 1924, p. 789, 2 figs. Results of author's calculations show that taper, even slight, may seriously disturb the de Saint-Venant parabolic distribution of shear over section, although Euler-Bernouilli formula for normal stress remains a good approximation; presents formula which provides simple and easily applied correction to shear over any region in which there exists uniform taper.

GRINDING

REGRINDING AUTOMOBILE PARTS. Regrinding of Automobile Parts, F. B. Jacobs. Abrasive Industry, vol. 5, no. 12, Dec. 1924, pp. 296-299, 9 figs. Cylinders are finished to standard oversizes and fitted with new pistons, rings and wrist pins; inspection an important item.

H

HARDNESS

TESTING. Hardness and Hardness Testing, L. B. Tuckerman. Mech. Eng., vol. 47, no. 1, Jan. 1925, pp. 53-55. Kind of clarification needed in ideas regarding hardness; two purposes of hardness testing; uniformity tested by hardness: hardness tests in specifications.

HEAT

RADIATION. New Data on Heat Radiation, A. Schack. Mech. Eng., vol. 47, no. 1, Jan. 1925, pp. 41-44, 4 figs. Notes based on investigations carried out in Düsseldorf at Heat Research Bur. of Assn. of German Iron Makers; radiation from surfaces met with in practice; heat transfer in furnaces; radiation of gases. Translated from Zeit. des Vereines deutscher Ingenieure, vol. 58, no. 39, Sept. 1924.

HEAT TRANSMISSION

CONVECTION. Heat Transfer by Convection, T. S. Taylor. Optical Soc. Am.—Jl., vol. 9, no. 6, Dec. 1924, pp. 693-700. In considering total heat loss when forced convection is involved, loss by radiation plays rather unimportant part; such is by no means the case for free convection, and for this reason exact knowledge of methods of accurately determining surface temperatures and radiation constants would be very helpful.

THERMAL CONDUCTIVITY. Methods of Measuring Thermal Conductivity in Solids and Liquids, L. R. Ingersoll. Optical Soc. Am.—Jl., vol. 9, no. 4, Oct. 1924, pp. 495-501. Linear-flow, radial-flow and periodic-flow methods.

HEAT TREATMENT

ECONOMIC VALUE OF B. T. U. Intrinsic Value of Heat Sources versus the Fluctuating Economic Value of the B.T.U., E. F. Collins. Am. Soc. Steel Treating—Trans., vol. 7, no. 1, Jan. 1925, pp. 82-100 and (discussion) 123-130, 23 figs. Points out that there is little of value in knowing relative British thermal unit costs for heat source unless all conditions surrounding use of heat source are also known; gives examples showing by areas of triangles, which represent heat energy value, how intrinsic value of British thermal unit fluctuates from one value to another due to different conditions of utilization, etc., from which it is concluded that highest "Overall" economy in heat-treating-processes often demands electric heat rather than fuel heat with its lower British thermal unit cost.

FUELS, SELECTION OF. Selection of Fuels for the Heat Treatment of Metal, J. A. Doyle. Am. Soc. Steel Treating—Trans.,vol. 7, no. 1, Jan. 1925, pp. 101-106, In selection of fuel, first considerations should be of quality and cost of finished product and comfort of operatives; all comparisons of fuels should be based on consideration of results desired under specific conditions and with equipment properly adapted to each.

HEATING, ELECTRIC

BUILDINGS. Electric Heating of Buildings (Elektrische Raumheizung), M. Hottinger. Gesundheits-Ingenieur, vol. 47, nos. 47 and 48, Nov. 22 and 29, 1924, pp. 549-556 and 561-570, 69 figs. Discusses Swiss conditions, and shows that even in great water-power countries general electric house heating is precluded. Details of resistance, electrode and induction heating, and examples of some installations. Electric heating of railway cars.

INDUSTRIAL. The Paradox of Electric Heating, C. L. Wilson. Indus. Mgt. (N. Y.), vol. 69, no. 1, Jan. 1925, pp. 45-48. Explains why most expensive form of heat often proves to be cheapest. Varied uses of electric heat in modern industries; costs to be considered; where electric heat is best; automatic regulation.

HEATING, HOT-AIR

HOT-AIR. Principles of Design in Furnace Heating. Sheet Metal Worker, vol. 15, nos. 6, 8, 10, 12, 13, 15, 16, 17, 18, 21, 22 and 23, Apr. 11, May 9, June 6, July 4, 18, Aug. 15, 29, Sept. 12, 26, Nov. 7, 21 and Dec. 5, 1924, pp. 199-201; 277-279; 373-376 and 404; 460-461 and 484; 502-505 and 524; 565-568; 604-606; 640-642; 680-682; 788-790; 830-833; and 867-869 and 887, 51 figs. Apr. 11: General outline of procedure to be followed in designing a gravity warm-air heating installation. May 9: Factors affecting determination of leader sizes. June 6: Simplified method of determining leader sizes, based on standard code for regulating installation of warm-air furnaces in residences. July 4, 18, Aug. 15, 29, Sept. 12 and 26: Factors affecting determination of wall stack sizes. Nov. 7: Effect of various insulating coverings for leaders and heat loss therefrom. Nov. 21: Effect of insulation of warm-air leader pipes upon plant operation. Dec. 5: Relation between stack size and temperature drop.

HEATING, HOT-WATER

GRAVITY SYSTEMS. A Short, Practical Method of Designing Gravity Water Heating Systems, F. E. Giesecke. Heat. & Vent. Mag., vol. 21, nos. 1, 2, 4, 6, 8 and 10, Jan., Feb., Apr., June, Aug. and Oct., 1924, pp. 41-47, 59-61, 47-51, 45-50, 53-55 and 52-57, 18 figs. Six illustrative problems frequently encountered in practice, and their solutions.

HEATING, HOUSE

GAS. Practical Notes on House-Heating by Gas, Heat, & Vent. Mag., vol. 21, no. 12, Dec. 1924, pp. 43-47, 6 figs. Data compiled by Am. Gas Assn.; includes chart for estimating gas requirements for steam, water and warm-air heating systems, and explains how to use chart; cross-connecting coal and gas boilers; thermostatic control.

OIL. Heating the Small Residence with Oil, C. F. Olmsted. Sheet Metal Worker, vol. 15, no. 6, Apr. 11, 1924, pp. 197-198 and 232. Regulations of Nat. Board of Fire Underwriters for construction and installation of oil burning equipments for domestic use and for storage and use of oil fuels used in connection therewith as recommended by Nat. Fire Protection Assn.

HEATING, STEAM

PROCESS. New Process of Plant Heating, Chr. Eberle. Mech. Eng., vol. 47, no. 1, Jan. 1925, pp. 44-45, 2 figs. Author describes new process of heating which he claims permits increasing efficiency of steam-heating plant without lowering heating temperature. Translated and abstracted from Zeit. des Vereines deutscher Ingenieure, vol. 68, no. 39, Sept. 27, 1924.

HELIUM

CANADA. Helium in Canada, R. T. Elworthy. Can. Min. Jl., vol. 45, no. 51, Dec. 19, 1924, pp. 1233-1235. Deals with helium versus hydrogen, proved superiority of helium in Canada, and steps required for progress.

HIGHWAYS

RESEARCH. Some Recent Developments in Highway Research. Eng. News-Rec., vol. 93, no. 24, Dec. 11, 1924, pp. 957-959. Abstracts of reports of committees of Advisory Board on Highway Research, as follows: Objects and methods of Highway Transportation Surveys, G. E. Hamlin; Structural Design of Highway, A. T. Goldbeck; Disk Shear Test for Road Soils, C. M. Strahan.

HYDRAULIC TURBINES

DEVELOPMENT. Modern Hydraulic Turbines and Cheaper Power, Johnstone-Taylor. Power House, vol. 17, nos. 6, 7, 10, 12, 15, 16, 17, 18, 19 and 20, Mar. 20, Apr. 5, May 20, June 20, Aug. 5, 20, Sept. 5, 20, Oct. 5 and 20, 1924, pp. 32 and 46; 21-22; 30-31; 34-35; 39 and 51; 32; 31 and 44; 22-23; 24-25; and 91-93; 23 figs. Development of modern hydraulic turbine. Mar. 20: Predicts manufacturing concerns of future will locate their plants, in absence of cheap hydro-electric power, in locations where water resources are available. Apr. 5: Types best adapted for high and low heads as well as for small and large units. May 20: Field of Pelton wheel. June 20: Electric practice of to-day demands governing mechanism capable of insuring close speed regulation. Aug. 5: Function of needle valve in governing Pelton wheel. Aug. 20: Method of protecting penstocks. Sept. 5: Utility of surge tank as a reservoir for sudden load. Sept. 20: Efficiency of hydro-electric plants. Oct. 5: Factors essential in comparing different types.

HYDRO-ELECTRIC DEVELOPMENTS

ISLE MALIGNE, CANADA. Two Units at World's Largest Power Centre Will Be Ready Next Month, D. Kennedy. Contract Rec., vol. 38, no. 52, Dec. 24, 1924, pp. 1260-1267, 12 figs. Detailed account of work accomplished to date on first of two hydro-electric schemes projected by Quebec Development Co., at Isle Maligne, for harnessing waters of Saguenay River, Total power for this plant 540,000 hp.

MUSCLE SHOALS. Muscle Shoals Possibilities, Phil. N. Moore. Min. & Metallurgy, vol. 6, no. 217, Jan. 1925, pp. 7-9, 3 figs. Points out that to guarantee even 200,000 primary hp. will require auxiliary steam plant of 120,000 hp. to be used perhaps 30 per cent of time; when actual cost per hp. of development shall be noticed, it is evident that whole enterprise has involved excessive capital cost which can only, after many years, if ever, earn suitable return upon its capital.

PALESTINE. Electrical Developments in Palestine, H. Home. Engineering, vol. 119, no. 3080, Jan.: 9, 1925, pp. 35-36, 5 figs. Describes works in hydroelectric development in Jordan Valley to be commenced in present year, and subsidiary works already carried out.

ST. MARGARET'S BAY, CANADA. St. Margaret's Bay Hydro Development. Can. Engr., vol. 47, no. 27, Dec. 30, 1924, pp. 639-642, 6 figs. Nova Scotia Power Commission's first hydro-electric development. Supplies Halifax with power. Run-off and precipitation data. Drainage area of two rivers utilized. Two power stations have a total output of 10,800 hp.

HYDRO-ELECTRIC PLANTS

WINNIPEG, CANADA. Unique Hydro-electric Power Plant at Winnipeg, A. Murphy. Power House, vol. 17, no. 20, Oct. 20, 1924, pp. 66-68, 3 figs. Explains unique featuresof hydro-electric plant and central heating system about to be put into operation.

I

ICE PLANTS

OPERATION. Ice Plant Operation, C. Wilkie. Refrig. Eng., vol. 11, no. 6, Dec. 1924, pp. 202-205. Deals with operation of ammonia compressor; ice freezing tanks, summary of ice-tank performance; ammonia condensers; thermometers and their location.

INDUSTRIAL MANAGEMENT

COST ACCOUNTING. *See Cost Accounting.*

FLOW-OF-WORK REGULATION. Effecting Economies by Regulating Work Flow, A. Whitehead. Indus. Mgt. (Lond.), vol. 11, nos. 2, 4, 7, 10, 15 and 18, Jan. 24, Feb. 21, Apr. 3, May 15, Sept. and Dec. 1924, pp. 35-37, 98-99, 183-185, 263-264, 407-408 and 497-498, 8 figs. How costing reveals production losses. Orders and deliveries of raw materials. Charting for production. Avoiding delay in production. Keeping record of output.

PLANNING AND PRODUCTION CONTROL. Planning and Production Control. Taylor Soc.—Bul., vol. 9, no. 6, Dec. 1924, pp. 271-283. Committee on industrial planning of Boston Chamber of Commerce presents composite picture of planning methods found effective in Boston's most efficient factories. Organizing for master planning; determination of method of control; definition of production control; its value in industrial management.

Production Control, Geo. D. Babcock. Am. Mach., vol. 61, no. 25, Dec. 18, 1924, pp. 963-970, 3 figs. Classification of manufacturing effort; mechanical equipment; preplanning; manufacturing for stock and order; production schedule; operation and time analysis. Paper presented before Am. Soc. Mech. Engrs.

SALVAGE CONTROL. Salvage Control by the Inspection Department, A. H. Frauenthal. Am. Mach., vol. 61, no. 24, Dec. 11, 1924, p. 912, 1 fig. Simple and effective method of keeping in touch with scrap losses as affecting both production and accounting departments.

SMALL FACTORIES. Management Difficulties in Small Factories, and Their Solution, H. W. Ross. Indus. Mgt. (Lond.), vol. 11, nos. 8, 14 and 17, Apr. 17, Aug. and Nov. 1924, pp. 207-208, 377-378, 467-468 and 470. Apr. 17: Common examples. Aug.: Purchase of materials. Nov.: Credit rating.

TIME STUDY. *See Time Study.*

INDUSTRIAL PLANTS

POWER COSTS. Getting the Facts of Power Costs, J. P. Jordan. Indus. Mgt. (N.Y.), vol. 69, no. 1, Jan. 1925, pp. 49-54, 6 figs. Deals with general power expense; steam cost; outside electric-power cost; steam-electric cost; total electric power cost, etc.; uses of power costs.

INDUSTRIAL RELATIONS

PARTNERSHIP PLAN. Sharing Management with the Employees, Mary van Kleeck. Iron Age, vol. 115, no. 4, Jan. 22, 1925, pp. 273-274. Plan which proved successful in removing causes of friction, meeting problem of low wages and promoting contentment. (Abstract.) Report of Dept. of Indus. Studies, Russell Sage Foundation, on its study of partnership plan of Dutchess Bleachery, Ind., at Wappingers Falls, N. Y.

INSPECTION

METHODS. Inspection Methods, E. Buckingham. Mech. Eng., vol. 47, no. 1, Jan. 1925, pp. 55-56. Deals with process and final inspection of product. (Abstract.)

INSULATING MATERIALS, ELECTRIC

BOARDS AND MOLDINGS. Directions for the Study of Non-Ignitable and Self-extinguishing Boards and Mouldings for Electrical Purposes. Instn. Elec. Engrs. —Jl., vol. 63, no. 336, Dec. 1924, pp. 51-59, 11 figs. Definitions and classification; methods of tests.

INSULATORS, HEAT

SLAG WOOL. Slag Wool as a Building Insulator. Sheet Metal Worker, vol. 15, no. 23, Dec. 5, 1924, pp. 861-862, 2 figs. Results of tests made by Bur. of Standards; recent tests in Norway.

TEMPERATURE VARIATION IN. A Study on the Periodic Temperature Variation in the Internal Combustion Engine, K. Takémura. Tokyo Imperial University—Jl., vol. 15, no. 3, Sept. 1924, pp. 13-53, 3 figs. Cylic temperature variation of working fluid in internal-combustion engine; thermal state of ignition ball; movement of heat in cylinder wall.

[*See also Airplane Engines; Automobile Engines; Diesel Engines; Gas Engines; Motor Buses, Engines.*]

IRON AND STEEL

BIBLIOGRAPHY 1924. Review of Iron and Steel Literature for 1924, E. H. McClelland Blast Furnace & Steel Plant, vol. 13, no. 1, Jan. 1925, pp. 9-11. Bibliography of important publications of 1924 together with certain late publications of 1923.

INDUSTRY 1924. Iron and Steel Review of 1924, B. E. V. Luty. Blast Furnace & Steel Plant, vol. 13, no. 1, Jan. 1925, pp. 2-4. States that remarkable changes are noticeable in influences which shape production schedules, selling prices, and employment.

IRON CASTINGS

BURNING-ON. Burning-on, J. H. List. Foundry Trade Jl., vol. 30, no. 436, Dec. 25, 1924, p. 542, 1 fig. Principles underlying burning-on; scope; basic conditions; governing factors as to possibility of burning; making an open burn-on; cracking of burns; burning-on boxed work.

CONTRACTION STRESS. Contraction Stress: Cause and Remedies, F. C. Edwards. Foundry Trade Jl., vol. 30, no. 435, Dec. 18, 1924, pp. 519-523, 11 figs. Contraction stress is said to be resultant of conflicting forces operating within castings and tending to cause fracture; these forces arise from shrinkage which takes place in castings while cooling; chief means of prevention lies in adopting sound principles of design.

DEFECTS AND CAUSES. Fixing the Responsibility for Foundry Defects, Jos. Leonard. Foundry Trade Jl., vol. 30, no. 435, Dec. 18, 1924, pp. 523-524. Gives list of typical defects and possible causes. (Abstract.) Translated from paper read before Assn. Technique de Fonderie.

MOLECULAR EQUILIBRIUM IN. Molecular Equilibrium in Grey Iron Castings, I. Lamoureux. Foundry Trade Jl., vol. 30, no. 435, Dec. 18, 1924, pp. 524-525. Discusses problem of producing castings which shall be free from internal stresses; remedies for contraction; method of casting; chills and denseners; annealing and tumbling. (Abstract.) Translated from paper read before Assn. Technique de Fonderie.

IRON ORE

LAKE SUPERIOR DISTRICT. Future of Lake Ore Outlined, M. C. Lake. Iron Trade Rev., vol. 75, no. 26, Dec. 25, 1924, pp. 1701-1705, 2 figs. Depletion of reserves of merchantable material in sight: annual shipment of 75,000,000 tons in 10 years indicated.

L

LABOUR TURNOVER

COST OF. The Other Side of Labour Turnover, Wm. Davenport. Am. Mach., vol. 62, no. 2, Jan. 8, 1925, pp. 53-54. Discusses excessive cost of labour turnover to industry; cost to the man himself; importance of specializing on one kind of work; duty of foreman.

MACHINES, RELATION TO. The Relation of Machines to Labour Turnover, R. B. Williams. Blast Furnace & Steel Plant, vol. 13, no. 1, Jan. 1925, pp. 5-8, 10 figs. Points out that machines have done much to decrease labour turnover, and gives examples showing how machines can be made to increase workman's morale and decrease labour turnover.

LIGHTING

INDUSTRIAL. Conditions Which Should Be Fulfilled in the Lighting of Industrial and Commercial Establishments (Les conditions à remplir dans l'éclairage des établissements industriels et commerciaux), M. Leblanc. Revue Générale de l'Electricité, vol. 16, no. 20, Nov. 15, 1924, pp. 800-802. Proposes lighting of a specified number of lux for various operations in chemical, paper, printing, tanning and other industries.

LOCOMOTIVES

CYLINDER PERFORMANCE. Locomotive Cylinder Performance, E. C. Poultney. Engineer, vol. 138, nos. 3595 and 3596, Nov. 21 and 28, 1924, pp. 574-575 and 602-604, 12 figs. Test results appertaining to engines of Pennsylvania express locomotives K2sa and E6s. Nov. 28: Cut-off, its relation to throttling; indicator diagrams for superheated and saturated steam; coal and water savings.

DIESEL-ELECTRIC. Diesel-Electric Locomotives (Locomotora Diesel Electrica), E. V. Moreno. Ingenieria, vol. 28, no. 9, Sept. 1924, pp. 383-386, 3 figs. Design, construction and operation of locotractor built by Diesel-Elektriska Vagn-Aktiebolaget, also advantages.

ELECTRIC. *See Electric Locomotives.*

INSPECTION REPORT. Bureau of Locomotive Inspection Report. Ry. Mech. Engr., vol. 99, no. 1, Jan. 1925, pp. 14-16, 4 figs. Review of 13th annual report of chief inspector of Bur. Locomotive Inspection to Interstate Commerce Commission; conditions show need for more careful inspection and thorough repair; stresses importance of proper use of autogenous welding. See also Ry & Locomotive Eng., vol. 38, no. 1, Jan. 1925, p. 25, 1 fig.

INTERNAL-COMBUSTION. Internal Combustion Locomotive Development, T. Grime. Machy. Market, no. 1248, Oct. 3, 1924, pp. 27-28. Thermal and economic aspect; consideration of problem of adapting internal-combustion engine to locomotive purposes; the direct-acting engine; geared, electric and hydraulic transmissions.

OIL-BURNING. How to Improve Oil Burning on Locomotives, J. N. Clark. Ry. Rev., vol. 75, no. 26, Dec. 27, 1924, pp. 1025-1027. Discusses function of various appurtenances of firebox and boiler in economical use of oil fuel. (Abstract.) Paper read before Travelling Engrs.' Assn.

PERFORMANCE AND RATING METHODS. Notes on Locomotive Performance and Rating Methods, E. G. Young. Assn. Chinese & Am. Engrs.—Jl., vol. 5, nos. 9 and 10, Sept. and Oct., 1924, pp. 1-8 and 5-11, 8 figs. on supp. plates. Usefulness of information obtained from laboratory and road dynamometer tests to anticipate performance of a locomotive of modern design. Shows use of simple data and graphic methods in checking and predetermining motive-power performance under various conditions.

LUBRICATING OILS

MANUFACTURE AND FUNCTION. The History, Manufacture and Function of Lubricating Oils, W. Miller. Oil Trade, vol. 15, nos. 9 and 11, Sept. and Nov. 1924, pp. 28-29, and 58 and 60, 7 figs. Sept.: Earliest lubricating use of petroleum; manufacturing and refining. Nov.: Distilling at low temperatures; removal of wax; use of agitator; chemical treatment.

M

MACHINE DESIGN

MATERIALS, RELATION TO. Relation of Materials to Machine Design, Jos. K. Wood. Am. Mach., vol. 61, no. 26, Dec. 25, 1924, pp. 985-988. Points out that material specification is tie between producer and consumer; technical and commercial factors affecting selection of materials; kinds of materials to be used for machine parts.

PROGRESS. The Trend of Machine Design. Mech. Wld., vol. 76, nos. 1962, 1965, 1967, 1972, 1974, 1977. 1979, 1981 and 1982, Aug. 8, 29, Sept. 12, Oct. 17, 31, Nov. 21, Dec. 5, 19 and 26, 1924, pp. 82-83, 130-131, 162, 242-243, 274, 322-323, 354-355, 387, and 403-404, 47 figs. Discusses geometrical forms tooled; restriction of function; abolition of countershaft; single-pulley drive; back gears; motor driving; range of speeds and feeds; retention of accuracy; protection; ball bearings; counterbalancing; lubrication; cutting tools; tool steel; coolants; examples of specialization; gear cutting; broaching machines; automatic lathes; drilling machines; turret lathes; shaping machines; etc.

MACHINE SHOPS

EQUIPMENT 1924. Shop Equipment Review. Am. Mach., vol. 62, no. 3, Jan. 15, 1925, pp. 81-143, 350 figs. Semi-annual résumé of machines, tools and accessories described in Shop Equipment News section of this journal during last six months of 1924. Principal developments in shop equipment, including boring, drilling, grinding, milling, threading and other machines, lathes, planer and shapers, presses, wood-working machinery, small tools, materials-handling equipment, etc., in America and Europe, including indexes of manufacturers.

WHEEL AND AXLE. An Interesting Wheel and Axle Shop. Ry. Rev., vol. 75, no. 25, Dec. 20, 1924, pp. 977-987, 21 figs. Equipment and methods used for handling wheels and axles in shops of Newport News Shipbldg. & Dry Dock Co., Newport News, Va.; introduction of mechanical materials-handling devices and refinement in present method of machine operation are result of comprehensive study.

MACHINE TOOLS

HEAVY. Heavy Machine Tools, C. D. Andrew. Eng. Production, vol. 8, no. 148, Jan. 1925, pp. 6-10, 9 figs. Observations regarding heavy machine tools, more especially with reference to methods of production of work upon them, and general remarks on certain developments of design to meet modern conditions.

STANDARDIZED DATA SHEETS. Standardizing Tool Data Sheets, A. L. Evans. Abrasive Industry, vol. 5, no. 10, Oct. 1924, pp. 240-249, 3 figs. Forms approved by Nat. Machine Tool Bldrs.' Assn. provides for uniform arrangement of data pertaining to all types of machine tools.

MACHINERY

FRACTURES FROM FREEZING. Fractures from Freezing, E. Ingham. Power Engr., vol. 19, no. 225, Dec. 1924, p. 469. Notes on risks of disastrous fractures of machinery which may arise in consequence of frost; preventive measures; anti-freezing solutions.

MARINE BORERS

MOLLUSK. Observations on Rock Boring Mollusks in Concrete, W. R. Sadler and D. E. Hughes. Eng. News-Rec., vol. 93, no. 26, Dec. 25, 1924, pp. 1027-1028. Analyses show acid used by borers in cement mortar at Los Angeles harbor; aggregate unlike rock on beach is immune.

MATERIALS HANDLING

MACHINERY FOR. Mechanical Handling Machinery at the British Empire Exhibition, Wembley. Indus. Mgt. (Lond.), vol. 11, nos. 11, 12, 13, 14 and 15, May 29, June, July, Aug. and Sept. pp. 297-300, 327-329, 355-360, 385-387 and 415-420, 10 figs. Descriptions of exhibits of different firms; describes also coal and ash-handling plant of Empire Exhibition power plant.

MEASURING INSTRUMENTS

UNIVERSAL MEASURING MACHINE. Universal Measuring Machine. Machy. (N.Y.), vol. 31, no. 5, Jan. 1925, pp. 387-388, 5 figs. Improved machine known as Hanson Whitney universal type, which is in part a comparator and in part direct measuring machine using precision screw and large graduated measuring wheel and vernier for obtaining accurate measuring.

METALLOGRAPHY

PHOTOMICROGRAPHY, HIGH-POWER. High Power Magnification in Metallography, R. G. Guthrie. Am. Soc. Steel Treating—Trans., vol. 7, no. 1, Jan. 1925, pp. 4-22, 11 figs. In his work, author resorts to use of conical illumination for bringing out maximum detail; he concludes that whatever value is inherently contained in high-power magnification, their true value is really a matter that will vary from one individual to other and he has found it to be great value in examination and interpretation of specimens.

METALS

FATIGUE. Fatigue in Metals, H. J. Cough. Iron & Coal Trades Rev., vol. 109, no. 2963, Dec. 12, 1924, p. 963. Also Foundry Trade Jl., vol. 30, no. 435, Dec. 18, 1924, pp. 527-528. Discusses types of stresses and tests, effect of speed, effect of surface scratches, and effect of stresses upon microstructure of metals. Abstract of lecture before Brit. Acetylene & Welding Assn.

VAPOR-PRESSURES. Vapor Pressures of Some Liquid and Solid Metals, R. W. Millar. Indus. & Eng. Chem., vol. 17, no. 1, Jan. 1925, pp. 34-35. Method by means of which it is possible to calculate vapor pressures of liquid metal and sublimation pressures of solid metal at any temperature from single determination of vapor pressure of liquid or of solid at one temperature, specific heats of solid and liquid, heat of fusion, and melting point.

MOLDING MACHINES

HYDRAULIC. New Hydraulic Molding Machine (Eine neue hydraulische Pressformmaschine). Zeit. für die gesamte Giessereipraxis, vol. 45, no. 39, Sept. 28, 1924, pp. 306-307, 3 figs. Design and operation of machine of simple construction, requiring small space and having large field of application.

MOLDS

INGOT, HOT TOP FOR. Hot Top for Ingot Molds, J. H. Hruska. Blast Furnace & Steel Plant, vol. 13, no. 1, Jan. 1924, pp. 4 and 12. Deals with hot top in regular steel-works practice; design of top; refractories which have to be used for hot top; lining of hot tops.

SAND, HARDNESS TESTS. Tests Hardness of Sand Molds, E. Ronceray. Foundry, vol. 53, no. 1, Jan. 1, 1925, pp. 34-35, 3 figs. Describes apparatus employed and results of tests from large number of experiments made on sand of varying thickness, dampness and density. (Abstract.) Exchange paper of Assn. Technique de Fonderie, presented before Am. Foundrymen's Assn.

MOTION STUDY

NAVAL GUNNERY, APPLICATION TO. The Application of Motion Study to Naval Gunnery, J. G. Gross. U. S. Nav. Inst.—Proc., vol. 50, no. 262, Dec. 1924, pp. 1998-2009, 2 figs. Definition of motion study based on extracts from publications by Frank B. and Lillian M. Gilbreth; its application in naval service; examples of instruction cards used on board U. S. S. Smith Thompson.

MOTOR-TRUCK TRANSPORTATION

COMMERCIALIZED HAULAGE. Commercialized Motor-Truck Haulage, J. A. Hoffman and W. F. Banks. Soc. Automotive Engrs.—Jl., vol. 16, no. 1, Han. 1925, pp. 62-71 and (discussion) 71-72, 11 figs. Presents essentials of successful motor-truck-haulage organization, being descriptive of practices of Motor Haulage Co., Brooklyn; deals with plants and equipment, management, less-than-carload freight, garage conditions, maintenance facilities, inspection system, standardized methods, repair orders aud routine, control, cost systems, etc.

N

NATIONAL DEFENSE

ENGINEERING PROBLEMS. Engineering Problems of National Defense, D. F. Davis. Mech. Eng., vol. 47. no. 1, Jan. 1925, pp. 33-34. Survey of major management-engineering problems involved.

NAVAL AIRCRAFT

CARRIERS. Seagoing Aircraft, S. Ballou. U. S. Nav. Inst.—Proc., vol. 50, no. 261, Nov. 1924, pp. 1793-1801, 1 fig. Deals with seagoing aircraft as affecting fleet actions at sea; characteristics of aircraft carriers; it is concluded that a fleet can best devote its aircraft-carrier capacity to protection of the big gun, rather than to adding small fraction in shape of bombing planes to its offensive power.

O

OIL FUEL

BURNING EQUIPMENT. Auxiliary Equipment for Oil Burning, K. Miller. Fuels & Furnaces, vol. 2, nos. 10, 11 and 12, Oct., Nov. and Dec., 1924, pp. 1047-1054, 1149-1154 and 1261-1267, 17 figs. Describes various forms of apparatus available for supplying oil and air to oil burners and points out their characteristic properties. Oct.: Classification of blowers and compressors and discussion of fan characteristics. Nov.: Turbo-blowers. Dec.: Positive pressure blowers.

Oil Burning and Oil-Burning Equipment in Industrial and Chemical Plants, W. F. Schaphorst. Indus. & Eng. Chem., vol. 17, no. 1, Jan. 1925, pp. 5-10, 7 figs. Advantages and disadvantages of steam jet or air jet, and mechanical atomizing burners; shape and combinations of openings in various burners appear to make little difference in burner efficiency; data on heating of oil, furnace volume required, current prices of oil, etc., and typical burners are shown.

OPEN-HEARTH FURNACES

DEVELOPMENTS 1924. The Open-Hearth in 1924, F. J. Crolius. Blast Furnace & Steel Plant, vol. 13, no. 1, Jan. 1925, pp. 42-45, 4 figs. Résumé of results obtained by application of demonstrated combustion principles.

MULTIPLE-FLAME CONTINUOUS. Multiple-Flame Continuous Melting Furnace Recovering Total Heat of Open-Hearth Process (Forno di fusione a fiamma multipla continua e a totale ricupero di calore per processo Martin), F. Fiorelli. Metallurgie Italiana, vol. 16, no. 10, Oct. 1924, pp. 446-451 and (discussion) 452-457, 5 figs. partly on supp. plates. Notes on operation of Siemens open-hearth furnace. Description of continuous multiple-flame furnace, including calculations, operation, and comparative cost data.

OPERATION. The Flame in Open-Hearth Furnaces (La fiamma nei forni Martin), E. de Castro. Metallurgia Italiana, vol. 16, no. 10, Oct. 1924, pp. 458-488, 15 figs. Discusses application of oil fuel, furnace readjustment, and tests carried out with fuel oil operation. Cost data.

OSCILLOGRAPHS

MECHANICAL MEASUREMENTS, FOR. Use of an Oscillograph in Mechanical Measurements, H. L. Curtis. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 1, Jan. 1925, pp. 45-52, 14 figs. Oscillograph is briefly described as galvanometer having short period and critical damping, which is so arranged that its deflections can be recorded on moving photographic film; measurement of short time intervals; measurement of velocity; measurement of displacement by step-by-step method.

OXY-ACETYLENE CUTTING

STEEL. Eliminating the Oxygen Waste, M. Piette. Welding Engr., vol. 9, no. 12, Dec. 1924, pp. 25, 28-29 and 44, 5 figs. Abstracted translation of paper "A Contribution to the Study of the Cutting of Steel by means of Oxy-Acetylene Flame and a Jet of Oxygen," read at 8th Int. Acetylene and Welding Congress, giving summary of principal results.

OXY-ACETYLENE WELDING

BRONZE WELDING. An Unusual Test of Bronze Welding in Cast Iron Pipe. Acetylene Jl., vol. 26, no. 4, Oct. 1924, pp. 176 and 180, 2 figs. Describes test made to determine strength of a bronze welded joint in an 18-in. cast-iron artesian well casing.

Bronze Welding of Cast Iron Pipe, H. R. Swartley Acetylene Jl., vol 26, no. 6, Dec. 1924, pp. 274-277, 4 figs. General discussion of process of bronze welding and recommendations for field application covering sizes of pipe and classes of service. Paper read before Int. Acetylene Assn. convention.

STRUCTURAL WORK. Oxy-Acetylene Welding and Cutting in the Structural Field, G. O. Carter. Am. Welding Soc.—Jl., vol. 3, no. 11, Nov. 1924, pp. 13-17, 4 figs. Considers several phases of situation of possibility of making a welded joint instead of a riveted connection. Factors in making of good oxy-acetylene welds. Use of bronze filler rods in place of steel in structural steel construction.

TANKS. Production Welding With Automatic Welding Machines. Acetylene Jl., vol. 26, no. 4, Oct. 1924, pp. 172-175, 5 figs. Discusses oxy-acetylene machine welding as applied to underground storage and other tanks.

P

PACKING

CONTAINERS. Cutting Down Shipping Losses, H. H. Squire. Mgt. & Administration, vol. 9, no. 1, Jan. 1925, pp. 47-50, 3 figs. Notes on shipping containers, with special reference to corrugated boxes; methods of packing, etc.

PAPER MACHINERY

TYPES. Paper-Making Machines, M. Wintermeyer. Eng. Progress, vol. 5, no. 12, Dec. 1924, pp. 255-260, 6 figs. Newspaper machines with high-pressure feed of material and withdrawable strainer section; machines for fine papers, medium fine papers and papers with one-sided gloss; automatic delivery machines; round strainer machines; long strainer pasteboard machines.

PAPER MANUFACTURE

PULP MANUFACTURE. A Liquid Sulphur Dioxide Process for Sulphite Pulp—Its Application to Longleaf Pine, R. H. McKee and D. E. Cable. Paper Trade Jl., vol. 78, no. 10, Mar. 6, 1924, pp. 53-56, 2 figs Extraction with various organic solvents; extraction with liquid sulphur dioxide; comparison of liquid sulphur dioxide extraction process with present gasoline extraction process.

WOOD PULP. Bleaching of Wood Pulp, C. E. Curran and P. K. Baird. Paper Trade Jl., vol. 79, nos. 1, 3 and 11, July 3, 17 and Sept. 11, 1924, pp. 56-58, 41-43, and 45-47, 7 figs. July 3: Factors affecting process and their control. July 17: Effect of hardness of water. Sept. 11: Effect of temperature on bleaching of sulphite pulp.

PAPER MILLS

SULPHITE MILL CALCULATIONS. Some Sulphite Mill Calculations. Paper, vol. 33, no. 20, Mar. 6, 1924, pp. 12-13 and 27, 4 figs. Collection of formulas and graphs which will assist in designing apparatus or calculating results of tests.

WASTE-HEAT UTILIZATION. Waste Heat in Pulp and Paper Mills, von Lassberg. Paper Trade Jl., vol. 79, nos. 24 and 25, Dec. 11 and 18, 1924, pp. 45-49 and 49-54, 7 figs. Discusses utilization of heat released between a temperature of 100 deg. cent. and one of 50 deg. cent., dealing with nature and amount of this heat, use to which it has been put up to present time, and the more extended use which can be made of it. Makes calculations and gives formulas. Translated from Papierfabrikant, 1924, pp. 461-472.

PATTERNS

STANDARDIZATION. Preliminary Experiments on the Standardization of Patterns, O. Querut. Foundry Trade Jl., vol. 30, no. 436, Dec. 25, 1924, p. 541. Author considers that standardization of patterns is intimately connected with that of cast machine parts, and that latter investigation is still in earliest stages; concludes that it is necessary at first to limit standardization to certain features common to all patterns. (Abstract.) Translated from paper presented before Assn. Technique de Fonderie.

PAVEMENTS, ASPHALT

PROPRIETARY AND PATENTED. Proprietary Asphalt Pavements Covered by Trade Names and Patents, Chas. A. Mullen. Eng. Jl., vol. 8, no. 1, Jan. 1925, pp. 15-18. Principal features of proprietary and patented asphalt pavements.

PHOTOGRAPHY

RADIO TRANSMISSION. The Transmission of Photographs by Radio, C. F. Jenkins. Tech. Eng. News, vol. 5, no. 3, Oct. 1924, pp. 96 and 110-111, 4 figs. Describes apparatus for sending photograph by radio and principle upon which design is based.

PIPE

CORROSION. Corrosion of Underground Pipe Lines, K. H. Logan. Chem. & Met. Eng., vol. 31, no. 26, Dec. 29, 1924, pp. 1011-1012. First progress report of extended investigation indicates that soil conditions are more important factor than pipe materials. (Abstract.) Paper presented before Am. Foundrymen's Assn. and published by permission of Bur. of Standards.

FLANGES, BRITISH STANDARD. British Standard Flanges, M. H. Sabine. Machy. (Lond.), vol. 25, no. 639, Dec. 25, 1924, pp. 410-411, 2 figs., 2 tables. Presents tables prepared to show what saving in space can be gained by clipping of flanges for equal and unequal combinations.

PIPE, CAST-IRON

CENTRIFUGALLY CAST. Centrifugal Metal Mould Cast Iron Pipes. Metal Industry (Lond.), vol. 25, no. 25, Dec. 19, 1924, p. 598. Discussion on spun cast iron pipes at meeting of Lancashire Branch of Instn. Brit. Foundrymen. Advantages of process; rate of output; comparison with ordinary sand-cast pipe; resistance to corrosion; comparative costs.

PIPE, WOOD-STAVE

MAINTENANCE. Maintenance of Wood-Stave Pipe in Hydro-Electric Practice, B. E. White. Power, vol. 60, nos. 21 and 26, Nov. 18 and Dec. 23, 1924, pp. 794-796 and 1019-1029, 4 figs. Information of methods of installation and maintenance, including description of number of cases where troubles with wood-stave pipe have developed in and near New York State; means taken to safeguard pipe and lengthen its life; suitable methods of installing and maintaining such pipe so as to obtain longest life. Dec. 23: Failures due to improper backfill.

PISTON RINGS

MANUFACTURE. Making Satisfactory Piston Rings, J. McIntosh. Am. Mach., vol. 61, no. 24, Dec. 11, 1924, pp. 917-918, 2 figs. Correct mixture of iron and careful pouring and cooling are said to be necessary for best results; grinding oversize with provision for closing.

PISTONS

MANUFACTURE. Making Pistons for Many Cars, L. S. Vadner. Am. Mach., vol. 62, no. 4, Jan. 22, 1925, pp. 149-150, 8 figs. Methods that utilize standard machines, since large variety of pistons made prevents highly specialized equipment being used to advantage; many semi-finished pistons furnished.

PLATES

DRILLED, STRESSES IN. Effect Net Section of Drilled Plates, C. R. Young and W. B. Dunbar. Can. Engr., vol. 47, no. 24, Dec. 9, 1924, pp. 575-580, 10 figs. Tests show zig-zag section always weaker than right section of same area. Usual hypothesis respecting stress variation on diagonal section incorrect. New and less severe deduction diagrams. Approximate rule.

PNEUMATIC MACHINERY

PLATE-TIGHTENING MACHINE. A Pneumatic Plate Tightening Machine. Engineer, vol. 138, no. 3598, Dec. 12, 1924, p. 667, 3 figs. New type of pneumatic tool designed to automatically draw together metal sheets or plates prior to operation of riveting them together; known as Hollett pneumatic plate-tightening machine.

POWER

RESOURCES. Power Resources, Present and Prospective, F. R. Low. Mech. Eng., vol. 47, no. 1, Jan. 1925, pp. 1-4. Power resources of the United States and increasing rate at which they are being drawn upon; conversion of energy of fuel into power; how long present fuel resources will last at present rates of consumption; efficiencies attained in conversion of fuel energy into power; possible sources of energy other than fuel.

POWER FACTOR

CORRECTION. Power-Factor Correction in Practice, L. W. W. Morrow. Elec. Wld., vol. 84, no. 21, Nov. 22, 1924, pp. 1096-1100, 4 figs. Use of static condensers for individual motor correction; what customers of results obtained.

RATE CLAUSES. Power-Factor Rate Clauses, R.R. Herrmann. Elec. World, vol. 84, no. 26, Dec. 27, 1924, pp. 1357-1359, 2 figs. It is shown that transformer and regulator costs are most affected by poor power factor; operating expenses increases slightly; rates should care for demand and energy charges; new rates advocated.

PRODUCER GAS

CALORIFIC VALUE. The Calorific Value of Producer-Gas by Graph, A. Levesley. Fuel, vol. 3, no. 12, Dec. 1924, pp. 422-423, 3 figs. Reproduces graph designed with object of eliminating rather lengthy and monotonous calculations ordinarily necessary to arrive at net value of producer gas in B.t.u. per cu. ft. from its analysis.

PULVERIZED COAL

Boiler Firing. A Review of Recent Applications of Powdered Coal to Steam Boilers, H. Kreisinger. Mech. Eng., vol. 47, no. 1, Jan. 1925, pp. 19-23, 2 figs. Trend of development for past two years of application of pulverized coal as fuel for making steam; developments in furnaces, driers, and mills; test results from boilers and mills in six central stations using pulverized coal as fuel; discusses mill capacities for various grades of coal. (Abridged.)

Economies. Economies to Be Derived from Pulverized Fuel, H. D. Savage. Engrs. & Eng., vol. 41. no. 10, Oct. 1924, pp. 261-265 and (discussion) 265-268, 1 fig. Possible economies; stoker and pulverized-fuel firing compared; burning inferior coal.

Locomotives. Pulverized Coal in Locomotives, Times Trade & Eng. Supp., vol. 15, no. 335, Dec. 6, 1924, p. 274. American and British experiments.

Pulverizers. Good Efficiency and High Rating with Unit-Type Pulverizers, J. G. Coutant. Power, vol. 61, no. 2, Jan. 13, 1925, pp. 60-61, 4 figs. Describes unit pulverizers in service in large power stations at Wasquehal, Comines and Rouen, France, and that installed at Sherman Creek Station of United Elec. Light & Power Co.

Unit System. The Unit System of Pulverized Coal, W. W. Clinedinst. Sibley Jl. Eng.,vol. 38, no. 8, Nov. 1924, pp. 197-199, 2 figs. Advantages of unit system; construction and theory; steam raising; test data; maintenance and cost of operation.

PUMPING STATIONS

Diesel-Engine-Driven. Operating Experiences and Economy of a Diesel Engine Driven Pumping Station, W. DeW. Vosbury. Am. Water Wks. Assn.—Jl., vol. 12, no. 4, Dec. 1924, pp. 381-390 and (discussion) 390-392, 1 fig. Describes operation and economy of Diesel engines of new pumping station at Gloucester, N. J.

Somerford, England. The Somerford Pumping Station, South Staffordshire Waterworks, Sulzer Bros. Company, F. J. Dixon. Technical Rev., no. 3, 1924, pp. 1-12, 9 figs. Pumping plant consists of a 4-cylinder Sulzer Diesel engine, driving a vertical spindle centrifugal borehole pump, and a horizontal spindle centrifugal force pump. Description of auxiliary equipment. Construction of borehole. Results of official duty trials. Abstract of paper read before Instn. Water Engrs.

PUMPS

Air-Lift. With Air Lift Flood Water Can Be Removed at a Single Inexpensive Setting of Equipment, E. J. Gealy. Coal Age, vol. 26, no. 25, Dec. 18, 1924, pp 868-870. 4 figs. Difficult pumping problems solved in mines of Glen Alden Coal Co. by use of compressed air; three air lifts deliver 2300 gals. per min.; economy of installation and convenience of operation.

Boiler-Feed. Boiler Feed Pump Explanations and Calculations, Chas. L. Hubbard. Power, vol. 60, nos. 25 and 26, Dec. 16 and 23, 1924, pp. 979-982 and 1021-1024, 8 figs. Dec. 16: Principles underlying successful operation and how to figure capacity, suction lift or pressure of feed pump. Dec. 23: Selecting boiler feed pumps; characteristics.

PUMPS, CENTRIFUGAL

Operation. The Operation of Centrifugal Pumps. J. S. Pillans. Engineer, vol. 138, no. 3600, Dec. 26, 1924, pp. 732-733, 3 figs. Deals with low-lift and turbine pumps.

R

RADIO COMMUNICATION

Signal Measuring. A Method of Measuring Radio Field Intensities and Atmospheric Disturbances, L. W. Austin and E. B. Judson. Inst. Radio Engrs.—Proc., vol. 12, no. 5, Oct. 1924, pp. 521-532, 7 figs. Method of measuring radio signals which depends on determination of equality of sound intensities in telephones from signal and from known alternating current preferably giving same tone; measured local current is taken from 1,000-cycle tuning-fork oscillator and electromotive force impressed on telephones is controlled by voltage divider.

RADIOTELEPHONY

Impedances. The Graphical Analysis of Composite Impedances, F. M. Colebrook. Experimental Wireless, vol. 2, no. 15, Dec. 1924, pp. 140-145, 15 figs. Considers some of the important arrangements of impedances met with in practical wireless telephony and telegraphy, and shows their characteristics graphically.

Magnetophones. The Marconi-Sykes Magnetophone, H. J. Round. Wireless Wld., vol. 15, no. 9, Nov. 26, 1924, pp. 260-265, 11 figs. Description of microphone and associated equipment which is used extensively not only for broadcasting stations but also for public speech amplifying, distributing and amplifying band music, etc.

Numas Circuit. The Numans Oscillator, K. C. van Ryn. Experimental Wireless, vol. 2, no. 15, Dec. 1924, pp. 134-136, 5 figs. Describes a new valve circuit from Holland that may be used with either single or double-grid valves, and makes an effective wavemeter.

Receivers. The Super-Heterodyne — Its Origin, Development, and Some Recent Improvements, E. H. Armstrong. Inst. Radio Engrs.—Proc., vol. 12, no. 5, Oct. 1924, pp. 539-552, 13 figs. Describes development of super-heterodyne receiver from wartime invention into commercial form of broadcast receiver apparatus now available to general public; success is due to low-filament-consumption vacuum tube and to reduction in number of tubes required by self-heterodyning, reflexing, and improvement in transformer design.

Receiving Circuits, Selective. Selective Receiving Circuits, N. W. McLachlan. Wireless Wld., vol. 15, no. 7, Nov. 12, 1924, pp. 189-193, 6 figs. Reviews conditions by which energy is set up and transferred in tuning system of a receiver.

Transmission. Transmitting Equipment for Radio Telephone Broadcasting, E. L. Nelson. Inst. Radio Engrs.—Proc., vol. 12, no. 5, Oct. 1924, pp. 553-577, 13 figs. Outlines general transmission considerations applying to any system for high-quality transmission of speech or music, and discusses specific requirements to be met by various apparatus units in radio broadcasting equipment; describes standard West. Elec. 500-w. broadcasting equipment, which has found application in some 50 of larger stations in United States and abroad.

RAILS

Wear. Causes of Wear of Rails (Les causes de l'usure des rails de chemins de fer). Génie Civil, vol. 85, no. 23, Dec. 6, 1924, pp. 521-523, 4 figs. Extract, from book entitled "Wear and Defects of Rails," by Ch. Fremont. Shows that wear is not due to abrasion but to crushing. Choice of steel for rails.

RAILWAY ELECTRIFICATION

Africa. Cape Peninsula Railway Electrification. S. African Power Engr., vol. 9, no. 77, Sept. 1924, pp. 15-20, 1 fig. Report on electrification of Cape Town-Simons' Town, Monument Sea Point, and Monument-Table Bay Docks lines. Estimates of capital outlay. See also same journal, no. 78, Oct. 1924, pp. 25-27, which gives further details.

RAILWAY MANAGEMENT

Car-Department Service. The Meaning of Effective Car Department Service, L. K. Sillcox. Car Foremen's Assn.—Official Proc., vol. 19, no. 3, Dec. 1924, 39 pp. (including discussion), 8 figs.; also (abstract) in Ry. Rev., vol. 76, no. 1, Jan. 3, 1925, pp. 78-86, 6 figs. Discusses elements involved in organization of car department and presents valuable information as to actual work and methods pursued; deals with material and human elements, co-ordination of which builds organization for successful operation.

RAILWAY MOTOR CARS

Brill. Brill Builds Large Rail Motor Car. Ry. Age, vol. 77, no. 26, Dec. 27, 1924, pp. 1155-1157, 6 figs. Seats 59 passengers and is designed to haul trailer seating 60 additional persons; driven by 6-cylinder engine which develops 190 hp. at 1300 r.p.m.

Four-Wheel Drive. Petrol Driven Rail Car with Four-Wheel Drive. Engineering, vol. 118, no. 3076, Dec. 12, 1924, pp. 817-818, 1 fig. Describes truck constructed by Four-Wheel Drive Lorry Co., Slough, Eng., for Norwegian State Rys.

Independent Motors. Gasoline Car with Independent Power Units. Ry. Mech. Engr., vol. 99, no. 1, Jan. 1925, pp. 11-13, 5 figs. Features of design of new self-propelled car for Chicago, Burlington & Quincy; motors, one on each truck, are not only entirely removed from car body with consequent saving of space, but are arranged for independent operation, to permit handling car under varying operation conditions with greater economy.

RAILWAY OPERATION

Train Control. Great Northern Installs Train Control. Ry. Age, vol. 78, no. 2, Jan. 10. 1925, pp. 183-187, 8 figs. Describes Sprague auxiliary system as inspected by representatives of Interstate Commerce Commission; installation is of intermittent inductive non-contact type.

Maintaining Train Control Equipment on Locomotives, E. Wanamaker. Ry. Mech. Engr., vol. 99, no. 1, Jan. 1925, pp. 40—44, 10 figs. Deals with automatic train control as applied to 165 miles of double track on Chicago, Rock Island & Pacific.

RAILWAY REPAIR SHOPS

Birmingham, Ala. Southern's New Shops Have Efficient Layout. Ry. Age, vol. 77, no. 26, Dec. 27, 1924, pp. 1159-1164, 13 figs. Modern units erected at Birmingham, Ala., for handling locomotive and car repairs; electrically driven equipment used practically throughout.

RAILWAY SIGNALING

Construction, 1924. Signal and Interlocking Construction, J. H. Dunn. Ry. Age, vol. 78, no. 1, Jan. 3, 1925, pp. 104-108 and 112, 3 figs. Résumé of activities of 1924; block signaling completed in 1924 and under consideration; interlocking construction in 1924; desk controllers and remote control machines.

RAILWAY YARDS

Classification. Shunting, Marshalling and Sorting Yards, R. H. Nicholls. Ry. Gaz., vol. 41, nos. 24, 25 and 26, Dec. 12, 19 and 26, 1924, pp. 761-764, 791-794 and 818-821, 15 figs. Principles of location and design; yard site in relation to yard working; ideal layout; British and Dominion practice compared; gravitation shunting methods; layout of points and switches. (Abstract.) Report covering Great Britain, Northern Ireland, India, and British Dominions, Protectorates and Colonies, submitted to Int. Ry. Congress Assn.

RAILWAYS

European Developments. Railway Developments in Europe. Ry. Age, vol. 78, no. 1, Jan. 3, 1925. Contains following articles: 100 Years of British Railways, W. H. Fraser, pp. 114-118, 7 figs.; France, M. Peschaud, pp. 119-121, 3 figs.; Increasing Efficiency in Austria, A. Niklitschek, pp. 122-124, 5 figs.; Czech Railways, Vaclay Partl, pp. 125-126, 2 figs.; Outlook for German Railways, Rich. P. Wagner, pp. 127-128, 1 fig.; New Railway Régime in Spain, A. C. Blackall, pp. 129-130, 1 fig.; Jugoslavia, pp. 131-132; Swedish Railways, L. Akselsson, pp. 133-134, 6 figs.; Danish Railways, E. Terkelsen, pp. 135-136, 5 figs.; Polish Railways, R. V. Wright, pp. 137-139, 6 figs.

Funicular, Penang Island. The Penang Hills Railway. Engineering, vol. 118, nos. 3072, 3074, 3076 and 3078, Nov. 14, 28, Dec. 12 and 26, 1924, pp. 664-668 and 678, 726-730 and 740; 789-792 and 804; and 852-853, 81 figs. Funicular railway has total length of 1 mi. 435 yd., and upper station is situated 2381 ft. above sea level.

Japan. Railways of Japan (Die Eisenbahnen des japanischen Inselreichs), Baltzer. Organ für die Fortschritte des Eisenbahnwesens, vol. 79, no. 13, Oct. 15, 1924, pp. 287-292. Details of developments, covering Tokaido, Shin-Etsu and Usui pass, Chuo or Nakasendo, Fukushima, Nippon, Sanyo, and Kinshiu lines.

South American Developments. Railways in South America. Ry. Age, vol. 78, no. 1, Jan. 3, 1925. Contains following articles: Great Expansion in Argentina, Geo. S. Brady, pp. 140-142, 6 figs.; Development Slow in Colombia, C. Jackson, pp. 143-144, 3 figs.: Brazil Needs More Railways, D. L. Derrom, pp. 145-147, 5 figs.

REDUCTION GEARS

Large, Machining. Problems Solved in Machining Large Gears, L. H. Kenney. Iron Age, vol. 115, no. 4, Jan. 22, 1925, pp. 263-268, 7 figs. Turbine speed reduction units of unusual size made at Philadelphia Navy Yard; method of cutting teeth and checking accuracy.

REFRIGERATING PLANTS

Radiators, Cast-Iron Sections. Heat Transfer in Cast-Iron Radiator Sections for Ammonia, H. J. MacIntire. Refrig. Eng., vol. 11, no. 6, Dec. 1924, pp. 195-199 and (discussion) 199 and 205-206, 6 figs. Account of tests on cold-storage box 12 ft. by 15 ft. with evaporative surface placed on side walls, in order to secure information as to relative advantages of cast-iron radiator sections as compared with piping.

RIVERS

Discharge, Measurements of. Recent Developments in Methods of Computation of River Discharge, C. H. Pierce. Cornell Civ. Engr., vol 33, no. 1, Oct. 1924, pp. 9-12, 2 figs. New methods developed by U. S. Geol. Survey which are more accurate that old methods; describes discharge integrator, precision instrument so constructed as to make continuous application of rating curve to gage height graph throughout 24-hr. period or whatever period may be selected as unit of time, and which sums up in such a way as to show average rate of flow in cubic feet per second.

ROADS

Flexible-Base. Utility of Flexible Base Pavements, E. C. Schmidt. Can. Engr., vol. 47, no. 26, Dec. 23, 1924, pp. 625-627. Discusses their adaptability particularly in Northwest. Advantages of asphaltic concrete. Improved grading specification for coarse asphaltic concrete mixtures. Paper read at Annual Asphalt Paving Conference at Louisville.

Impact Tests. Status of the Motor Truck Impact Tests of the Bureau of Public Roads, C. A. Hogentogler. Pub. Roads, vol. 5, no. 9, Nov. 1924, pp. 11-14, 6 figs. Details of tests on slabs; particulars of investigation in which force of impact delivered by an actual truck to an actual road is measured simultaneously with effect of blow on road surface.

ROADS, CONCRETE

SLAB REINFORCEMENT. New Type of Slab Reinforcement For Concrete Roads, C. N. Conner. Eng. News-Rec., vol. 93, no. 24, Dec. 11, 1924, p. 954, 1 fig. Uniform mesh reinforcement strengthened at slab edges by second mesh in 18-in. strips; major members transverse.

TESTS. Static Load Tests on Pavement Slabs, J. T. Thompson. Pub. Roads, vol. 5, no. 9, Nov. 1924, pp. 1-6, 12 figs. Conclusions from tests conducted by U. S. Bur. Pub. Roads during summer of 1924. Description of slabs, and test methods and apparatus. Effect on static resistance of character of subgrade, reinforcement, and bituminous top. See also Pub. Wks., vol. 55, no. 12, Dec. 1924, pp. 364-366, 6 figs.

VIBRATION CONSTRUCTION PROCESS. Constructing Concrete Roads by Vibration. Eng. News-Rec., vol. 94, no. 1, Jan. 1, 1925, pp. 26-29, 3 figs. Includes following contributions: Editorial summary on general process and special plant; Practical Construction Experience, S. D. Moore; Special Construction Features, H. L. Tillson.

ROLLING MILLS

BREAKING SPINDLES FOR MAIN DRIVE. Breaking Spindles for Main Roll Drives, J. H. Albrecht. Iron & Steel Engr., vol. 1, no. 12. Dec. 1924, pp. 634-635, 2 fig. Describes combination flexible coupling and breaking spindle installed on 84-in. plate mill, Youngstown Sheet & Tube Co.

COLD-ROLLING. Cold Rolling Steel for the Hardware Industry, H. C. Hatch. Can. Machy., vol. 32, no. 24, Dec. 11, 1924, pp. 19-21 and 22, 5 figs. Physical characteristics and manufacture in plant of Stanley Steel Co.: quality is said to be largely dependent on skill of roller and condition of surface of rolls; suitability for plating an important property of product.

ELECTRIC DRIVE. Large-Powered Rolling Mill Drives. Engineering, vol. 118, no. 3077, Dec. 19, 1924, p. 842, 1 fig. Describes electrically driven gear for rolling-mill drive and heavy flywheel for use on Ilgner system to balance load on electric motor, constructed by Scott & Hodgson, Manchester, Eng.

SHEET MILLS. Loose Rolling Gains Favor Among Sheet makers, J. D. Knox. Iron Trade Rev., vol. 75, no. 26, Dec. 25, 1924, pp. 1706-1711 and 1722, 9 figs. Youngstown company installs new 8-mill plant for manufacture of high-grade automobile sheets.

ROOFS

PREPARED, MANUFACTURE OF. Some Relations between Maintenance and Operating Costs, J. L. McK. Yardley. Indus. Engr., vol. 82, no. 12, Dec. 1924, pp. 566-570 and 601, 4 figs. Equipment and operation of roofing felt mill; layout and operation of roofing mill; equipment required in roofing-asphalt refinery.

S

SAND, MOLDING

EXPERIMENTAL EXAMINATION. The Experimental Examination of Moulding Sand, A. Tauflieb. Foundry Trade Jl., vol. 30, no. 436, Dec. 25, 1924, pp. 548-549, 7 figs. Indicates simple and direct experimental examinations that can be carried out in any foundry, at same time giving definite and useful information on quality and suitability of various sands employed. (Abstract.) Translated from paper presented to Assn. Technique de Fonderie.

SEAPLANES

ALL-METAL. Large All-Metal Seaplanes, Rohrbach. Roy. Aeronautical Soc.—Jl., vol. 28, no. 168, Dec. 1924, pp. 655-672 and (discussion) 672-675, 18 figs. Author gives his personal experience and opinions; general advantages of all-metal construction; advantage of heavily loaded airplane; comparison of biplane and monoplane; Details of Ro II-type flying boat being built in Copenhagen.

SEWAGE DISPOSAL

ACTIVATED SLUDGE. Study of Activated Sludge (Contribution à l'étude des boues activées). L. Cavel. Académie des Sciences—Comptes Rendus, vol. 179, no. 20, Nov. 17, 1924, pp. 1095-1098. Concludes that presence of even traces of acid prevent nitrification and even very weakly-acid sewage should not be allowed in sludge purifying plants.

SLUDGE DIGESTION. Studies of Separate Sludge Digestion at Baltimore, T. C Schaetzle. Eng. News-Rec., vol. 93, no. 23, Dec. 4, 1924, pp. 919-923, 5 figs. Three-years' investigation at sewage works shows most rapid digestion in first few weeks; one-third seeding sludge and liquefaction by aerobes desirable features.

TREATMENT. Some New Sewage Treatment Plant and Apparatus. Engineer, vol. 138, no. 3600, Dec. 26, 1924, pp. 731-732, 6 figs. partly on p. 726. Describes bio-aeration plant and two types of water-wheel-driven sewage distributors at Hanley sewage works. Stoke-on-Trent.

SILICA BRICK

RESISTANCE. Factors Affecting the Resistance of Silica Refractories to Abrasion, F. A. Harvey and E. N. Mcgee. Am. Ceramic Soc.—Jl., vol. 7, no. 12, Dec. 1924, pp. 895-906, 4 figs. Resistance to abrasion is tested by grinding a groove in surface of refractory by means of carborundum wheel with suitable mounting; other methods used in tests; factors affecting resistance of silica brick to abrasion are porosity and degree of burn; porosity is affected by grind, quality of ganister, per cent lime and workmanship; relation between length of groove, porosity and burn.

SMOKE

ABATEMENT. Smoke Abatement Congress. Times Trade & Eng. Supp., vol. 15, no. 331, Nov. 8, 1924, p. 177. Review of improved systems discussed at conference held in Manchester, Eng.

SOOT BLOWERS

SAVINGS EFFECTED BY. Tests Showing Mechanical Soot Blower Savings, R. June. Power House, vol. 17, no. 20, Oct. 20, 1924, pp. 82-84, 4 figs. Data obtained from tests in operating departments of public utility stations, showing fuel economy this type of power plant equipment effects.

STANDARDIZATION

CANADA. Engineering Standards Work in Canada in 1924, R. J. Durley. Can. Machy., vol. 32, no. 26, Dec. 25, 1924, pp. 154-156. During year Can. Eng. Standards Assn. issued six new publications; report on gasoline; steel wire strands; concrete and cedar poles; road-construction work; etc.

STEAM

HIGH-PRESSURE. Application of High Pressure Steam, B. N. Broido. Power Plant Eng., vol. 29, no. 2, Jan. 15, 1925, pp. 130-133. Discusses obstacles in way of high pressures; development in superheaters; conditions which affect steam turbines; use of two reheaters; importance of pipe-line design. (Abstract.) Paper presented at joint session of Eng. Soc. West. Pa. and Pittsburgh, Section of A.S.M.E.

STEAM ACCUMULATORS

RUTHS. Ruths' Accumulators for Steam Storage, A. J. T. Taylor. Can. Engr., vol. 47, no. 26, Dec. 23, 1924, pp. 631-633, 4 figs. Practical method of meeting variation in rate of steam production and consumption. Particularly valuable for pulp and paper, sugar and textile industries and as standby and peak reducer for hydro-electric installations.

Steam Accumulators As a Factor in Power Costs, A. J. T. Taylor. Power House, vol. 17, no. 20, Oct. 20, 1924, pp. 31-34, 5 figs. Describes invention of Johannes Ruths, for storing steam, in use in pulp and paper industry of Sweden, Holland and other European countries.

STEAM ENGINES

HEAT-CYCLE EFFICIENCIES. Heat-Cycle Efficiencies, L. S. Marks. Power, vol. 61, no. 3, Jan. 20, 1925, pp. 100-102, 8 figs. Author urges general acceptance of ideal cycle efficiency as standard for computing engine efficiency; definition given applies equally well, whether engine operates on Carnot, Rankine, regenerative, reheating, two-vapor Rankine or any other cycle.

THERMAL EFFICIENCY. Standards of Comparison for Steam Engines. Engineer, vol. 138, no. 3599, Dec. 19, 1924, pp. 689-690. Review of discussion at meeting of joint committee on tabulating results of heat engine and boiler trials on suggested improved standard of comparison for thermal efficiency of steam engines.

STEAM GENERATORS

DESIGN TENDENCIES. Present Tendencies of Steam Generation, Jas. Kemnal. Inst. Mar. Engrs.—Trans., vol. 36, Nov. 1924, pp. 437-447 and (discussion) 447-462, 6 figs. Deals with improvements in boiler construction resulting from adaptation of steam turbines to higher pressures and higher superheats.

STEAM POWER PLANTS

WASTE-HEAT UTILIZATION. Choice of Initial State of Steam in Power Plants Utilizing Waste Heat (Ueber die Wahl des Dampf-Anfangszustandes bei Kraftanlagen mit Abwärmeverwertung), Bente. Siemens-Zeit., vol. 4, no. 10, Oct. 1924, pp. 340-344, 10 figs. Discusses use of steam for manufacturing. Determination of initial steam condition for various turbine efficiencies and performances by means of curves starting from waste-steam condition.

STEAM TURBINES

AIR-TEST METHODS. The Turbine Designer's Wind Tunnel, H. L. Wirt. Mech. Eng., vol. 47, no. 1, Jan. 1925, pp. 13-17, 15 figs. Describes air-testing methods developed by Gen. Elec. Co. for testing elements of turbines by simulating conditions in turbine with models and determining their relative performance, and from these results predicting effect of similar changes on turbine; includes curves from tests of two types of nozzles showing how improvement has been made and illustrating value of method in designing turbine elements.

DISKS, VIBRATION OF. Vibration of Steam Turbine Discs. J. von Freudenreich. Engineering, vol. 119, nos. 3079 and 3080, Jan. 2 and 9, 1925, pp. 2-4 and 31-34, 19 figs. It is shown that, contrary to prevalent idea, whole problem of disk vibration can be solved with high degree of accuracy, both experimentally as well as theoretically; and that a disk has higher factor of safety against vibration the higher the speed of rotation, provided that centrifugal stresses do not exceed safe limit of stress of material of disk. Results of tests carried out by Brown, Boveri & Cie.

FORD RIVER ROUGE PLANT. Five Hundred Thousand Horsepower in Ford Turbines for River Rouge Plant. Power, vol. 61, no. 3, Jan. 20, 1925, pp. 88-94, 9 figs. Present plans call for ultimate plant of one-half million horsepower or 360,000 kw. in 8 turbo-generator units of Ford design and manufacture, including auxiliaries; output to be used entirely for Ford industries and railroad.

INSTALLATION. Installation of Steam Turbines, J. Y. Dahlstrand. Power Plant Eng., vol. 29, no. 2, Jan. 15, 1925, pp. 128-130, 2 figs. Method of alignment of shaft; turbines must be relieved of piping strains; best location for pump governors.

STEEL

ALLOY. *See Alloy Steels.*

FORGING TEMPERATURE. On the Forging Temperature of Steels, K. Honda. Tôhoku Imperial University—Sci. Reports, vol. 13, no. 1, Oct. 1924, pp. 21-25, 5 figs. Results of investigation show that in case of carbon steels, elongation-temperature curve has generally two maxima and two minima; temperatures of maxima are 760 and 1200 deg., these latter being temperatures most favorable for forging; hence in forging low-carbon steels, precaution must be taken against fall of temperature to 600 deg.

HARDENED-BALL, X-RAY SPECTRUM OF. Density and X-Ray Spectrum of Hardened Ball Steel Tempered at Various Temperatures, K. Heindlhofer and F. L. Wright. Am. Soc. Steel Treating—Trans., vol. 7, no. 1, Jan. 1925, pp. 34-47 and (discussion) 47-53, 18 figs. X-ray diffraction method was applied to reveal nature of transformation occurring when tempering quenched ball steel; this transformation is evidenced by density and hardness measurements and by micro-structure.

HIGH-SPEED. *See Steel, High-Speed.*

STRUCTURAL. *See Structural Steel.*

TEMPER COLORS ON. Note on "Temper" Colours, R. C. Gale. Chem. & Industry, vol. 43, no. 50, Dec. 12, 1924, pp. 349T-352T, 2 figs. Possible explanations of cause of color in films when piece of polished hardened steel is tempered by reheating; results of author's experiments to determine thicknesses of "temper" color films on steel.

STEEL CASTINGS

INSPECTION STANDARDS. Inspection Standards for Steel Castings, W. J. Corbett. Iron Age, vol. 115, no. 2, Jan. 8, 1925, pp. 115-119, 4 figs. Standards laid down by group of electric steel foundries based on research; meeting specialization in purchase requirements.

MANUFACTURE. Manufacture of Steel Castings, G. Varley. Mech. Wld., vol. 75, nos. 1947, 1949, 1951 and 1952, Apr. 25, May 9, 23 and 30, 1924, pp. 260-261, 290-291, 322-323 and 339-340, 12 figs. Discussion of the different processes; treeming; molding; annealing; failures in manufacture. Reprinted from Trans. Liverpool Eng. Soc.

PURCHASING, FACTS GOVERNING. When Buying Castings, W. J. Corbett. Iron Trade Rev., vol. 76, no. 4, Jan. 22, 1925, pp. 282-284. Among things which should be known when buying castings are: how design affects product; how patterns should be made; how costs are calculated; how foundrymen can be of service and what are duties of buyer and seller.

STEEL, HEAT TREATMENT OF

DEFECTS CAUSED BY ERRORS IN. Observations on Some Causes and Remedies for Defects in Steel with Special Reference to Practical Application of Heat Treatment, R. H. Harriss. S. African Instn. Engrs., vol. 23, no. 4, Nov. 1924, pp. 288-320, 47 figs. Starts from ingot and traces origin and cause of defects in steel brought about by errors in heat treatment and cooling in ingot stage.

FATIGUE RESISTANCE, EFFECT ON. Experiments on the Fatigue of Steel, A. Ono. Kyushu Imperial Univ., Memoirs of College of Eng., vol. 3, no. 2, 1924, pp. 51, 85, 21 figs. Deals with effect of heat treatment on fatigue resistance of steel, especially nickel chrome steel. Results of fatigue, statical, and impact tests.

FUNDAMENTAL PRINCIPLES. Heat Treatment and Metallography of Steel, H. C. Knerr. Forging— Stamping—Heat Treating, vol. 10, nos. 9, 10, 11 and 12, Sept., Oct., Nov. and Dec., 1924, pp. 319-321, 385-392, 419-430 and 459-460, 44 figs. A practical course in elements of physical metallurgy. Basis of a series of lectures given by author in connection with course in heat treatment and metallography of steel at Temple Univ., Phila., Pa., under auspices of Phila. Chapter, Am. Soc. for Steel Treating.

Gaseous Fuels for. Gas as a Factor in Improving Quality Standards and Lowering Production Costs of Heat Treated Steel, H. O. Loebell. Am. Soc. Steel Treating—Trans., vol. 7, no. 1, Jan. 1925, pp. 107-123 and (discussion) 123-130.

Rear-Axle Shafts. Special Equipment Used in Heat Treating Rear Axle Main Shafts, H. O. Lang. Fuels & Furnaces, vol. 2, no. 12, Dec. 1924, pp. 1241-1245, 6 figs. Describes complete unit for heating, quenching and drawing rear-axle main shafts.

Salt Baths. Fused Salt Baths for the Prevention of Soft Spots in Quenched High Carbon and Carburized Steels, W. J. Merten. Am. Soc. Steel Treatings—Trans., vol. 7, no. 1, Jan. 1925, pp. 23-31 and (discussion) 31-33, 7 figs. Experiments described give evidence for cause of major objections to salt-bath heating and describes manner in which these unsatisfactory conditions can be eliminated; composition of quenching medium used to prevent soft spots is disclosed and discussed.

STEEL MANUFACTURE

Manganese Steel. Making Cast Manganese Steel, J. M. Quinn. Foundry, vol. 52, no. 24, Dec. 15, 1924, pp. 964-966, 2 figs. Rapid melting and proper method of making slag and alloy additions play important role in producing satisfactory metal; how steel is heat treated.

STEEL WORKS

Italy. Works of Acciaierie Elettriche Cogne Girod in Aosta (Gli stabilimenti della Soc. Anonima "Acciaierie Elettriche Cogne Girod," Aosta), F. Giolitti. Metallurgia Italiana, vol. 16, no. 10, Oct. 1924, pp. 438-445, 10 figs. partly ou supp. Plates. Details of Heroult furnaces, rolling-mill equipment, gas heating furnaces, annealing furnace, and other equipment.

STELLITE

Properties. The Hard Metal "Stellite" (Das Hartmetall "Stellit"), A. Märkle. Maschinenbau, vol. 3, no. 28, Nov. 27, 1924, pp. 1078-1079. Discusses principal properties, proper treatment, working, uses, and production of tools and their efficiency.

STREET RAILWAYS

Articulated Cars. Articulated Cars for Baltimore. Elec. Traction, vol. 20, no. 12, Dec. 1924, pp. 582-583, 3 figs. United Rys. & Elec. Co. adopts jointed 2-car units as result of studies on other properties.

Rail Crossings, Thermit-Welded. Thermit Welded Crossings for Tramways. Tramway & Ry. Wld., vol. 56, no. 25, Nov. 20, 1924, pp. 263-264, 3 figs. By its use rails of any British standard specification or section can be spliced at any angle, no expensive patterns required, and after fitting is finished Thermit weld is made and band of Thermit metal completely covers all joints of rails; result is a crossing in one solid piece. Greater economy effected.

STRUCTURAL STEEL

Reinforced with Concrete. Steel Reinforced with Concrete, O. Faber. Concrete & Constr. Eng., vol. 19, no. 12, Dec. 1924, pp. 755-757, 1 fig. Results of tests on steel-joists cased in concrete and tested in compression as stanchions, and tests on slabs composed of steel joists filled in with concrete.

Testing. Testing Structural Steels Under Alternating Stresses, O. Föppl. Mech. Eng., vol. 47, no. 1, Jan. 1925, p. 52, 3 figs. Describes testing arrangements for determining strength of materials under alternating bending stresses, with special reference to author's arrangement with cardboard strip between test bar and load-carrying bearing. Translated and abstracted from Schweizerische Bauzeitung, vol. 84, no. 18, Nov. 1, 1924.

SUPERPOWER

Economics of Interconnection. The Economics of Interconnection of Large Steam Power Systems, E. Douglas. Power, vol. 61, no. 2, Jan. 13, 1925, pp. 52-53. Author points out fallacy of associating superpower, or interconnected systems, with cheap power, and shows that adequacy and continuity of service are principal objectives.

SUPERHEATED STEAM

Insulation. Superheated Steam Insulation Pays, R. H. Heilman. Chem. & Met. Eng., vol. 31, no. 24, Dec. 15, 1924, pp. 934-936. Shows relatively short time required to repay original cost of installations and relatively large return per year on investment that can be effected by proper insulation of superheated steam surfaces. (Abstract.) Paper read before Am. Inst. Chem. Engrs.

SUBSTATIONS

Design. The Design of Static Sub-Stations, With Some Notes on Their Equipment, N. Thornton. Jr. Instn. Engrs., vol. 35, Pt. 2, Nov. 1924, pp. 37-72, 25 figs. Considers requirements and objects of a substation, reviews the different forms of equipment to be accommodated, their effect on substation design, and considers actual substation design by means of several typical examples.

T

TELEPHONY

Automatic. Strowger Director System in Havana, H. E. Clapham. Telephone Engr., vol. 28, no. 12, Dec. 1924, pp. 38-39, 6 figs. Director trunking in Havana network meets with gratifying success. Notes on what director accomplishes and how it simplifies trunking plan of a large city network. See also Telephony, vol. 87, no. 24, Dec. 13, 1924, pp. 25-28, 8 figs.

TELLURIDES

Canada. The Tellurides, E. Thomson. Can. Min. Jl., vol. 45, no. 49, Dec. 5, 1924, pp. 1187-1190, 4 figs. Their characteristics and their occurrences in Canada.

THERMIT WELDING

Rails. Welding Rails in Brooklyn. Reactions, vol. 17, no. 3, 1924, pp. 43-46, 8 figs. Brooklyn-Manhattan Transit Corp. and Brooklyn City R. R. use thermit process on large proportion of its lines being reconstructed; advantages of thermit process.

THERMODYNAMICS

Carnot's Principle. Carnot's Principle, M. I. Pupin. Mech. Eng., vol. 47, no. 1, Jan. 1924, pp. 38-39. Extracts from address at Carnot Centenary Commemoration. See also succeeding article by Wm. L. Emmet, entitled, Carnot's Influence upon Engineering, pp. 39-40.

TIDAL POWER

Hydrocompressor Installations. Tidal Power Installations, J. O. Boving. Elec. Rev., vol. 95, no. 2454, Dec. 5, 1924, pp. 844-845, 1 fig. Discusses advantages of hydrocompressors and possibilities of development of low-head hydrocompressor.

Utilization. Utilization of Tidal Power at the Aber Vrac'h Plants (L'utilisation des marées aux installations de l'Aber Vrac'h), G. Trautner. Technique Moderne, vol. 16, no 22, Nov. 15, 1924, pp. 782-785, 7 figs. Discusses the various methods proposed for utilizing tidal power in view of fact that French government has voted to participate in Aber Vrac'h undertaking to solve practicability of question. Bibliography.

TIME STUDY

Planning and Scheduling Aided by. Time Studies as an Aid to Planning, Scheduling, and Dispatching, H. G. Dent. Soc. Indus. Engrs.—Bul., vol. 7, no. 1, Jan. 1925, pp. 9-12. Outlines procedure involved in standardizing operations; time studies and time-study analysis; determination of standard time.

Principles and Practice. The Principles and Practice of Time Study, H. W. Dickson. Indus. Mgt. (N. Y.), vol. 69, no. 1, Jan. 1925, pp. 39-44. Explaining time study to foremen; the stop watch; length of time observer should spend on time study; checking operator's failure to meet standard time; standardizing conditions; securing worker's co-öperation; analysis of time study; allowances; establishing rates; clerical functions of time-study department.

TOLERANCES

Cylindrical Machine Parts. Tolerances (Toleranser), H. Törnebohm. Teknisk Tidskrift, vol. 54, nos. 42 and 46, Oct. 18 and Nov. 15, 1924, pp. 109-113 and 121-125, 19 figs. System of fits and tolerances of cylindrical machine parts, as devised by Swedish Engineering Standards Committee and proposed for acceptance as national Swedish standard. Comparison with similar systems developed by other countries show that each country seems to prefer a slightly different system.

TRANSFORMERS

Oils, Filtering. Filtering Transformer Oil in the Field, F. C. De Weese. Power, vol. 60, no. 26, Dec. 23, 1924, pp. 1016-1017. Necessary equipment; order of procedure.

Parallel Operation. The Parallel Operation of Three Phase connected Transformers, W. H. Gregory. Elec. Engr., vol. 1, no. 7, Oct. 15, 1924, pp. 256-259, 7 figs. Discusses polarity, phase rotation and angular displacement; voltage ratio; effect of impedance, resistance and reactance on parallel operation; use of paralleling reactors for securing satisfactory parallel operation.

Types and Practice. Transformer Practice. Power Plant Eng., vol. 29, no. 1, Jan. 1, 1925, pp. 39-53, 60 figs. Group of articles discussing elemental theory of transformer and describing schemes of connection, as follows: Types of Transformers; Ratio of Transformation; Systems of Transformer Connections, V. E. Johnson; Details of Modern Transformers; Methods of Cooling Transformers.

TUBES

Brass, Manufacture of. The Manufacture of Brass and Copper Tubes, G. Evans. Metal Industry (Lond.), vol. 25, nos. 24 and 25, Dec. 12 and 19, 1924, pp. 565-566 and 589-592, 8 figs. Deals with draw-bench department. Dec. 12; Hydraulic benches, Dec. 19; Chain benches.

V

VACUUM TUBES

Push-Pull Circuit. A High Efficiency Vacuum Tube Oscillating Circuit, D. C. Prince and F. B. Vogdes. Inst. Radio Engrs.—Proc., vol. 12, no. 5, Oct. 1924, pp. 623-650, 17 figs. Describes modified push-pull circuit in which approximately square waves of current are passed through two tubes alternately; high efficiency is obtained by superimposing upon grid circuit a voltage porportional to current variations in plate circuit.

Triodes. Experimental Determination of the Fundamental Dynamic Characteristics of a Triode, E. Takagishi. Inst. Radio Engrs.—Proc., vol. 12, no. 5, Oct. 1924, pp. 609-622, 10 figs. By picking out fundamental component only from distorted current in triode while functioning, writer has found first new forms of dynamic characteristics for a triode, which are utilizable for solving various problems not hitherto satisfactorily solved (for example, modulation in radio-telephony, phenomenon of "ziehen" or "pulling", etc.; experiments relative to voltage amplification factor for which new expression has been found.

VARNISHES

Insulating. Chemical Problems in Insulating Varnishes, H.C.P. Weber. Indus. & Eng. Chem., vol. 17, no. 1, Jan. 1925, pp. 11-14, 2 figs. Finished coal is result either of simple evaporation of solvent or of evaporation accompanied by oxidation or result of condensation; specific varnishes must be employed for specific purposes; oil varnishes are most widely used and protective film is obtained by evaporation accompanied by oxidation; during this process materials are formed which have low electrical resistance.

W

WATER POWER

Pulp and Paper Industry. Water Power in the Pulp and Paper Industry. Power House, vol. 17, no. 20, Oct. 20, 1924, pp. 77 and 80-81, 1 fig. Total installed and purchased power from all sources, used by industry in 1924 shown by Dominion Water Power Branch, Dept. Inter. to exceed 726,375 hp.

WATER SUPPLY

Surface, Canada. Surface Water Supply of Canada—St. Lawrence and Southern Hudson Bay Drainage, Ontario, S. S. Scovil. Canada Dept. Inter., Dominion Water Power Branch, Water Resources Paper No. 42, 1924, 90 pp., 2 maps. Hydrometric data covering climatic year 1922-23.

WELDING

Aluminum. *See Aluminum, Welding.*

Cast Iron. The Welding of Cast Iron from a Metallurgical Point of View, J. G. Pearce. Acetylene Jl., vol. 26, nos. 3 and 4, Sept. and Oct. 1924, pp. 136-140 and 184, 186, 188 and 190, 10 figs. Discusses influence of carbon upon iron, influence of rate of cooling on structure, white and grey iron, elements in cast iron, influence of constitution on properties and on welding process, and welding special irons. Lecture delivered to Brit. Acetylene & Welding Assn., Lond. Taken from Acetylene & Welding Jl., Lond.

Electric. *See Electric Welding, Electric Welding, Arc.*

Methods. Welding Methods. Werkstattstechnik, vol. 18, no. 22, Nov. 15, 1924, pp. 633-676, 155 figs. A series of articles by different authors on autogenous welding, welding in forge shop, welding of castings, arc welding and electrode material, electric spot welding, autogenous aluminum welding, copper welding, etc.

Oxy-Acetylene. *See Oxy-Acetylene Welding.*

Thermit. *See Thermit Welding.*

WIRE DRAWING

Machines. British Wire-Drawing and Wire-working Machinery. Engineer, vol. 138, nos. 3577, 3578, 3579, 3580, 3581, 3582, 3583, 3584, 3586, 3587, 3588, 3589, 3590, 3592, 3593, 3595, 3596, 3597, 3598 and 3599, July 18, 25, Aug. 1, 8, 15, 22, 29, Sept 5, 19, 26, Oct. 3, 10, 17 and 31, Nov. 7, 21, 28, Dec. 5, 12, and 19, pp. 72-74, 109-112, 130-131, 164-166, 189-193, 218-219, 234-236 and 238, 258-261, 317-319, 345-347, 375-377, 405-408 and 410, 432-434 and 436, 500-502.520-521, 577-578, 610-612, 637-640 and 642, 675-677 and 690-691, 158 figs. July 18: Manufacture of wire rods. July 25: Layout of factories; wire drawing Aug. 1: Design and production of dies. Aug. 8; Wire-drawing blocks. Aug. 15: Continuous wire-drawing machines. Aug. 22: Safety-pin machine. Aug. 29: Wire-netting machinery. Sept. 5, 19 and 26: Wire factories. Oct. 3: Barbed-wire machines. Oct. 10: Electric cable-making. Oct. 17: High-speed stranding machines. Oct.: 31: Straightening and cutting-off machines. Nov. 7: Pin-making machines. Nov. 21: Nail and rivet-making machines. Nov. 28: Needle making. Dec. 5: Wire-weaving looms. Dec. 12: Miscellaneous machines. Dec. 19: Large wire-drawing bench.


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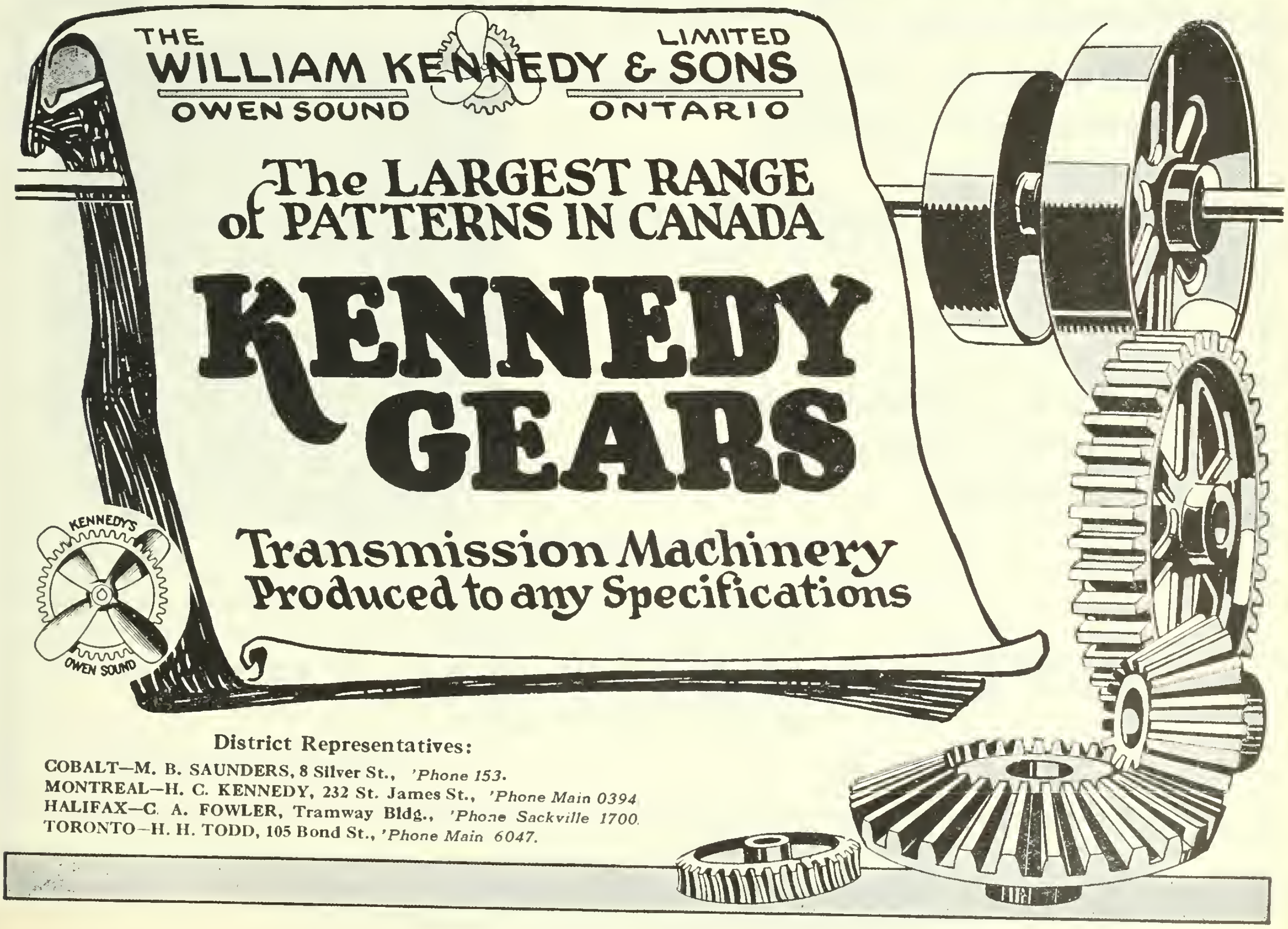

THE WILLIAM KENNEDY & SONS LIMITED
OWEN SOUND ONTARIO
The LARGEST RANGE of PATTERNS IN CANADA
KENNEDY GEARS
Transmission Machinery Produced to any Specifications
KENNEDY'S OWEN SOUND
District Representatives:
COBALT—M. B. SAUNDERS, 8 Silver St., 'Phone 153.
MONTREAL—H. C. KENNEDY, 232 St. James St., 'Phone Main 0394
HALIFAX—C. A. FOWLER, Tramway Bldg., 'Phone Sackville 1700.
TORONTO—H. H. TODD, 105 Bond St., 'Phone Main 6047.

Request for Institute Records

To the Members of The Institute

In order to make the Year Book and List of Members of the greatest possible value to the membership, it is earnestly requested that you kindly fill in the return slip.

In many cases we have not on our records the official positions of our members and it is hoped that all members will return the slip, filled in, at the earliest possible date.

FRASER S. KEITH, Secretary.

*Name in full*________________________

*College degrees*________________________

*Military titles and honours (including dates of enlistment and demobilization)*____________

*Firm and position*____________________

*Mailing address*____________________

Purchaser's Classified Directory

A Selected List of Equipment, Apparatus and Supplies

For Alphabetical List of Advertisers see page 46

A

Acids:
Nichols Chemical Co., Ltd.
Air Brakes:
Canadian General Electric Co., Ltd.
Air Compressors:
Lancashire Dynamo and Motor Co. of Can. Ltd.
Air Coolers:
Laurie and Lamb.
Air Hose Clamps:
Knox Mfg. Co.
Air Hose Couplings:
Knox Mfg. Co.
Air Valves, Throttle:
Knox Mfg. Co.
Alumina Sulphate:
Nichols Chemical Co., Ltd.
Ammonia Controlled Water Regulators:
Under-Feed Stoker Co., of Canada, Ltd.
Ammonia Valves and Fittings:
Crane Ltd.
Anchorage Equipment:
Canadian Line Materials, Ltd.
Angle Bars:
British Empire Steel Corp., Ltd.
Angles:
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.
Vickers & Combustion Engineering, Ltd.
Arches, Flat:
Vickers & Combustion Engineering, Ltd.
Asbestos Products:
Canadian Johns-Manville Co., Ltd.
Asphalt:
Imperial Oil Ltd.
Ash Handling Equipment:
Link-Belt Ltd.
Vickers & Combustion Engineering, Ltd.
Automatic Air Valves:
Jenkins Bros., Ltd.
Automatic Underfeed Stokers:
Taylor Stoker Co., Ltd.
Vickers & Combustion Engineering, Ltd.

B

Baffle Walls:
Canadian Johns-Manville Co., Ltd.
Bale Ties:
British Empire Steel Corp., Ltd.
Balls, Chromang Grinding:
William Kennedy & Sons, Ltd.
Balls, Steel:
Openshaw & Bennet Ltd.
Barbed Wire:
British Empire Steel Corp., Ltd.
Bars, Reinforcing:
Algoma Steel Corp., Ltd.
British Empire Steel Corp., Ltd.
Burlington Steel Co., Ltd.
Steel Co., of Canada, Ltd.
Bars, Steel & Iron:
Burlington Steel Co., Ltd.
Steel Co., of Canada Ltd.
Beams:
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.
Vickers & Combustion Engineering, Ltd.
Bearings, Ball:
Openshaw & Bennet, Ltd.
N. Slater Co., Ltd.
Belting:
General Supply Co., of Canada, Ltd.
Jones and Glassco, Regd.
Bending Machines:
John Bertram & Sons Co., Ltd.,
Billets, Blooms and Slabs:
British Empire Steel Corp., Ltd.
Blankets:
Grant-Holden-Graham, Ltd.
Blowers, Centrifugal:
De Laval Steam Turbine Co.
Blue Print Machinery:
Montreal Blue Print Co.
Boilers:
Wm. Hamilton Co. Ltd.
E. Leonard & Sons, Ltd.
Mussens Limited.
Vickers & Combustion Engineering, Ltd.
Boilers, Electric:
Dominion Engineering Works, Ltd.
Boilers, Heating:
E. Leonard & Sons, Ltd.
Taylor Stoker Co., Ltd.
Vickers & Combustion Engineering, Ltd.
Boilers, Marine:
Vickers & Combustion Engineering, Ltd.
Boilers, Portable:
E. Leonard & Sons, Ltd.
Boilers, Return Tubular:
Babcock-Wilcox & Goldie-McCulloch Ltd.
E. Leonard & Sons, Ltd.
Bolts:
British Empire Steel Corp., Lt d
N. Slater Co., Ltd.
Steel Co., of Canada, Ltd.
Bonds, Rail:
Dominion Insulator & Mfg. Co., Ltd.
Boring and Turning Mills:
John Bertram & Sons Co., Ltd.,
Boxes, Valve:
Jenkins Bros., Ltd.
Brass, Sheets, Rods, Tubes:
Openshaw & Bennet Ltd.
Bridge Designs and Engineering Services:
Strauss Bascule Bridge Co.
Bridges, Steel:
Canadian Bridge Co., Ltd.
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.
Vickers & Combustion Engineering, Ltd.
Broadcasting Equipment:
Northern Electric Co., Ltd.
Buckets, Clamshell:
F. H. Hopkins & Co., Ltd.
Buckets, Orange-peel:
F. H. Hopkins & Co., Ltd.
Bucket Loaders:
Link-Belt Ltd.
Mussens Ltd.
Builders Supplies:
Jno. E. Russell Co., Ltd.
Building Materials, Asbestos:
Canadian Johns-Manville Co., Ltd.
Building Papers:
Barrett Co., Ltd.
Buildings, Steel:
Canadian Bridge Co., Ltd.
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.
Vickers & Combustion Engineering, Ltd.
Bus-Supports:
Canadian Line Materials, Ltd.

C

Canvas Goods:
Grant-Holden-Graham, Ltd.
Car Dumpers:
Link-Belt Ltd.
Car Equipment Specialties:
Dominion Insulator & Mfg. Co Ltd.
Car Pullers:
Link-Belt Ltd.
Car Steps, Safety:
Irving Iron Works Co.
Car Wheels, Chilled Iron.
Canada Iron Foundries, Ltd.
Cars, Dump:
Clare Osborn Ltd.
F. H. Hopkins & Co., Ltd.
Mussens Ltd.
Casements, Steel:
Can. Metal Window & Steel Products, Ltd.
Trussed Concrete Steel Co., of Canada, Ltd.
Castings:
Babcock-Wilcox & Goldie-McCulloch Ltd.
William Kennedy & Sons, Ltd.
Castings, Brass:
N. Slater Co., Ltd.
Superheater Co., Ltd.
Castings, Iron:
Canada Iron Foundries, Ltd.
Dominion Engineering Works, Ltd.
Gartshore-Thomson Pipe and Foundry Co., Ltd.
Wm. Hamilton Co. Ltd.
E. Leonard & Sons, Ltd.
Superheater Co., Ltd.
Catenary Materials:
Canadian Line Materials, Ltd.
Dominion Insulator & Mfg., Co. Ltd.
N. Slater Co., Ltd.
Cement, Dealers:
Jno. E. Russell Co., Ltd.
Cement Gun:
General Supply Co., of Canada Ltd.
Cement, High Temperature:
Canadian Johns-Manville Co., Ltd.
Cement, Manufacturers:
Canada Cement Co., Ltd.
Chain Grate Stokers:
Babcock-Wilcox & Goldie-McCulloch Co., Ltd.
Chains:
Link-Belt, Ltd.
Chains, Silent:
Jones and Glassco, Regd.
Link-Belt Ltd.
Channels:
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.
Chemist, Industrial:
Milton Hersey Co., Ltd.
Chimneys:
Vickers & Combustion Engineering, Ltd.
Circuit Breakers:
Dominion Engineering Agency, Ltd.
Clamps, Double Bolt:
Knox Mfg. Co.
Clamps, High Pressure Hose:
Knox Mfg. Co.
Clamps, Rock Drill:
Knox Mfg. Co.
Clamps, Sectional:
Knox Mfg. Co.
Clamps, Single Bolt:
Knox Mfg. Co.
Coal:
British Empire Steel Corp., Ltd.
Coal Handling Equipment:
Dominion Bridge Co. Ltd.
Link-Belt, Ltd.
Mussens Limited.
Vickers & Combustion Engineering, Ltd.
Coke:
British Empire Steel Corp., Ltd.
Compressors:
Babcock-Wilcox & Goldie-McCulloch Co., Ltd.
General Supply Co., of Canada, Ltd
Vickers & Combustion Engineering, Ltd.
Compressors, Air:
Canadian Westinghouse, Co., Ltd
Lancashire Dynamo and Motor Co. of Can. Ltd.
Mussens Limited.
Compressors, Ammonia:
Taylor Stoker Co., Ltd.
Compressors, Centrifugal.
De Laval Steam Turbine Co.
Concrete Armouring, Surface:
Irving Iron Works Co.
Concrete Mixers:
Clare Osborn, Ltd.
General Supply Co., of Canada, Ltd.
F. H. Hopkins & Co., Ltd.
Mussens Ltd.
Condensers, Synchronous & Static:
Canadian General Electric Co., Ltd.
Griswold & Co., Ltd.
Lancashire Dynamo and Motor Co. of Can. Ltd.
Conduit, Telephone Cable:
Pacific Coast Pipe Co. Ltd.
Conduit, Underground Fibre:
Canadian Johns-Manville Co., Ltd.
Conduit, Underfloor Duct:
Canadian Johns-Manville Co., Ltd.
Connecting Rods:
British Empire Steel Corp., Ltd.
Construction Material Electrical:
Northern Electric Co., Ltd.
N. Slater Co., Ltd.
Contractors:
E. G. M. Cape & Co.
Randolph MacDonald Co., Ltd.
D. P. Robinson & Co. Inc.
Contractors' Plant and Supplies:
Clare Osborn, Ltd.
F. H. Hopkins & Co., Ltd.
Mussens Limited.
Contractors' Pumps:
De Laval Steam Turbine Co.
Controllers, Electric:
Canadian Westinghouse Co. Ltd.
Conveyors:
Link-Belt Ltd.
Vickers & Combustion Engineering, Ltd.
Conveyors, Portable Belt:
Link-Belt Ltd.
Mussens Ltd.
Copper, Sheets, Rods, Tubes:
Openshaw & Bennet, Ltd.
Couplings, Air Hose:
Knox Mfg. Co.
Couplings, High Pressure Hose:
Knox Mfg. Co.
Couplings, Rock Drill:
Knox Mfg. Co.
Couplings, Steam Hose:
Knox Mfg. Co.
Couplings, Suction Hose:
Knox Mfg. Co.
Cranes:
Babcock-Wilcox & Goldie-McCulloch Ltd.
Vickers & Combustion Engineering, Ltd.
Cranes, Crawler:
Link-Belt Ltd.
Cranes, Locomotives:
Clare Osborn, Ltd.
F. H. Hopkins & Co., Ltd.
Link-Belt, Ltd.
Mussens Ltd.
Cranes, Travelling:
Dominion Bridge Co , Ltd.
Creosote Oils:
Barrett Co., Ltd.
Cross Arm Braces:
Burlington Steel Co., Ltd.
N. Slater Co., Ltd.
Crushed Stones:
Jno. E. Russell Co., Ltd.
Crushers, Jaw, Gyratory:
F. H. Hopkins & Co., Ltd.
Vickers & Combustion Engineering, Ltd.
Culvert Pipe:
Gartshore-Thomson Pipe and Foundry Co., Ltd.
Jno. E. Russell Co., Ltd.
Cutters, Milling:
Pratt & Whitney Company of Canada, Ltd.
Cutting off Machines:
John Bertram & Sons Co., Ltd

D

Damper Regulation:
Under-Feed Stoker Co., of Canada, Ltd.
Dampproof Coating:
Canadian Johns-Manville Co., Ltd.
Derricks:
Mussens Ltd.
Die Screw Plates:
Pratt & Whitney Company of Canada, Ltd.
Dies:
Pratt & Whitney Co., of Canada, Ltd.
N. Slater Co., Ltd.
Doors, Fireproof:
Mussens Limited.
N. Slater Co., Ltd.
Dredges:
Vickers & Combustion Engineering, Ltd.
Drills:
Pratt & Whitney Company of Canada, Ltd.
Drilling Machines, Metal:
John Bertram & Sons Co., Ltd

Purchaser's Classified Directory

Drill Sharpeners:
Lancashire Dynamo and Motor Co. of Can. Ltd.

E

Economizers:
Babcock-Wilcox & Goldie-McCulloch Ltd.
General Supply Co., of Canada Ltd.
Vickers & Combustion Engineering, Ltd.
Electric Motors:
Lincoln Electric Co., of Canada, Ltd.
Electric Welders:
Lincoln Electric Co., of Canada, Ltd.
Electrical Appliances:
Northern Electric Co. Ltd.
Electric Railway Car Couplers:
Dominion Insulator & Mfg. Co., Ltd.
Electrical Supplies:
Northern Electric Co., Ltd.
Enamels, Acid & Fume Resisting:
Dominion Paint Works, Ltd.
Enamels, Industrial Lighting:
Dominion Paint Works, Ltd.
End Mills:
Pratt & Whitney Company of Canada, Ltd.
Engines, Gas and Oil:
Canadian Fairbanks-Morse Co. Ltd.
Vickers & Combustion Engineering, Ltd.
Engines, Steam:
Babcock-Wilcox & Goldie-McCulloch Ltd.
Laurie and Lamb.
E. Leonard & Sons, Ltd.
Vickers & Combustion Engineering, Ltd.
Excavators:
Mussens Limited.
Excavators, Dragline:
Link-Belt Ltd.
Exhaust Steam Injectors, Locomotive:
Superheater Co., Ltd.

F

Fan Engine Regulators:
Under-Feed Stoker Co., of Canada, Ltd.
Feed-Water Heaters, Locomotive:
Superheater Co., Ltd.
Fence Posts, Steel:
Burlington Steel Co., Ltd.
Files:
Simonds Canada Saw Co. Ltd.
Fillers, Wood and Metal:
Dominion Paint Works, Ltd.
Fire Alarm Apparatus:
Northern Electric Co., Ltd.
Floor Stands:
Jenkins Bros., Ltd.
Flange Couplings:
Cumberland Steel Co.
Flanges, Companion:
Jenkins Bros., Ltd.
Files, Valve:
Jenkins Bros., Ltd.
Flooring, Fireproof:
Irving Iron Works Co.
Flooring, Open Steel:
Irving Iron Works Co.
Flooring, Steel:
Irving Iron Works Co.
Flooring, Non-Slipping:
Irving Iron Works Co.
Flooring, Ventilating:
Irving Iron Works Co.
Floors, Monolithic:
Canadian Johns-Manville Co., Ltd.
Forgings:
British Empire Steel Corp., Ltd.
Dominion Bridge Co., Ltd.
N. Slater Co., Ltd.
Friction Clutches:
Link-Belt Ltd.
Canadian Johns-Manville Co., Ltd.
Fuel, Oil:
Imperial Oil, Ltd.
Furnaces, Automatic:
Under-Feed Stoker Co., of Canada, Ltd.

G

Galvanizing, Hot Dip:
N Slater Co., Ltd.
Gasoline:
Imperial Oil, Ltd.
Gauges:
Pratt & Whitney Co., of Canada, Ltd.
Gear Reductions:
Hamilton Gear & Machine Co.
Gears:
Hamilton Gear & Machine Co
Link-Belt, Ltd.
Vickers & Combustion Engineering, Ltd.
Gears, Machine Cut:
Jones and Glassco, Regd.
Gears, Double Helical:
De Laval Steam Turbine Co.
Gears Reduction:
De Laval Steam Turbine Co.
Generators:
Canadian General Electric Co., Ltd.
Canadian Westinghouse Co.Ltd.
Griswold & Co., Ltd.
Lancashire Dynamo and Motor Co. of Can. Ltd.
Grab Buckets:
Link-Belt Ltd.
Mussens Limited.
Grating, Steel:
Irving Iron Works Co.
Gratings, Area, Sidewalk:
Irving Iron Works Co.
Ground Joints Unions:
Dart Union Co., Ltd.
Ground Shafting:
Cumberland Steel Co.
Guards, Truck Radiator:
Irving Iron Works Co.

H

Hammers, Steam:
John Bertram & Sons Co., Ltd.,
Hangers:
Link-Belt Ltd.
Hangers, Door:
N. Slater Co., Ltd.
Headlights, Electric Railway:
Dominion Insulator & Mfg. Co., Ltd.
Heaters, Boiler Feed-Water:
Babcock-Wilcox & Goldie-McCulloch Ltd.
Vickers & Combustion Engineering, Ltd.
Heating Material:
Crane Ltd.
Hobs:
Pratt & Whitney Company of Canada Ltd.
Hoisting Engines:
Clare Osborn, Ltd.
F. H. Hopkins & Co., Ltd.
Lancashire Dynamo and Motor Co. of Can. Ltd.
Mussens Ltd.
Hoists, Electric:
Lancashire Dynamo and Motor Co. of Can. Ltd.
Link-Belt Ltd.
Taylor Stoker Co., Ltd.
Hoists, Hydraulic:
Vickers & Combustion Engineering, Ltd
Hoists, Mono-Rail:
Link-Belt Ltd.
Taylor Stoker Co., Ltd.
Hose Couplings, High Pressure:
Knox Mfg Co.
Hydraulic Press Control Systems:
Taylor Stoker Co., Ltd.
Hydraulic Turbines:
Boving Hydraulic & Engineering Co.
Dominion Engineering Works, Ltd.
General Supply Co., of Can. Ltd.
Wm Hamilton Co. Ltd.
Vickers & Combustion Engineering, Ltd.

Industrial Electric Control:
Canadian General Electric Co. Ltd.
Dominion Engineering Agency, Ltd.
Insulated Rail Joints, Continuous:
Rail Joint Co., of Canada, Ltd
Insulation, Steam Pipe Casing:
Pacific Coast Pipe Co. Ltd.
Insulation, Underground Systems:
Canadian Johns-Manville Co. Ltd.
Insulators, Porcelain:
Dominion Insulator & Mfg., Co. Ltd.

J

Joints, Filler Paving:
Barrett Co., Ltd.

K

Kerosene:
Imperial Oil Ltd.

L

Ladder Steps, Steel:
Irving Iron Works Co.
Lathes:
John Bertram & Sons Co., Ltd.,
Lightning Arrestors:
Canadian General Electric Co., Ltd.
Dominion Engineering Agency, Ltd.
Lighting Equipment, Industrial and Street:
Canadian General Electric Co., Ltd.
Line Materials:
Dominion Insulator & Mfg. Co., Ltd.
N. Slater Co., Ltd.
Locomotives:
Clare Osborn, Ltd.
F. H Hopkins & Co., Ltd.
Mussens Ltd.
Locomotives, Electric:
Canadian General Electric Co., Ltd.
Canadian Westinghouse Co.,Ltd
Lubricating Oils & Greases:
Imperial Oil Ltd.
Lumber, Asbestos:
Canadian Johns-Manville Co., Ltd.

M

Machine Knives:
Simonds Canada Saw Co. Ltd.
Machine Tools:
John Bertram & Sons Co., Ltd.
Machinery:
Canadian Fairbanks-Morse Co., Ltd.
Dominion Engineering Works, Ltd.
Mackinaw Clothing:
Grant-Holden-Graham, Ltd.
Mandrels:
Pratt & Whitney Company of Canada, Ltd.
Marine-Machinery:
William Kennedy & Sons, Ltd.
Material Handling Plants:
Link-Belt Ltd.
Mussens Limited.
Vickers & Combustion Engineering, Ltd
Menders, High Pressure Hose:
Knox Mfg. Co
Men's Furnishings:
Grant-Holden-Graham, Ltd.
Merchant Bars:
British Empire Steel Corp., Ltd.
Metal Lath:
Trussed Concrete Steel Co. of Canada, Ltd.
Milling Cutters:
Pratt & Whitney Co., of Canada, Ltd.
Milling Machines:
John Bertram & Sons Co., Ltd.
Mine Hoists, Steam and Electric:
Lancashire Dynamo and Motor Co. of Can. Ltd.
Mining Machinery:
Wm. Hamilton Co. Ltd.
William Kennedy & Sons, Ltd.
Motors:
Canadian Fairbanks-Morse Co., Ltd.
Dominion Engineering Agency Ltd.
Lancashire Dynamo and Motor Co. of Can. Ltd.
Motors, Electric:
Canadian General Electric Co., Ltd.
Canadian Westinghouse Co., Ltd
Lancashire Dynamo and Motor Co. of Can. Ltd.
Lincoln Electric Co., of Canada Ltd.
Motor Oils:
Imperial Oil Ltd.

N

Nails:
British Empire Steel Corp., Ltd.
Nipples, High Pressure Hose:
Knox Mfg. Co.
Nipples, Pneumatic Hose:
Knox Mfg. Co.
Nipples, Rock Drill:
Knox Mfg. Co.
Nozzles, Malleable Iron:
Knox Mfg. Co.
Nuts:
British Empire Steel Corp., Ltd,

O

Oil Burning Equipment:
Vickers & Combustion Engineering Ltd.
Oil Purifiers, Centrifugal:
De Laval Steam Turbine Co.

P

Packings, Asbestos Sheet:
Canadian Johns-Manville Co., Ltd.
Packings, Rod and Plunger:
Canadian Johns-Manville Co., Ltd.
Paints, Metal Protectives:
Barrett Co., Ltd.
Paper Mill Machinery:
Dominion Engineering Works, Ltd.
Paving Contractors:
Standard Paving Ltd.
Pencils:
American Lead Pencil Co.
Penstocks:
Wm. Hamilton Co. Ltd.
Horton Steel Works, Ltd.
Pacific Coast Pipe Co., Ltd.
Vickers & Combustion Engineering, Ltd.
Pinions:
Hamilton Gear & Machine Co.
Jones & Glassco, Reg'd.
Pipe Coils:
Superheater Co., Ltd.
Pipe, Concrete:
Jno. E. Russell Co., Ltd.
Pipe Couplings, Union:
Dart Union Co., Ltd.
Pipe Fittings:
Crane Ltd.
Pipe, Lead:
Steel Co. of Canada, Ltd.
Pipes, Cast Iron:
Canada Iron Foundries, Ltd.
Gartshore-Thomson Pipe and Foundry Co., Ltd.
General Supply Co., of Canada Ltd.
Kennedy & Company, Ltd.
National Iron Corp., Ltd.
Pipe Insulations:
Canadian Johns-Manville Co., Ltd.
Pipe Lock Bar:
General Supply Co., of Canada, Ltd.
Pipe, Wood Stave:
Pacific Coast Pipe Co., Ltd.
Pipes, Reinforced Concrete:
Jno. E. Russell Co., Ltd.
Pipes, Wrought Iron:
Crane Ltd.
Planing Machines, Metal:
John Bertram & Sons Co., Ltd.,
Plate Rolls:
John Bertram & Sons Co., Ltd.,
Plates, Brass and Copper:
Openshaw & Bennet, Ltd.
Plates, Steel:
British Empire Steel Corp., Ltd.
Hamilton Bridge Works Co.,Ltd.
Vickers & Combustion Engineering, Ltd.
Vulcan Iron Works, Ltd.
Plumbing Material:
Crane Ltd.
Pole Line Hardware:
Canadian Line Materials, Ltd.
Posts, Indicator:
Jenkins Bros., Ltd.
Porcelain, Insulators:
Dominion Insulator & Mfg. Co., Ltd.
Power Apparatus:
Northern Electric Co., Ltd.
Power Plant Equipment:
Babcock-Wilcox & Goldie-McCulloch Ltd.
Vickers & Combustion Engineering, Ltd.

THE HAMILTON BRIDGE WORKS COMPANY LIMITED

HEAD OFFICE AND WORKS

HAMILTON, CANADA

BRANCH OFFICE:
410 GENERAL ASSURANCE BLDG.
BAY AND TEMPERANCE STS.
TORONTO.

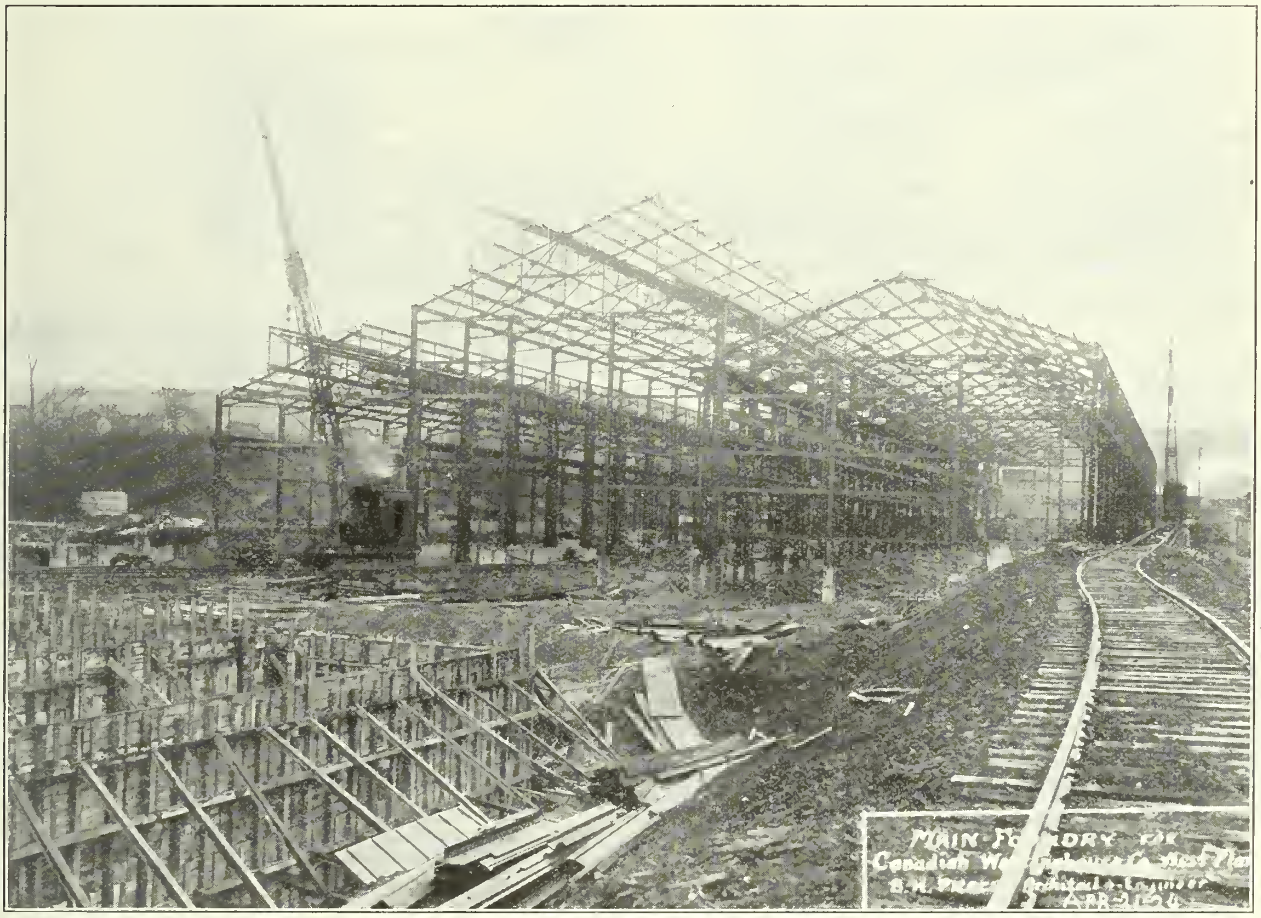
ENGINEERS, MANUFACTURERS AND ERECTORS

—OF EVERY CLASS OF—

STRUCTURAL STEEL AND BRIDGE WORK

OFFICE AND MILL BUILDINGS, HIGHWAY AND RAILWAY BRIDGES

MINE BUILDINGS AND HEADFRAMES.



We carry a large stock of Structural Shapes and plates and your requirements can be immediately filled. Our large shops, with a capacity of 36,000 tons annually, enable us to turn out whatever you require, from the largest building to a few beams, in a surprisingly short time. Orders for plain material which has only to be cut to length can be shipped within twenty-four hours.

Purchaser's Classified Directory

Presses, Hydraulic:
John Bertram & Sons Co., Ltd
Propeller Wheels:
Vickers & Combustion Engineering, Ltd.
Wm. Kennedy & Sons, Ltd.
Pulp Mill Machinery:
Dominion Engineering Works, Ltd.
William Hamilton Co., Ltd.
Pulp Pumps:
De Laval Steam Turbine Co.
Pulpwood Machinery:
Wm. Hamilton Co. Ltd.
Vickers & Combustion Engineering, Ltd.
Pulverized Fuel Systems:
Under-Feed Stoker Co., of Canada, Ltd.
Vickers & Combustion Engineering, Ltd.
Pump Governors:
C. A. Dunham Co., Ltd.
Under-Feed Stoker Co., of Canada, Ltd.
Pump Valves:
Jenkins Bros., Ltd.
Pumps:
Canadian Fairbanks-Morse Co., Ltd.
Dominion Engineering Works, Ltd.
General Supply Co., of Canada, Ltd.
Jones & Glassco, Reg'd.
Mussens Limited.
Pumps and Condensers:
Babcock-Wilcox & Goldie-McCulloch Ltd.
Pumps, Centrifugal:
De Laval Steam Turbine Co.
Dominion Engineering Works, Ltd.
Laurie & Lamb.
Pumps, Hydraulic:
Taylor Stoker Co., Ltd.
Pumps Oil:
Taylor Stoker Co., Ltd.
Punches and Punch Dies:
Pratt & Whitney Company of Canada, Ltd.
Punches and Shears:
John Bertram & Sons Co., Ltd.

R

Radiator Traps:
Canadian Johns-Manville Co., Ltd.
Radiator Valves:
Jenkins Bros., Ltd.
Radio Receiving Sets:
Northern Electric Co., Ltd.
Rail Bonds:
Dominion Insulator & Mfg., Co. Ltd.
Rail Joints:
Rail Joint Co., of Canada, Ltd.
Rails:
Algoma Steel Corp., Ltd.
British Empire Steel Corp., Ltd.
Burlington Steel Co., Ltd.
F. H. Hopkins & Co., Ltd.
Steel Co. of Canada, Ltd.
Railroad Spikes:
Steel Co., of Canada, Ltd.
Railway Equipment:
Canadian General Electric Co., Ltd.
Rawhide Pinions:
Hamilton Gear & Machine Co
Rawlplugs:
Dominion Engineering Agency Ltd.
Reamers:
Pratt & Whitney Co., of Canada, Ltd.
Recording Instruments:
Vickers & Combustion Engineering, Ltd.
Refrigerating Machinery:
Taylor Stoker Co., Ltd.
Reinforcing Steel:
Burlington Steel Co., Ltd.
Trussed Concrete Steel Co., of Canada, Ltd.
Rivets:
British Empire Steel Corp., Ltd.
Road Oils & Preservatives:
Barrett Co., Ltd.
Road Rollers:
Dominion Insulator & Mfg. Co., Ltd.
Mussens Limited.
Rock Drills, Air and Steam:
Lancashire Dynamo and Motor Co., of Can. Ltd.
Rods, Steel:
British Empire Steel Corp., Ltd.
Roofing, Prepared:
Barrett Co., Ltd.
Roofs, Built up, Felt & Pitch:
Barrett Co., Ltd.
Roofing, Asbestos and Prepared:
Canadian Johns-Manville Co., Ltd.
Roofs, Asbestos Built up:
Canadian Johns-Manville Co., Ltd.
Roofing, Asbestos Ready-to-lay:
Canadian Johns-Manville Co., Ltd.
Roofing, Corrugated Asbestos:
Canadian Johns-Manville Co., Ltd.
Rope, Wire:
Dominion Wire Rope Co., Ltd.
Mussens Limited.
Rubber Goods, Mechanical:
Jenkins Bros., Ltd.

S

Safes:
Babcock-Wilcox & Goldie-McCulloch Co., Ltd.
Sash, Steel:
Trussed Concrete Steel Co., of Canada, Ltd.
Sawmill Chains:
Link-Belt Ltd.
Sawmill Machinery:
William Hamilton Co., Ltd.
Saws:
Simonds Canada Saw Co. Ltd.
Scales:
Canadian Fairbanks-Morse Co. Ltd.
Screening Equipment:
Link-Belt, Ltd.
Mussens Limited.
Vickers & Combustion Engineer ing, Ltd.
Screw Blanks, Lead:
Cumberland Steel Co.
Sewer Pipe:
Jno. E. Russell Co., Ltd.
Shaft Couplings, Flexible:
De Laval Steam Turbine Co.
Shafting, Cold Drawn:
Cumberland Steel Co.
Sheathing:
Barrett Co., Ltd.
Sheets:
Steel Co., of Canada Ltd.
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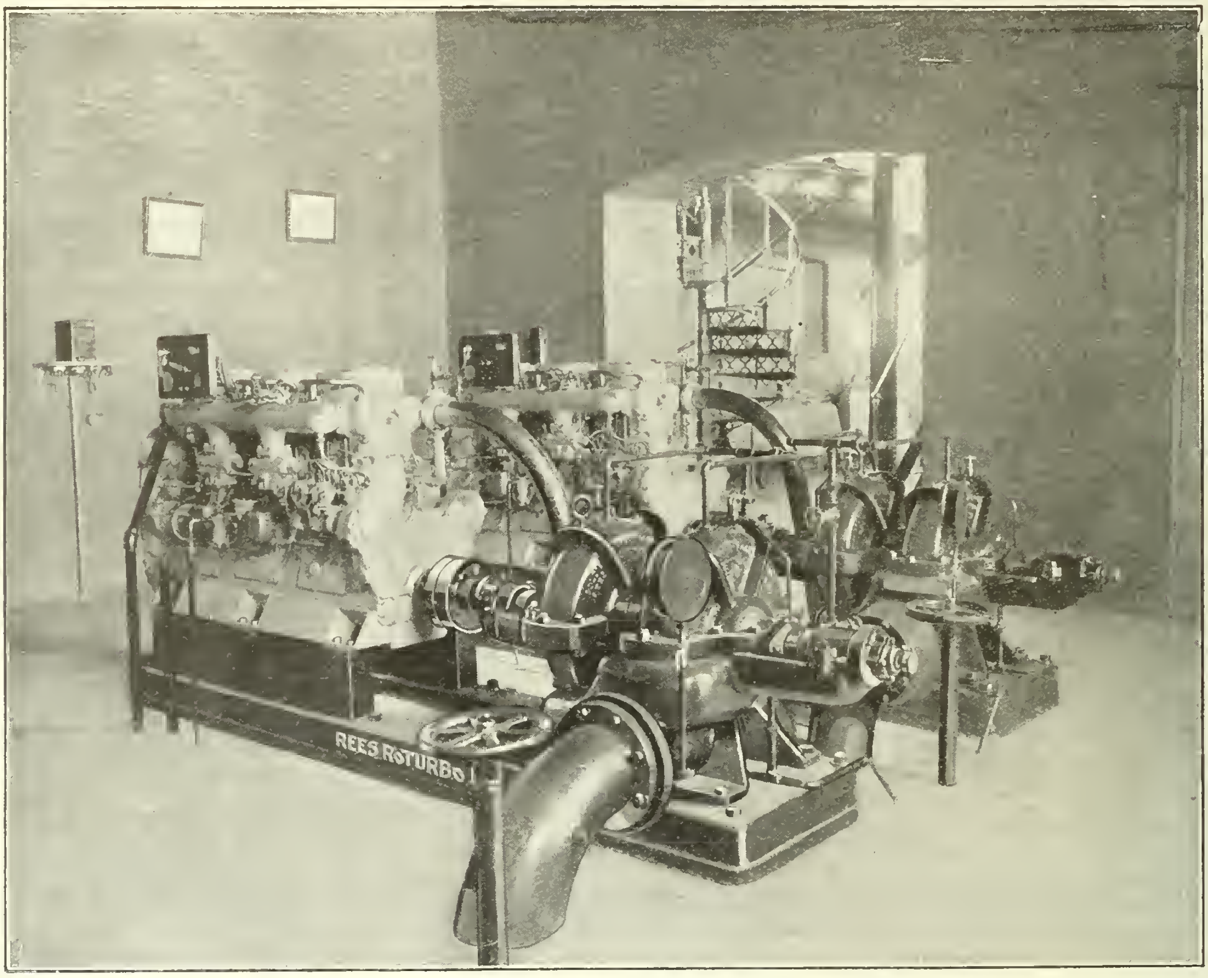

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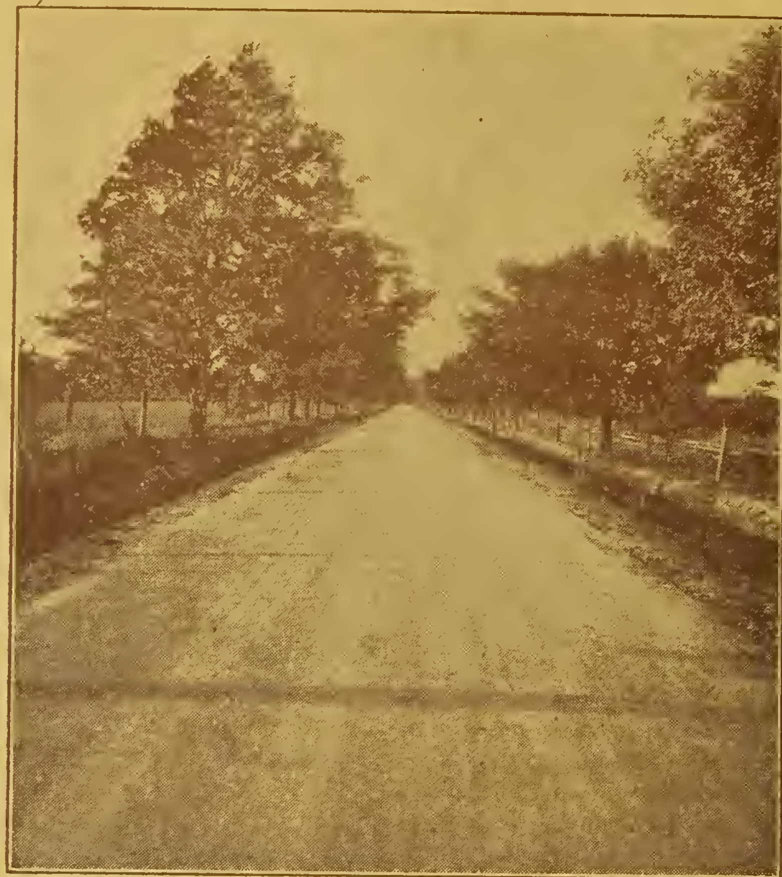

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THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

"TO FACILITATE THE ACQUIREMENT AND INTERCHANGE OF PROFESSIONAL KNOWLEDGE AMONG ITS MEMBERS, TO PROMOTE THEIR PROFESSIONAL INTERESTS, TO ENCOURAGE ORIGINAL RESEARCH, TO DEVELOP AND MAINTAIN HIGH STANDARDS IN THE ENGINEERING PROFESSION AND TO ENHANCE THE USEFULNESS OF THE PROFESSION TO THE PUBLIC"

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APRIL 1925

PUBLISHED MONTHLY BY THE ENGINEERING INSTITUTE OF CANADA

AT 176 MANSFIELD STREET, MONTREAL

Vol. VIII No. 4


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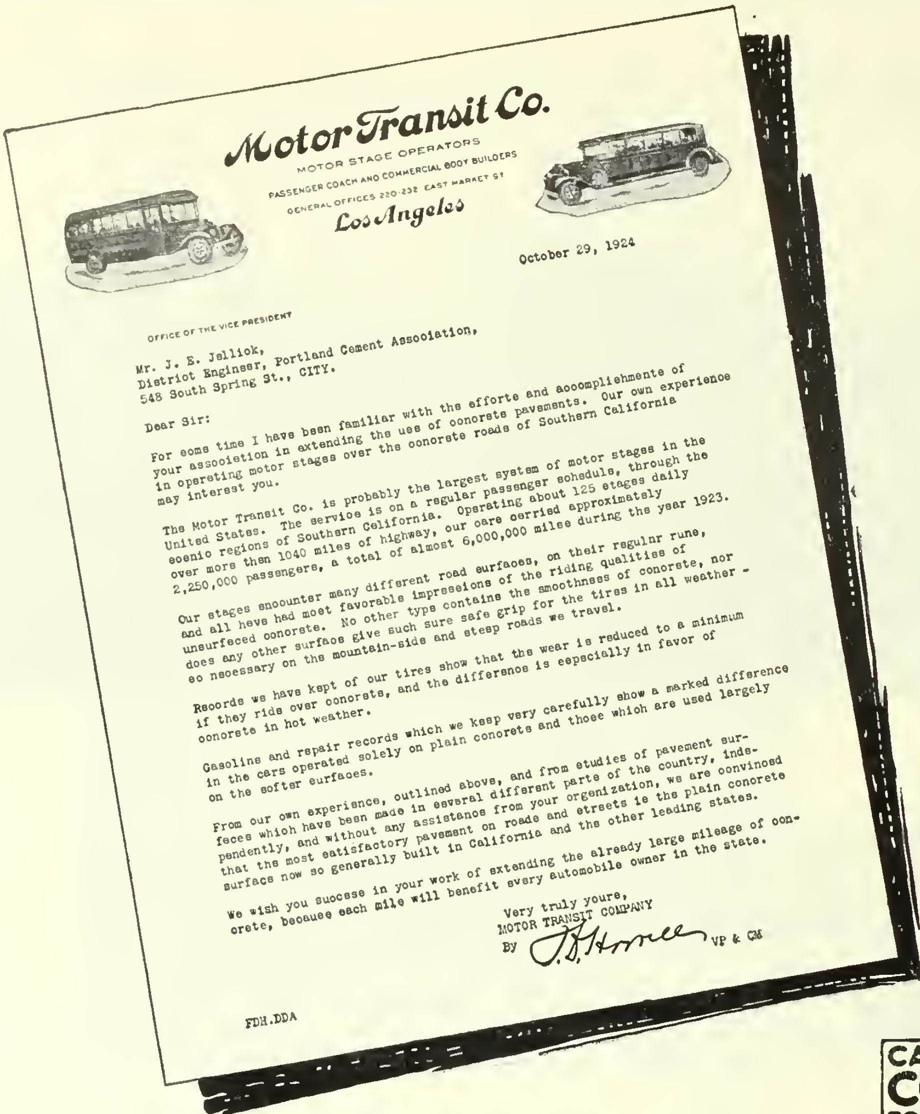

Motor Transit Co.
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October 29, 1924

OFFICE OF THE VICE PRESIDENT

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548 South Spring St., CITY.

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The Motor Transit Co. is probably the largest system of motor stages in the United States. The service is on a regular passenger schedule, through the scenic regions of Southern California. Operating about 125 stages daily over more than 1040 miles of highway, our cars carried approximately 2,250,000 passengers, a total of almost 6,000,000 miles during the year 1923.

Our stages encounter many different road surfaces, on their regular runs, and all have had most favorable impressions of the riding qualities of unsurfaced concrete. No other type contains the smoothness of concrete, nor does any other surface give such sure safe grip for the tires in all weather - so necessary on the mountain-side and steep roads we travel.

Records we have kept of our tires show that the wear is reduced to a minimum if they ride over concrete, and the difference is especially in favor of concrete in hot weather.

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MOTOR TRANSIT COMPANY
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Duration, hours	26.45	22.03	24.53	30.27	24.98
Rating, per cent	94	140	182	242	270
Heat absorbed by boiler and superheater	85.3	86.4	83.0	81.6	81.5
Do., boiler, superheater and economizer	91.0	92.9	90.7	90.3	89.8
Loss in dry gases	2.6	3.6	4.2	4.7	5.8
Loss in water vapor	4.1	3.8	4.3	4.2	3.6
Loss in radiation, combustible ash, and unaccounted for	2.3	0.3	0.8	0.8	0.8
TOTAL	100.0	100.0	100.0	100.0	100.0

The results of these tests should be considered as the results of actual operation since the test results are automatically maintained in every-day operation irrespective of changes in coal.

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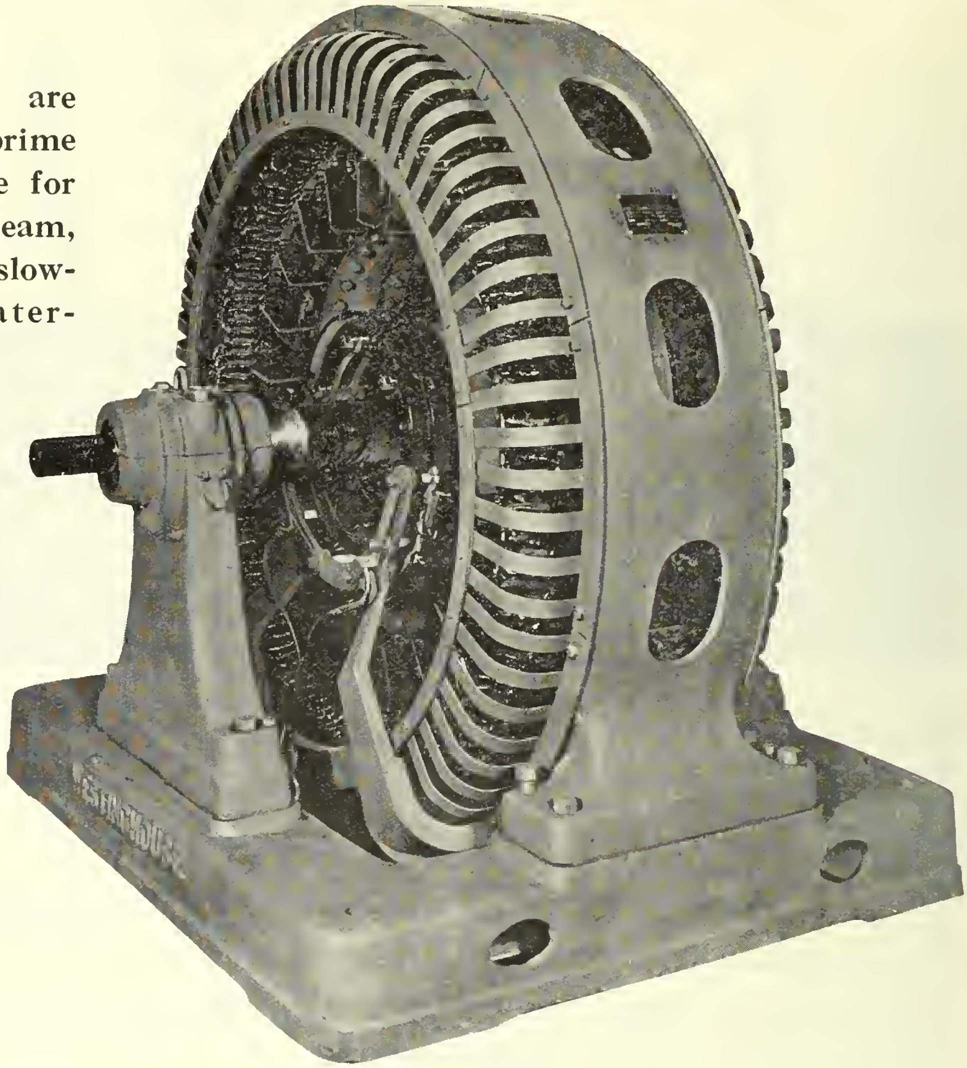

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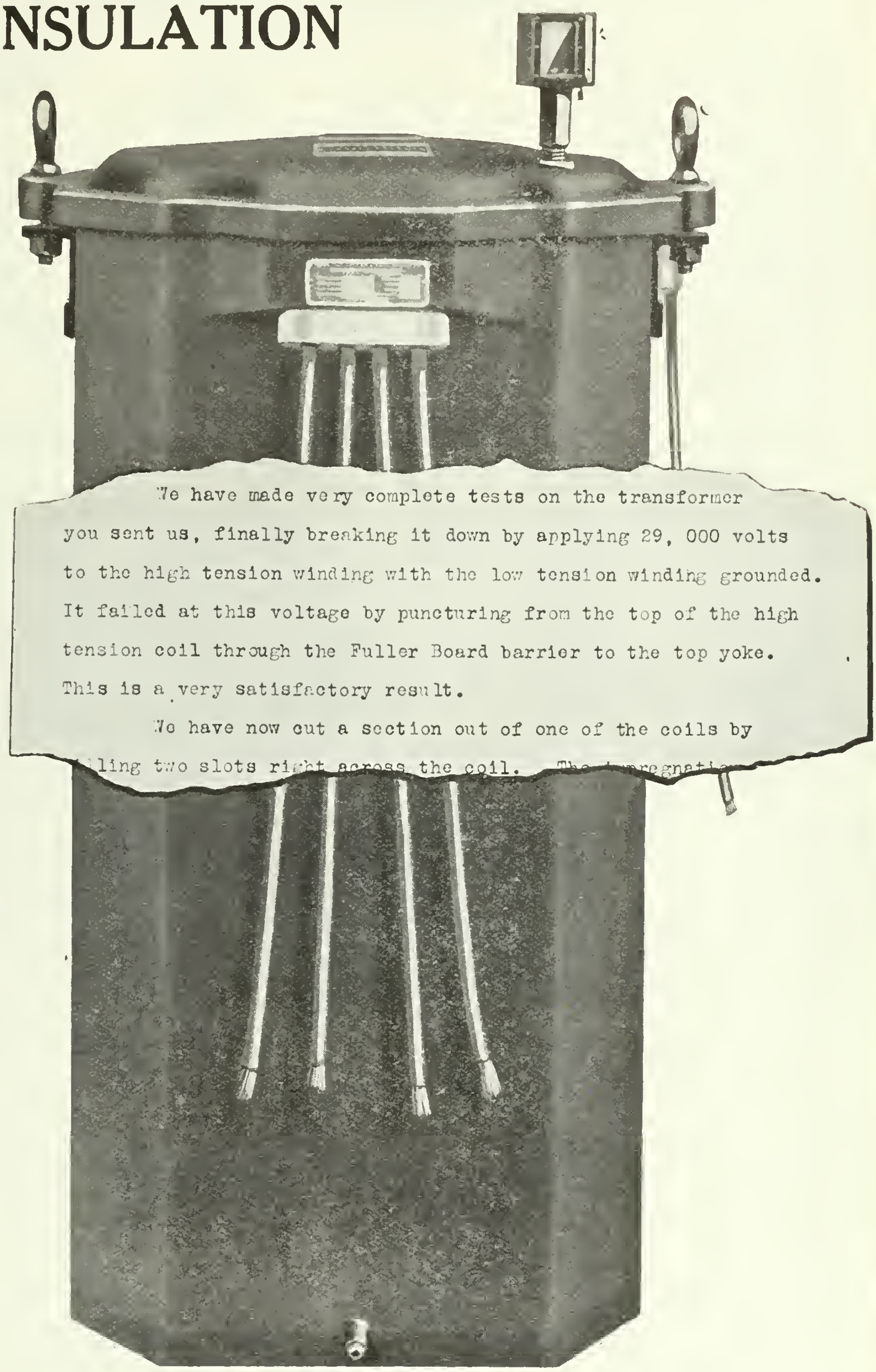

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APRIL, 1925

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Recent Advancement in the Construction and Operation of Grain Elevators

Development of the Modern Types of Grain Elevators with reference to Methods adopted to minimize the Possibilities and Effects of Explosions.

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Paper read before the Montreal Branch, The Engineering Institute of Canada, November 6th, 1924.

Eleven years ago, the late Mr. James Spelman, at that time President and Chief Engineer of the John S. Metcalf Company, Limited, read a paper before the Canadian Society of Civil Engineers upon elevator construction. It is the writer's intention in this paper to give a brief, very brief, summary with a few illustrations from that paper, and then carry on with the developments in this line of engineering from that time to the present moment.

Figure No. 1 is a cross-section of some silos that were used by the early Egyptians, taken from a recently discovered wall painting. In this you have all the fundamentals of the grain elevator. The grain was received in the pile at the right of the picture and measured in a measuring basket by the man on the right. It was then carried by the other men, walking up the stairs to the top of the bins, from which primitive elevators the modern term "elevator leg" was doubtless derived. The grain was poured in at the top and taken out at the bottom when required, and the markings on the bin walls are supposed to indicate the character of the grain. The bins were not two-storey affairs, as we might judge from the illustration. We are given to understand that this is the manner in which the Egyptian showed something behind. It was their way to illustrate something in the background by putting in on top. Simple as this process is, it conveys the idea of the modern elevator. You receive the grain, weigh it or measure it, put it into the different bins according to grade, and take it out of the bottom. We do not know whether they had any means of measuring it as they took it out or not, but in these ancient pictures you have some of the essential features of the modern elevator.

We have progressed somewhat from the time of the picture, but this progression has not been universal as figure No. 2 will demonstrate. This is a picture of an up-to-date elevator in Central Africa.

In all countries other than Canada and the United States, the handling, transportation and sometimes the storage of grain is mainly carried on by means of bags. It is true that elevators exist here and there and that there is a great demand for elevator systems in many European countries. Unfortunately the demand always appears to come from those countries which lack the capital to build the elaborate systems they desire and need; equally unfortunate is the fact that their governments generally lack the stability to furnish sufficiently satisfactory guarantees to any foreign capitalists to justify them in investing in these schemes.

An outstanding example of a very different state of affairs may be seen in the State of New South Wales, Australia, which has recently spent several million pounds in a complete system, including country and port elevators, one of the latter, at Sydney, being a 5,600,000-bushel house, which is larger than any port elevator in Canada to-day.

Figure No. 3 shows how grain was and still is stacked in the open in many districts. The loss by vermin, particularly mice, is tremendous; special trenches, to act as traps for them, were constructed around some of these stacks, and in one night 2½ tons of mice were destroyed. Figure No. 4 shows the delivery of grain in bags to one of the large country elevators recently constructed. Figure No. 5 shows the Sydney terminal elevator in the course of construction. This house was completed more than two years ago and is now in operation.

Types of Modern Grain Elevators

The modern type of grain elevator is a product of this continent, although the deep bin idea was by no

Figure No. 1.—Ancient Egyptian Grain Silo.

means unknown in other countries. About ten years ago, I saw bins 60 or 70 feet deep and probably 10 feet square with massive brick walls in Ireland. These were probably 20 or 30 years old then. They were also used in other places, but never became popular, and small wonder, considering the material they used.

There are several varieties of large elevators based primarily upon the method of receiving into and shipping the grain out of the house. Leaving out of consideration the small country elevators, which are merely collecting stations for the larger houses, we have the following types:—

No. 1 — Inland elevators receiving from rail and shipping by rail, — for example the government elevator at Transcona.

No. 2 — Lake-side elevators receiving by rail and shipping by water or rail, — for example Fort William, Port Arthur or Chicago elevators.

No. 3 — Lakeside elevators receiving by water and shipping by rail, — for example Tiffin or Port McNicoll.

No. 4 — Port elevators receiving by rail and shipping by ocean boat, — for example the Vancouver, St. John, New Brunswick or Baltimore, Maryland, elevators.

No. 5 — Port elevators receiving by rail or by water and shipping by ocean boats or by rail, — for example the Montreal elevators, or the largest elevator in existence at present, the Chicago and Northwestern elevator at South Chicago, (see figure No. 6). This is a house operated by the Armour Grain Company, and has a storage capacity of 10,000,000 bushels or 300,000 tons of wheat, and is the house that exploded in 1920. This explosion and the measures taken to prevent similar disasters in the future will be referred to later.

Receiving by Rail and Shipping by Water

A typical sectional view through a house, the main business of which is to receive by rail and ship by water, is shown in figure No. 7. It can also reverse this process, or receive and ship in any of the ways named under headings Nos. 1 to 5. On the left is seen the track shed with five lines of tracks passing through it. Below these, track hoppers are situated, into which the contents of the cars are discharged, and below those hoppers, belts run to the receiving legs located in the receiving house. The grain is elevated by these legs to the top of the house and discharged into garners, each capable of holding a car-load of grain. The hoppers dump their contents into a scale also capable of containing a car-load. which after weighing is discharged by spouts either direct to bins in the vicinity of the scale or to belts which carry it over any bin in the house and there discharge it. Whilst the scale is emptying its load gradually, the garner is refilling, ready to dump to the scale again as soon as this is empty.

Omitting the many processes by which the grain is drawn from the bins and passed through a variety of cleaning machines, dryers, etc., and returned to the bins, we will pass to the point where it is required to ship the grain out of the house by water.

The grain now lies in these bins 100 feet deep, and by opening the bin gate by means of a rack and pinion, it escapes on to the belt below and is carried through tunnels across the intervening space between the storage and the river house. There it is discharged to the boots of the shipping legs and elevated to the top of the river house, discharged through garners and scales to the bins below, as it was when first received into the house from the railroad tracks, the only difference being that the bins adjacent to the water have their sloping bottoms at a higher level than the others, and are known as "shipping bins". There are twelve of these bins and each is provided with a dockspout capable of carrying 30,000 bushels per hour.

Upon the arrival of a boat at the wharf alongside the river house, the dockspouts are directed to the several hatches and insofar as the house is concerned, loading can proceed at the rate of 360,000 bushels per hour until the previously weighed grain in the shipping bins is discharged and the rate of weighing with six scales at 15,000 bushels per hour each is overtaken, after which loading can proceed at the weighing rate only, that is, 90,000 bushels per hour. Owing to the necessity of trimming the grain in the holds however, the foregoing maximum rate of loading cannot be maintained, this latter part of the loading being much slower. As an example of this, we would cite the recent record made by the new Windmill Point galleries where the SS. *Innerton* took on 274,500 bushels of wheat in 6¼ hours. This is an average of 44,000 bushels per hour, but during the earlier part of this run, 70,000 bushels per hour were poured into her holds. Of course a gallery cannot load as fast as a house with shipping bins, with direct spouts from them.

Figure No. 2.—Primitive grain bins in Central Africa, placed on poles to protect the grain from rats and mice.

Figure No. 3.—Grain bagged and stacked in open.

Figure No. 4.—Grain delivery in bags, Australia.

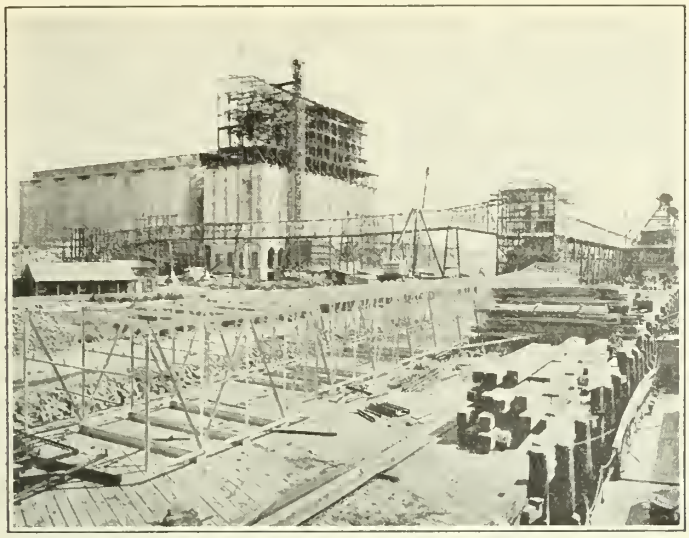


Figure No. 5.—Terminal Elevator, Sydney, New South Wales, Australia. Capacity 5,600,000 bushels.

Receiving from Boats and Shipping by Rail

Figure No. 8 shows a similar section of the C.P.R. elevator at Port McNicoll; it is an illustration of type No. 3, i.e., an elevator specially built for receiving from boat and shipping by cars. A lake vessel, probably from Port Arthur or Fort William, ties up alongside the wharf; upon the wharf and running upon tracks are three movable marine towers. They are movable to enable them to be brought opposite any three hatches without moving the boat. Each tower contains what is known as a marine leg more than 100 feet long, which, upon being lowered into the grain carries it up by the buckets within the leg and discharges it into an upper garner with scale beneath. After weighing, the grain is discharged to a lower garner, which in turn feeds to a lofter leg discharging to spouts through the roof of storage, from these it is conveyed by a system of belts to any bin in the house.

The process of shipping out of such a house as this consists of drawing the grain from the hopper bottomed

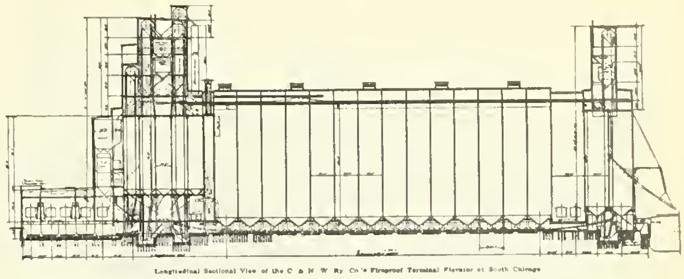


Figure No. 7.—Longitudinal sectional view of the Chicago and Northwestern Railway Company's fireproof terminal elevator at South Chicago.

bins on to the basement belts which run through tunnels into the working house. There it is elevated, discharged into garners and thence to scales precisely as in the preceding example up to the point of its discharge from the scale. There a distinct difference shows, in that instead of the scale discharging continually to a bin, the contents of which are run into the hold of a ship in bulk, in the case of discharging the cars, each carload must be weighed separately and discharged direct to its particular car, to which it is consigned. The contents of the scale are discharged through what is known as a car spout with a long vertical drop of maybe 100 feet, with the result that the velocity of the grain at the time it reaches the car is very high and is sufficient to shoot it to the two opposite ends of the car through the agency of what is known as a Sandmeyer loader. This is, in effect, merely a movable end to the vertical spout, bent round in two opposite directions, the grain splitting into two streams and filling up the ends of the car. The process of loading cars is very rapid, and is only limited by the speed at which the leg can fill up the scale again. If you have a 15,000-bushel leg, it is obvious that it cannot do more than fill ten 1,500-bushel cars in an hour or six minutes per car. To shoot the grain out of the scale into the car, move the car on and spot another car requires less than six minutes.

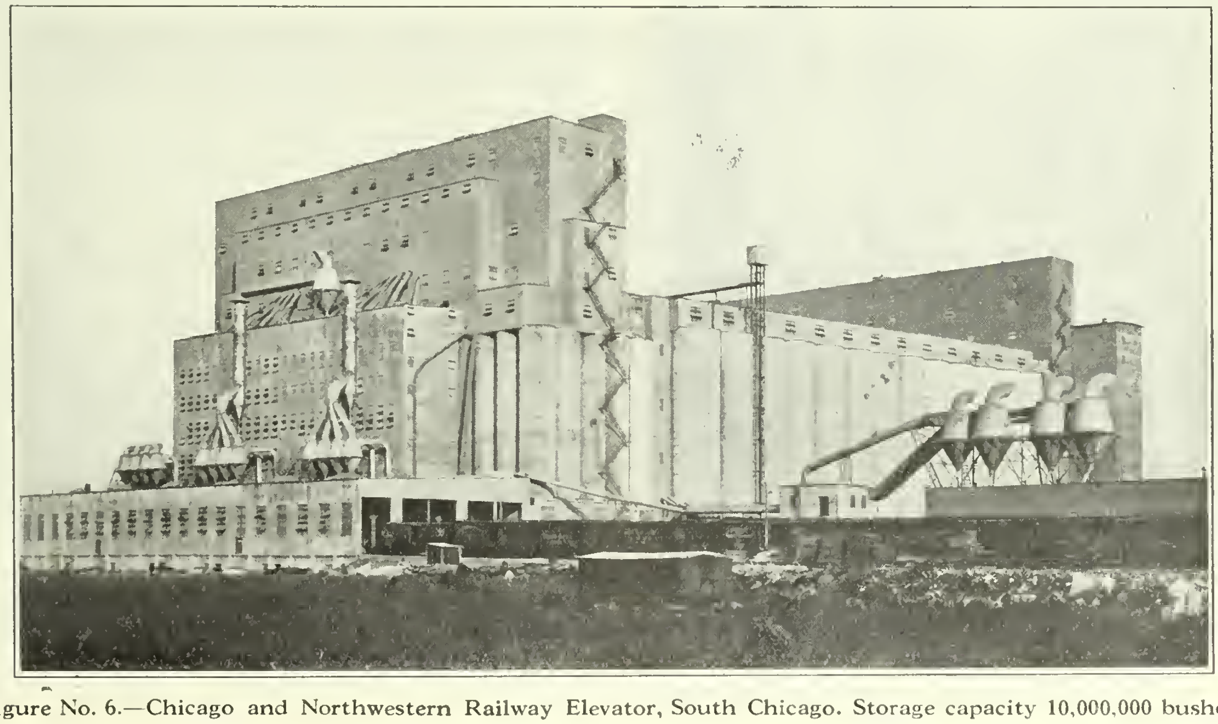


Figure No. 6.—Chicago and Northwestern Railway Elevator, South Chicago. Storage capacity 10,000,000 bushels.

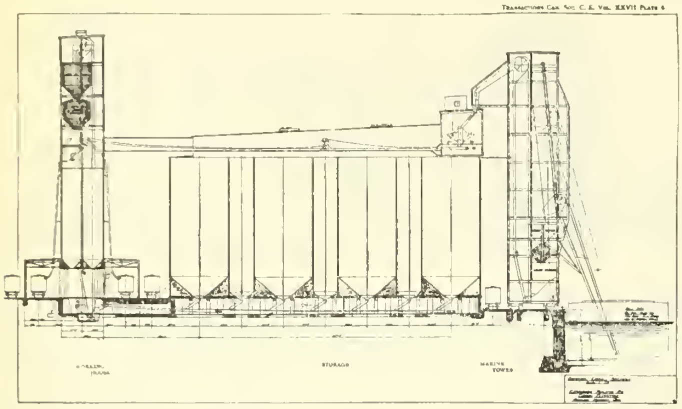


Figure No. 8.—Longitudinal sectional view of C.P.R. elevator at Port McNicoll, Ontario.

Types of Elevators to Receive and Ship either by Rail or Water

Figure No. 9, which is an interior view of the Harbour Commissioners of Montreal elevator No. 2, will serve as another illustration of type No. 5 elevator, which can receive from either cars or boats and ship to either, although loading out to cars is of small consequence compared with the vast quantities loaded into ocean vessels at this point.

This house is of a type known as an "up house", that is, there is no separate track shed. The cars run into the house and are there discharged into hoppers below the floor. The movements of the grain inside the house are similar to the foregoing examples except that the grain lying in the shipping bins is not discharged direct through dockspouts to vessels, as in the case of the Chicago house previously mentioned, but is fed on to belts in the side gallery. The belts in this side gallery of Harbour Commissioners of Montreal elevator No. 2 are connected with Harbour Commissioners elevator No. 1, and both are connected to the shipping galleries over the freight sheds. By this means a ship may be lying at any one of the berths at several piers and may be taking in her grain cargo from either elevator perhaps over half a mile away and at the same time be taking her ordinary cargo from the freight sheds.

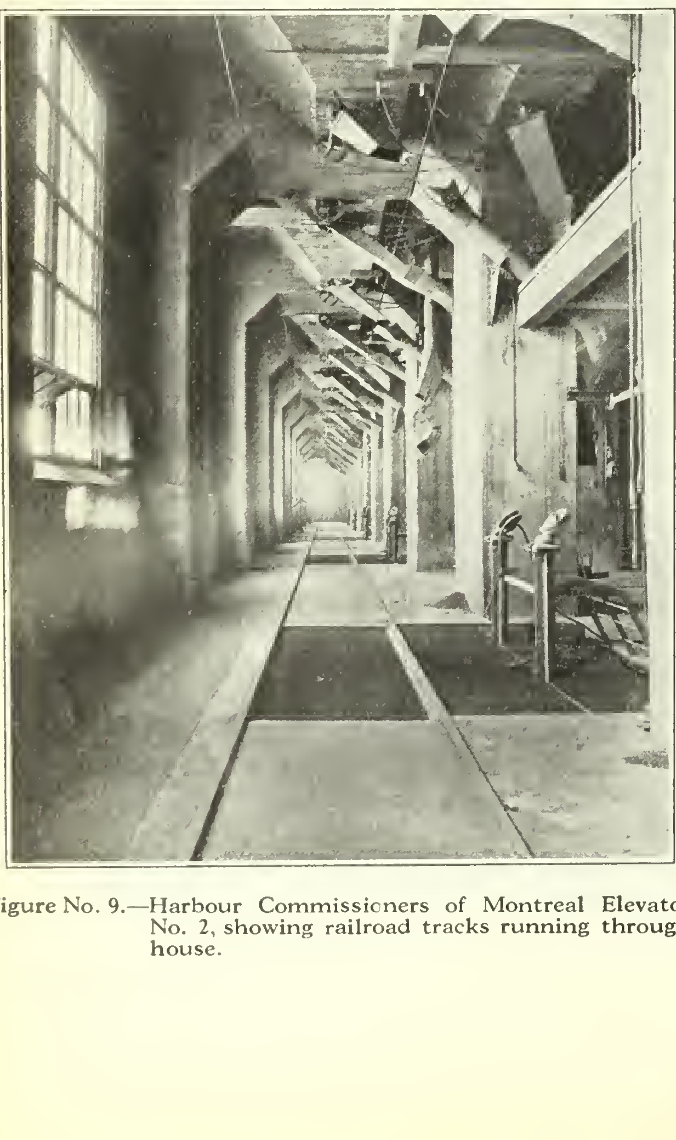


Figure No. 9.—Harbour Commissioners of Montreal Elevator No. 2, showing railroad tracks running through house.

In order to obviate the necessity of a vessel requiring a full cargo of grain and nothing else lying alongside a freight shed and so taking up valuable space for the shipment of general cargo, the jetty gallery of Harbour Commissioners elevator No. 2, (figure No. 10), was added. It contains four belts and can feed to vessels lying on either side of it from the same sources that the galleries above freight sheds can.

History of Methods and Materials used in Construction of Elevators

From the foregoing brief survey of the different types of elevators, we will now pass to another still more brief survey of the history of the different methods and materials used in their construction.

Up to about thirty years ago, elevator construction was almost universally in wood, the still well-known cribbed bins being the standard form and a very good form it was for its day. The elevator builder of those days was an excellent example of the practical constructor, not troubled with any great amount of theory, and he just laid and nailed one plank on top of another, (side to side, not edge to edge), until the desired height was reached that previous failures had shown to be dangerous. When the bins were first filled with grain there was a very noticeable subsidence of the top of the bins due to compression of the cribbing. This was uniformly ¼" to the foot, and it was necessary to load all bins gradually and equally or the building would have been badly distorted. On top of this structure he then erected the cupola, a building of perhaps 80 feet in height, by the simple process of erecting the posts of the first storey, laying the beams across them and repeating this process until the sky, or somewhere in that vicinity was reached. True, they put in a few braces, mostly knee braces, but as, in the examples we have examined, a fair percentage of these were quite loose, it is evident they were not working; having gone up as far as they wanted to go, nothing else would have stopped them, they apparently told the contraption to *stay put*, and as far as we know it always did.

Figure No. 11 is a good illustration of the cribwork in the course of erection; the bins did not generally run over twelve feet square or the cribbing which was sometimes 4 inches at the top of bin and 8 or 10 inches at bottom would have been insufficient to carry the load as a beam.

About this time, i.e., thirty years ago, a demand for a fireproof elevator began to make itself felt. This was doubtless due to the increasing cost of timber and the rising rates of insurance. The natural ending of such a structure was by fire.

One of the first substitutes used for wood was steel, but this era did not last long. Tile bins reinforced by steel rods were and are still sometimes used. Then came the age of reinforced concrete which has remained the almost universal material for bins up to the present time.

The cupola or upper storeys over the bins were, until recently, frequently constructed entirely of concrete and very strong structures they were. There are reasons, to which we shall have occasion to refer later, that have led us to the conclusion that many of these concrete cupolas were far too strong in their construction.

Marked Changes during Recent Years

From the foregoing survey, we will now pass to the particular points upon which a marked change has been introduced in the last few years, taking these points in what appears to me to be their order of progressive relative importance.

Roller Bearings

The first is the substitution of roller bearings throughout the plant for solid or ring-oiling. In the Harbour Commissioners of Montreal elevator No. 3, there are over 14,000 bearings; on the belt conveyors there is a roller with two bearings to every 7 feet in length of the top belt and every 21 feet of the lower. When we include concentrator bearings, etc., it amounts to one bearing for about every 1.4 foot run of conveyor. On a 600-foot conveyor, this equals 750 bearings. With the common solid babbitted bearing, the power required to run the belt light was over half that required to run it with its full load. Power tests on belts equipped with roller bearings show such a marked improvement in this respect that their adoption is becoming quite general. The Harbour Commissioners of Montreal elevator No. 3 is equipped throughout with them. The motor drives to all belts have been installed with one-third less horsepower than would have been used for the old solid type of bearing.

Silent Chain Drives and Double Helical Gearing

The second point is the elimination of rope drives and the substitution of silent chains, or, in the case of leg drives, double helical gearing. Up to a few years ago, the use of rope drives in elevators was almost universal, and a very good drive it was too, and there was very little chance of bettering it until the individual motor eliminated the line shaft.

Figure No. 12, of the engine-room of the Grand Trunk elevator at Portland, Maine, built in 1896 and still doing good work, illustrates the heart of such a system, and figure No. 13 shows one of the line shafts, and figure

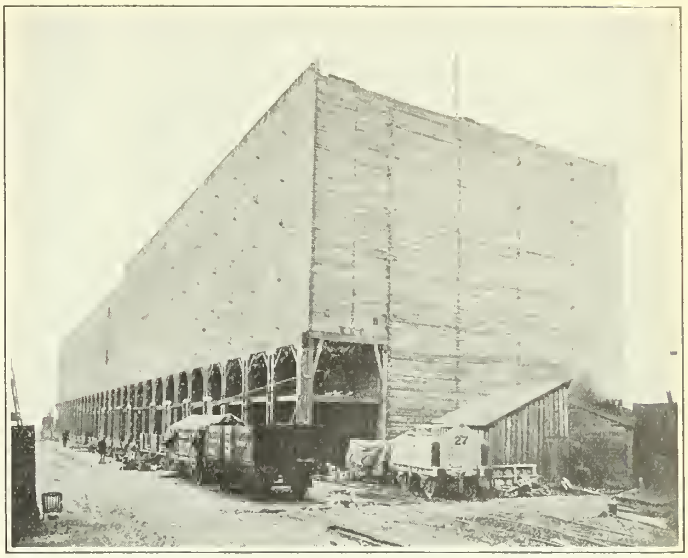


Figure No. 11.—Manchester Ship Canal Elevator No. 1, Manchester, England. Storage capacity 1,500,000 bushels.

No. 14 some of the leg head drives; note the wood spouts, heads, etc., and particularly the water barrels.

With the advent of the individual motor, all the elaborate system of transmission from the prime mover was eliminated, but the rope drive from the motor to its particular unit remained until quite recently. Figures Nos. 15 and 16 of the leg head drives of the Harbour Commissioners of Montreal elevator No. 2, built as short a time ago as 1912, show the standard drive of that period. As a contrast to this, figure No. 17, of the double helical gear drives at the Harbour Commissioners of Montreal elevator No. 3, is interesting. Everything that this drive contains is shown in this view, but not quite everything was shown on one floor of the previous views, as the countershaft drive direct from the motor was not on the top floor but on the floor below.

Roller bearings were also used on these helical gear drives, and although they cannot of course show such a reduction of power as is shown on the conveyor belts, their efficiency and also that of the double helical gears is, we believe, amply demonstrated by the fact that before the motor coupling was bolted up, I put one finger


Figure No. 10.—Harbour Commissioners of Montreal, jetty gallery, Elevator No. 2.

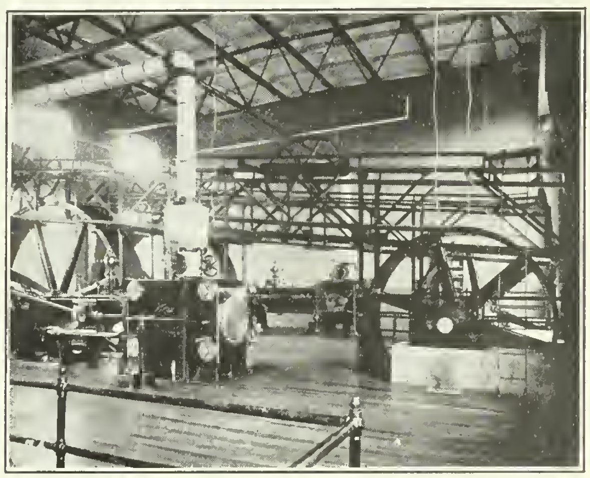


Figure No. 12.—Engine-room, Grand Trunk Elevator, Portland, Maine U.S.A. Storage capacity 1,000,000 bushels.

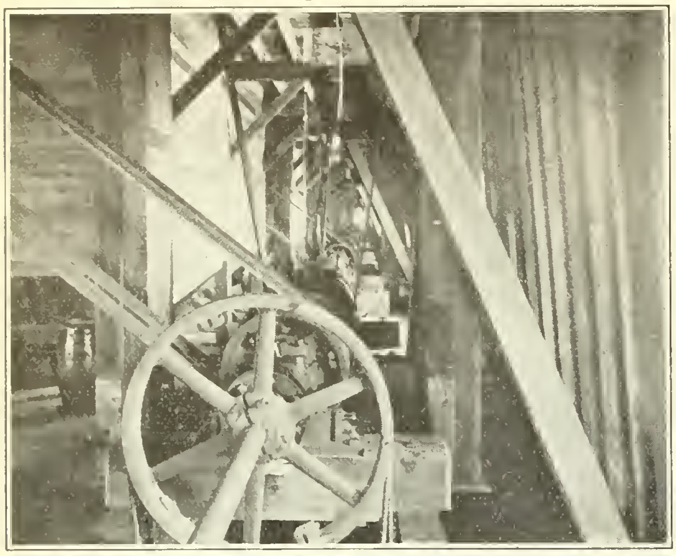


Figure No. 13.—Line shaft of rope driven elevator.

in one of the bolt holes and turned the train of gears and the head pulley with its 360 feet of belting, buckets, etc. As this amounted to a weight of about 10 tons, we think we were justified in concluding that the friction in this 140-h.p. drive was either near the vanishing point or that I had *some pull.*

Silent chain drives have been used for some time for head drives; as a rule these are a combination of rope and chain, the chain drive being to the countershaft and the slower drive from countershaft to head being of the rope variety.

All conveyor drives at the Harbour Commissioners of Montreal elevator No. 3 are direct by chain. Their principal advantage is the small space they occupy, due largely to the absence of any tension; this with its tracks, etc., is one of the main drawbacks to a rope drive.

Car Unloading

Until quite recently, the method of unloading a car has been by power shovels. The power shovel, figure No. 18, is a most ingenious contrivance; a drum is situated on a revolving shaft, a rope is wound upon this drum, and if you take hold of the end of it and walk away it will unwind easily as far as you please, so long as you do not stop. The moment you do stop, however, it will wind up again and haul you back to the point you started from. A big iron-shod, two-handled scoop is attached to this rope, and with it the shoveler goes into the car. The moment he stops the rope jerks taut and the scoop full of grain is drawn out of the car and dumped into the boot of an elevator leg or hopper. A pair of shovelers can unload a car in about half an hour.

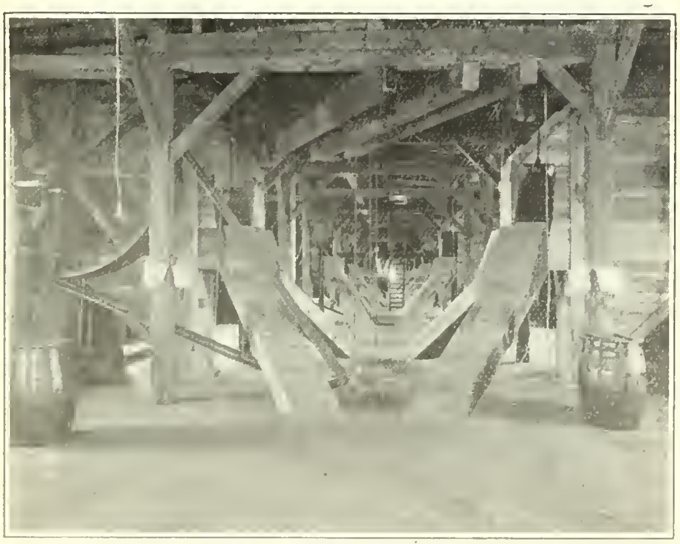


Figure No. 14.—Leg head with rope drives.

The foregoing method of emptying a grain car has been almost universal for many years, but it will be observed that it entails manpower to draw the shovel back, which is not at all in accordance with modern ideas on grain handling. Consequently, in a few of the more recently constructed elevators, a new and much improved method has been introduced in the shape of automatic car dumpers which not only do the work much more rapidly, but eliminate the work of the shovelers entirely. As this work was performed inside the car in an atmosphere so densely laden with dust as to make it impossible for the men to work without masks, it was a matter of considerable and increasing difficulty to obtain men to operate the shovels under such objectionable conditions, and the elimination of the necessity for such labour by the substitution of machinery is a very desirable gain. There is also a large saving in labour and materials owing to the car grain door being opened rapidly and without damage by the machine.

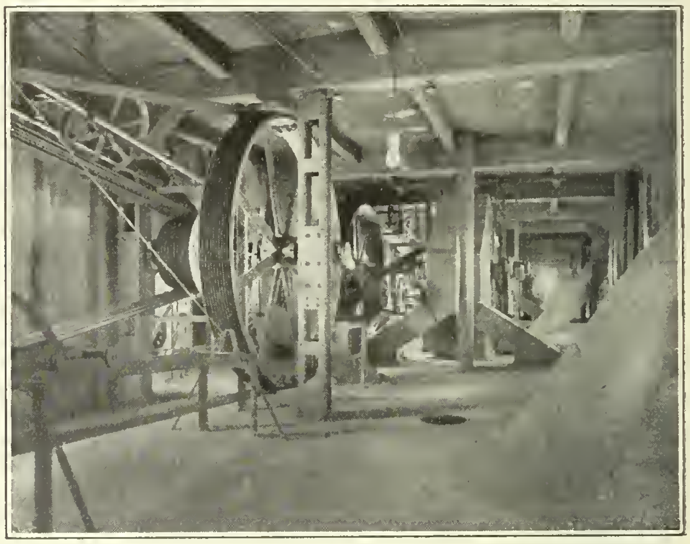


Figure No. 15.—Harbour Commissioners of Montreal Elevator No. 2, rope driven leg heads.

The operation of the "Metcalf" car dumper, (figure No. 19), is, in outline, as follows:—

The car is hauled onto a platform about 50 feet long, across which the rails run so that when the dumper is not in operation the end of the rails upon it are in line and continuous with the track at either end of the platform. The car to be unloaded, having been run onto this platform, is automatically clamped in position, raised 8 feet into the air by means of wire cables, and at the same time it is tilted sideways and the grain door rammed in, (figure No. 20). The platform with the car upon it is then tilted endways, first in one direction and then in the other, (figure No. 19), until all the grain has run out into a pit with a hoppered bottom below rail level. The grain is drawn off from this pit onto a belt conveyor, which carries the grain into the elevator where it is carried

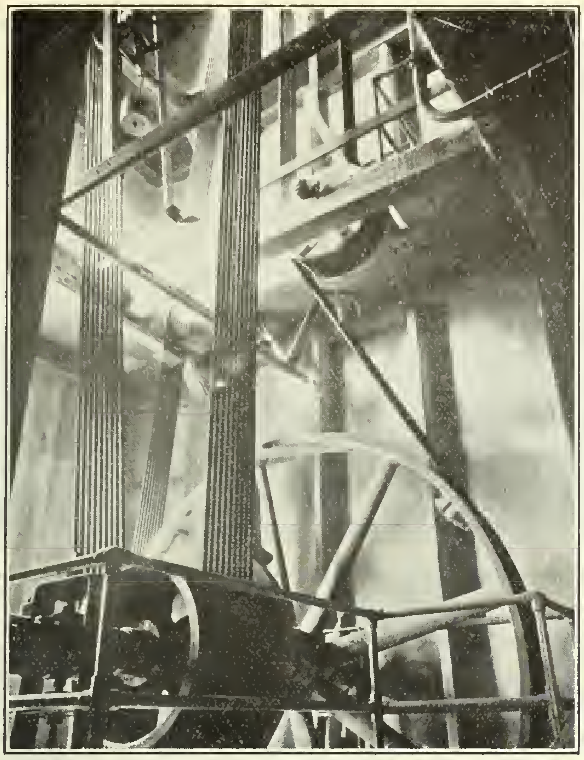


Figure No. 16.—Harbour Commissioners of Montreal Elevator No. 2, rope drive to leg heads.

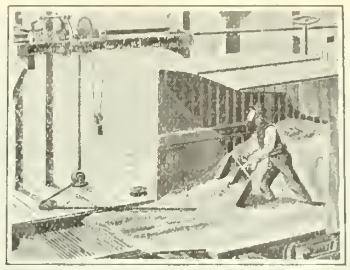


Figure No. 18.—Power operated car shovels.

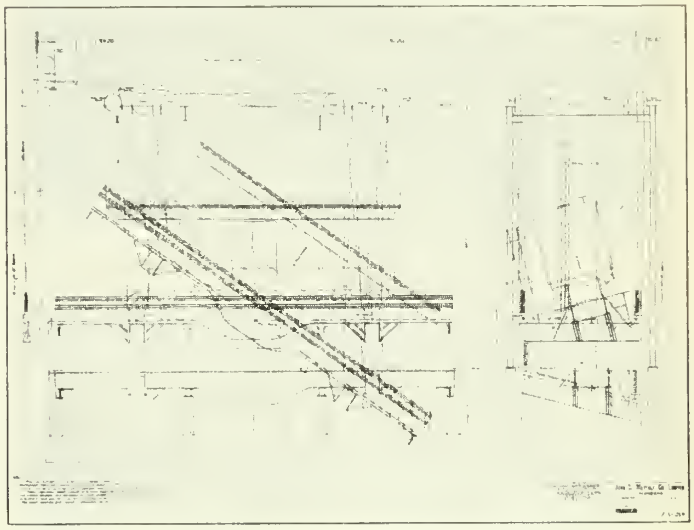


Figure No. 19.—Longitudinal Sectional diagram of "Metcalf" Car Dumper.

up by a leg and distributed to the bins in the usual manner. One of these car dumpers is capable of unloading seven 2,000-bushel cars per hour or over 8,000 tons of grain in twenty hours, if worked continuously, a condition quite common in a terminal elevator in the busy season. The new installation at the Harbour Commissioners of Montreal elevator No. 3 has a battery of four of these dumpers which will give a combined unloading capacity of over 30,000 tons in twenty-four hours.

Figures Nos. 21 and 22 are views of the machine in operation, while figure No. 19 shows how the different motions of the machine are obtained by means of wire cables. The operating drums are situated on the upper platform. There are four hoist drums situated one at each corner of the machine, which are all driven by one motor; the two rear drums, being of slightly larger diameter than the front drums, wind up the rear side of the movable platform carrying the car faster than the front side, thus giving it the required tilt of 14° by the time it has attained its maximum vertical rise, (see figure No. 20). The four hoist drums are then anchored and the two tilt drums, both of which are on the same shaft, are brought into action. As the cables are, in effect, continuous around this drum, its revolution pays out cable towards one end

Figure No. 17.—Harbour Commissioners of Montreal Elevator No. 3, double reduction double helical gear drives to leg head.

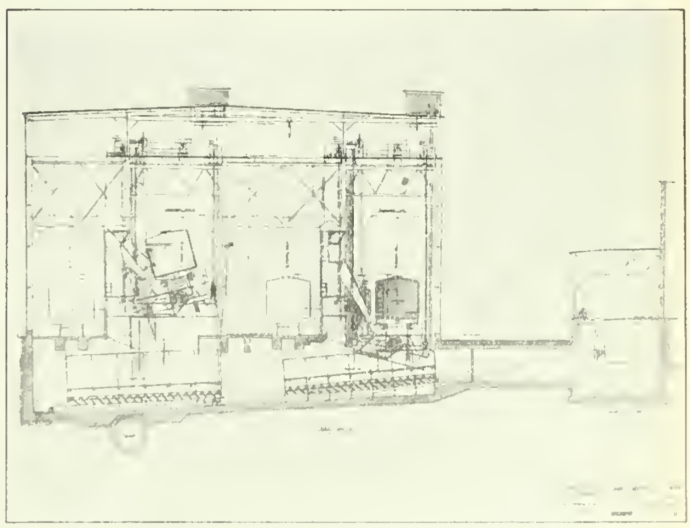


Figure No. 20.—Cross-sectional view showing four "Metcalf" Car Dumpers.

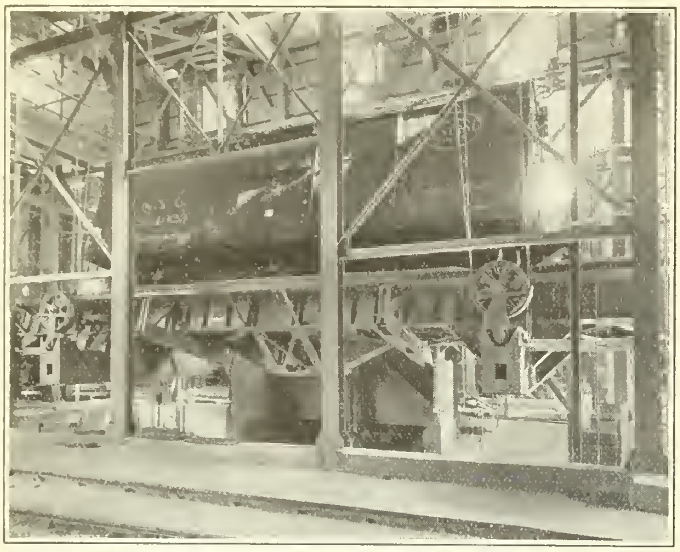


Figure No. 21.—"Metcalf" Car Dumper showing vertical lift and side tilt.

of the system, and draws a corresponding amount in from the other end, with the result that the car is tipped in the direction the tilt drum revolves. When the car has been tilted 35° in one direction, and the grain discharged from the high end of car, the process is then reversed.

The figure of seven cars per hour has been kept up for 10 hours, 70 cars having been handled on the Windmill Point dumper in that time. In the Harbour Commissioners of Montreal elevator No. 3, certain improvements have been introduced, and although no test over a full day has yet been made, two cars have been spotted and emptied in 14 minutes, and as equally good results have been accomplished at the new Baltimore and Ohio Railroads plant at Baltimore and it is expected that a speed of eight cars per hour will be obtained. This is quite as fast as the grain can be taken away by the belts, weighed, etc., in any existing elevator system.

Prevention of Explosions

Having disposed of the improvements under the foregoing headings, which although important in their sum, are really no more than natural steps in the process

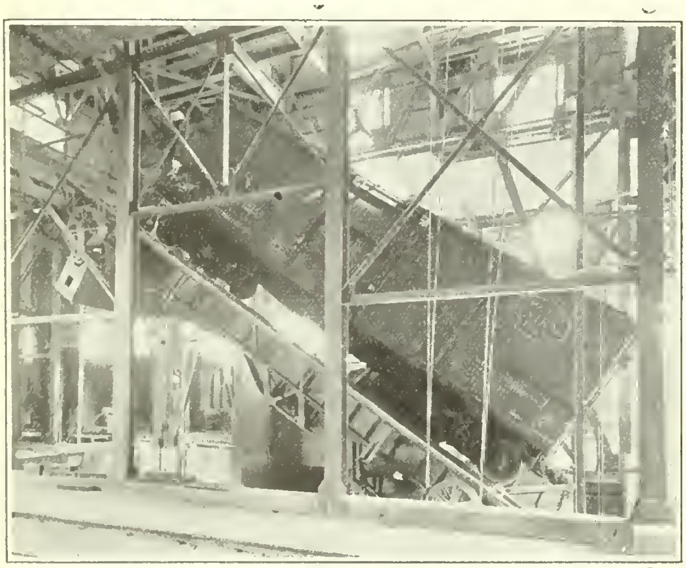


Figure No. 22.—"Metcalf" Car Dumper in operation showing end tilt.

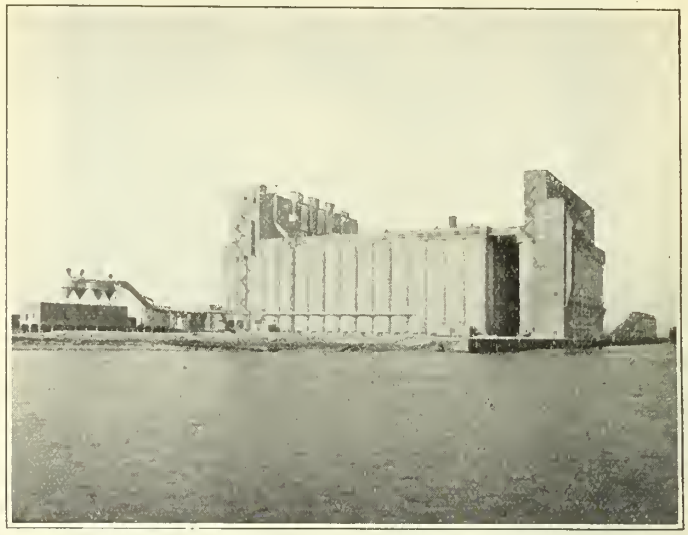


Figure No. 23.—Chicago and Northwestern Railway Elevator, South Chicago. Storage capacity 10,000,000 bushels.

of evolution, we come to a real and drastic change, not due in any way to progressive improvements in engineering, but rather due to a very severe jolt administered to some of these improvements, resulting in some of those buildings which everyone had fondly imagined were such a great improvement upon anything previous, being not only metaphorically, but very literally blown sky high.

As long as elevators were built of wood, the public heard very little about explosions, and we have frequently heard the question asked, "Why did we not get explosions in these houses?" We think we did get explosions, possibly as frequently but certainly not with such disastrous results, and when they did occur the fire that either caused or followed them was so much more in evidence that the explosion was lost sight of.

Probably one of the reasons that account for the rarity of serious explosions during the wooden era is the fact that the cupolas of these buildings were much better ventilated than those of concrete. We do not mean that the window space or other vents were more numerous, but that the wind would have a better chance to find an entrance through the siding than through an 8-inch

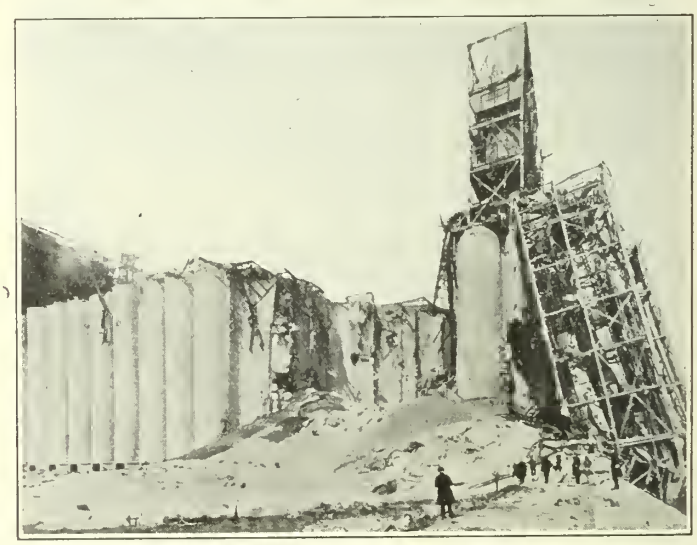


Figure No. 24.—Chicago and Northwestern Railway Elevator wrecked by explosion.

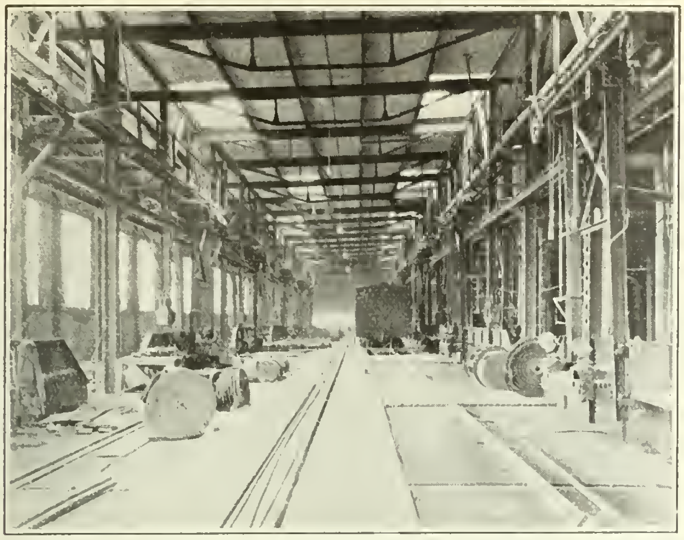


Figure No. 25.—Chicago and Northwestern Railway Elevator, South Chicago, interior of track shed.

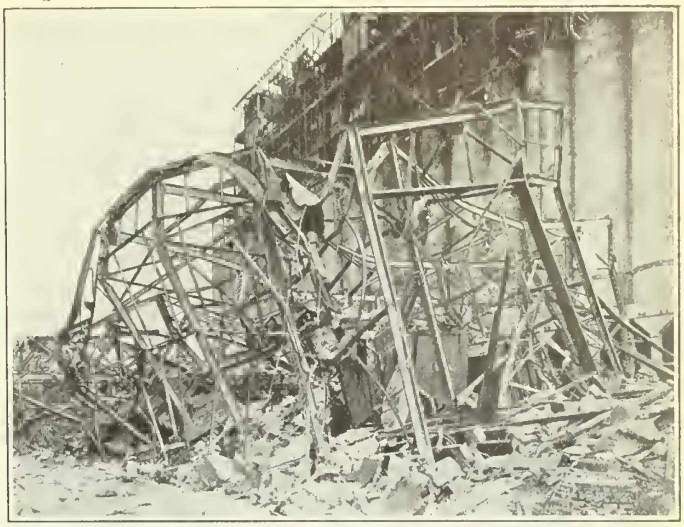


Figure No. 26.—Chicago and Northwestern Railway Elevator, track shed and receiving house cupola wrecked by explosion.

concrete wall. Another point was the smaller amount of electric wiring. Whatever the cause may be, it is an undoubted fact that explosions of sufficient magnitude to become common knowledge have increased in number and violence in the past few years.

From time to time there have been lengthy investigations into the cause of particular explosions, and certain minor precautions were adopted and circulars issued by official and semi-official organizations, impressing upon elevator operators the necessity of these precautions being taken when the new Chicago and Northwestern elevator at Chicago, — actually depicted in some of these circulars as a model of how an elevator should be designed to prevent explosion, — went up in the most terrific elevator explosion on record. Figure No. 23 shows this building before, and figure No. 24, after the explosion. Figure No. 25 is a view showing the interior of the trackshed in this house as it appeared before the explosion, and figure No. 26 shows what it looked like after the explosion.

This disaster led to much work being done in a thorough investigation of the causes of these explosions, and our knowledge of the conditions under which grain dust would explode, also the exact force produced by such explosions was considerably increased. With regard to the latter part, i.e., the explosive force generated, although we may not previously have known exactly what it was in pounds per square inch, we knew that it was sufficient to be heard over fifty miles away.

Conclusions regarding Minimizing the Risk of Explosion

Having given full consideration to the many devices and methods whereby the accumulation of dust or the risk of explosion is minimized, we were compelled to come

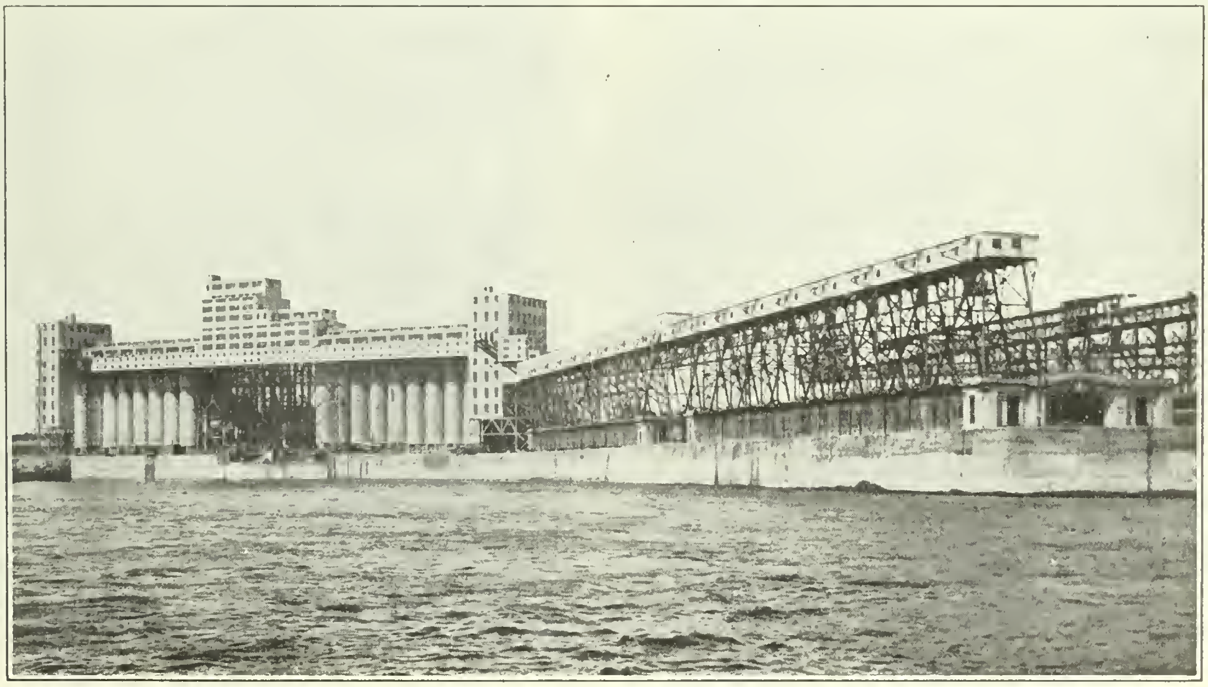


Figure No. 27.—Harbour Commissioners of Montreal Elevator No. 3. Present storage capacity 2,000,000 bushels.

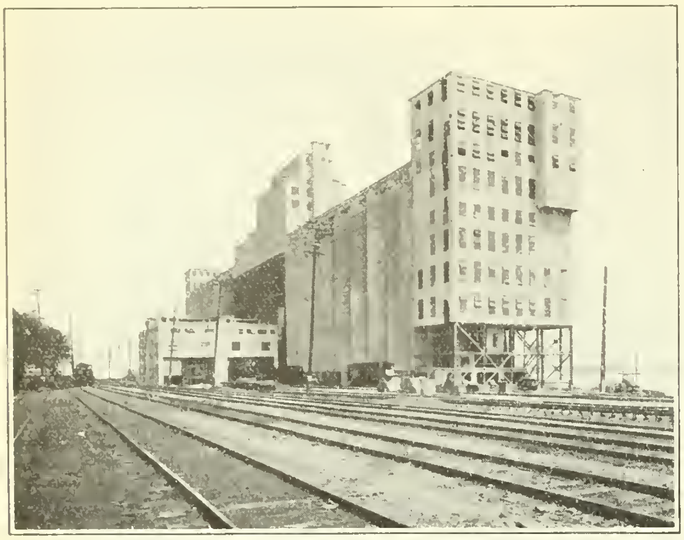


Figure No. 28.—Harbour Commissioners of Montreal Elevator No. 3. Present storage capacity 2,000,000 bushels.

to the conclusion that they were insufficient for the purpose.

You cannot eliminate the dust from the grain because it is the grain.

You cannot sweep up the dust without stirring up that dust and so charging the air with that very mixture of dust and air that constitutes the danger.

No suction system, however elaborate, can entirely eliminate the danger, as the mixture with which the suction pipes are filled is of a highly explosive nature and this dust laden explosive mixture must be outside the pipes before it is in.

The point at which I believe more explosions originate than at any other is the boot of the elevator leg, and you certainly cannot eliminate dust from the inside of a leg.

The fall of the grain from the top to the bottom of a bin, (sometimes 100 feet deep), when it is being filled, is attended by a cloud of dust which is at least difficult, if not impossible, to eliminate.

You cannot eliminate the incandescent wire from the electric light bulbs, and the breakage of one of these bulbs in air, laden with a certain amount of dust, will inevitably produce an explosion. True, you can guard these bulbs and so reduce the danger, but as long as that white hot wire is there, so is some percentage of danger.

In stating that it is impossible to eliminate all or any of these dangers, there is no wish to imply that it is scientifically impossible; it is not, but it is intended to imply that it is commercially impossible to do so entirely, although they may be very greatly reduced. In most of the recently constructed elevators, more or less elaborate dust collection schemes have been installed. These collecting systems are unquestionably a great step in the right direction, but unfortunately the value of a collection system is entirely dependent upon whether it is collecting and this may be only occasionally, or even *semi*-occasionally. At best, with floor sweeps, the dust accumulates to some extent before it is swept to the intakes and this accumulation is generally sufficient to cause a disastrous explosion; all that is required is a wind or shock to suspend the dust and a spark.

Although adopting all the recently accepted explosion safeguards, such as dust collecting systems, vapourproof globes, swinging sash for windows, vents to legs and bins, we came to the conclusion that an explosion-proof elevator is about on a par with an unsinkable ship, that is, it has no existence nor is it at all likely to have any existence; but, continuing the analogy of the ship, which is divided into watertight compartments to localize the effect of any disaster, the most practical and advisable means of obviating the spreading of any explosion lay in

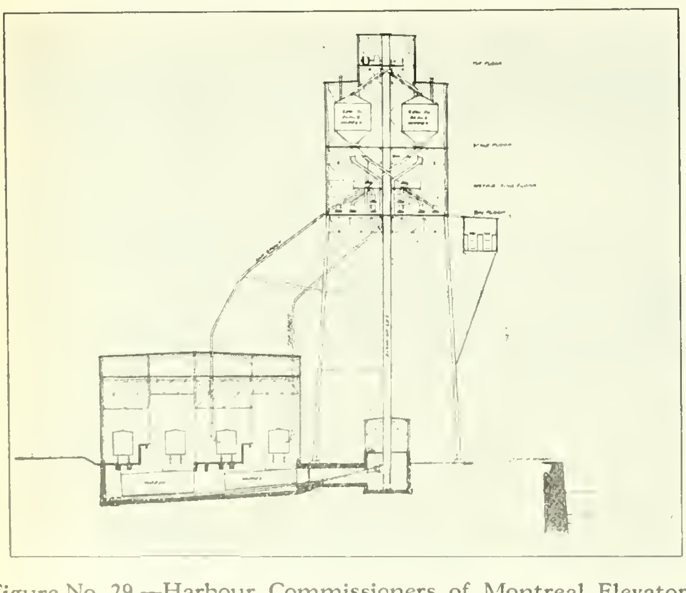


Figure No. 29.—Harbour Commissioners of Montreal Elevator No. 3. Sectional view showing car dumpers, funnels, boot house and working house above.

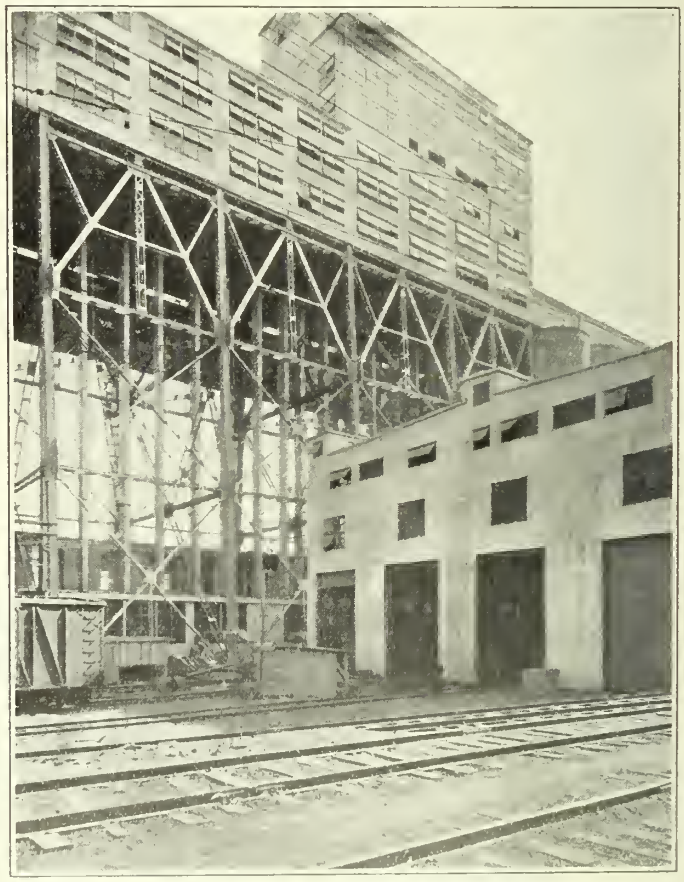


Figure No. 30.—Harbour Commissioners of Montreal Elevator No. 3, showing legs running in open from boot house to cupola above.

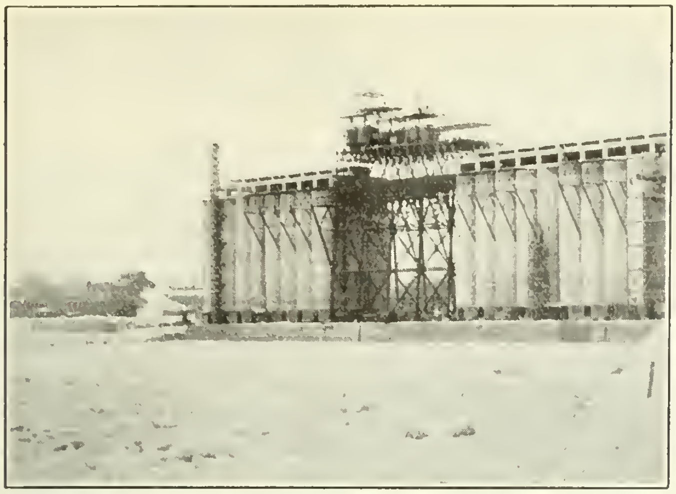


Figure No. 31.—Harbour Commissioners of Montreal Elevator No. 3, showing cupola of working house before sheeting was erected.

segregating the different units of an elevator in order to confine any minor explosion that might occur to the unit in which it occurred, and by efficient venting of each unit, allow the pressure to escape to the open air instead of to the other units of the plant.

Segregation of Units to Limit Effects of Explosion

The principal of segregation of units has been put into effect for the first time upon a large scale in the new Harbour Commissioners of Montreal, elevator No. 3, and the principle as followed in this case is shown in the accompanying illustrations. Figure No. 27 is a general view of this plant from the water side. It is of 2,000,000 bushels capacity, divided into two units, each of approximately 1,000,000 bushels capacity. Figure No. 28 is a view from the land side. These two units are absolutely separated up to the top of the bins and are there only connected by the belts running through small openings into the centrally located working house. The very dusty process of car unloading is carried out in a car-shed isolated from the other parts of the plant.

The belts carrying the grain from the hoppers below rail level in the car-shed run through tunnels and discharge to the boots of receiving legs in a boot house, which is only carried a few feet above ground level and roofed over, (see figure No. 29). The leg casings passing through this roof are carried up in the open air to a height of over 100 feet above ground level. thus giving any explosion that may occur in these legs an opportunity to blow out the thin sheet metal casing and escape before it reaches the building above. Figure No. 30 shows these features very clearly, while figure No. 31, taken before the working house sheeting was put on, gives a good idea of how little obstruction the real structure would cause in the event of an explosion. The scale hoppers are erected, and little beyond a light protection against the weather remains to be added. Figure No. 30 shows that even this covering is mostly glass.

The upper part of the receiving house into which these legs run, commences at the level of the top of the concrete bins and contains the leg heads, drives, scales and belts to convey the grain in either direction to the east or west units of storage bins. Separation of the upper half of the receiving house from the storage houses is effected by means of heavy concrete walls, the only openings through which are such as are necessary for the passing of belt conveyors and for doors.

The boots of shipping legs in the basement are located in small houses, separated from the storage basement by

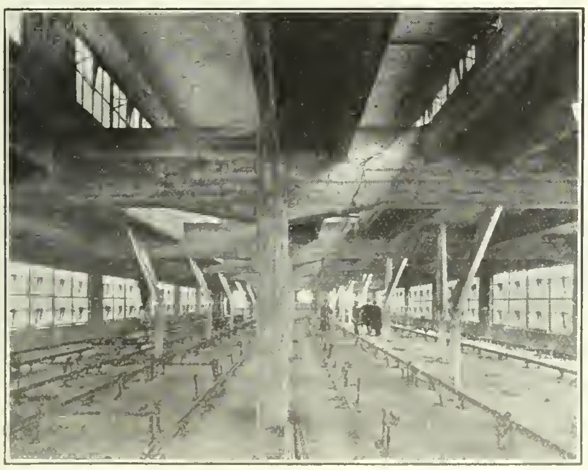


Figure No. 32.—Harbour Commissioners of Montreal Elevator No. 3, storey over bins showing self-opening windows.

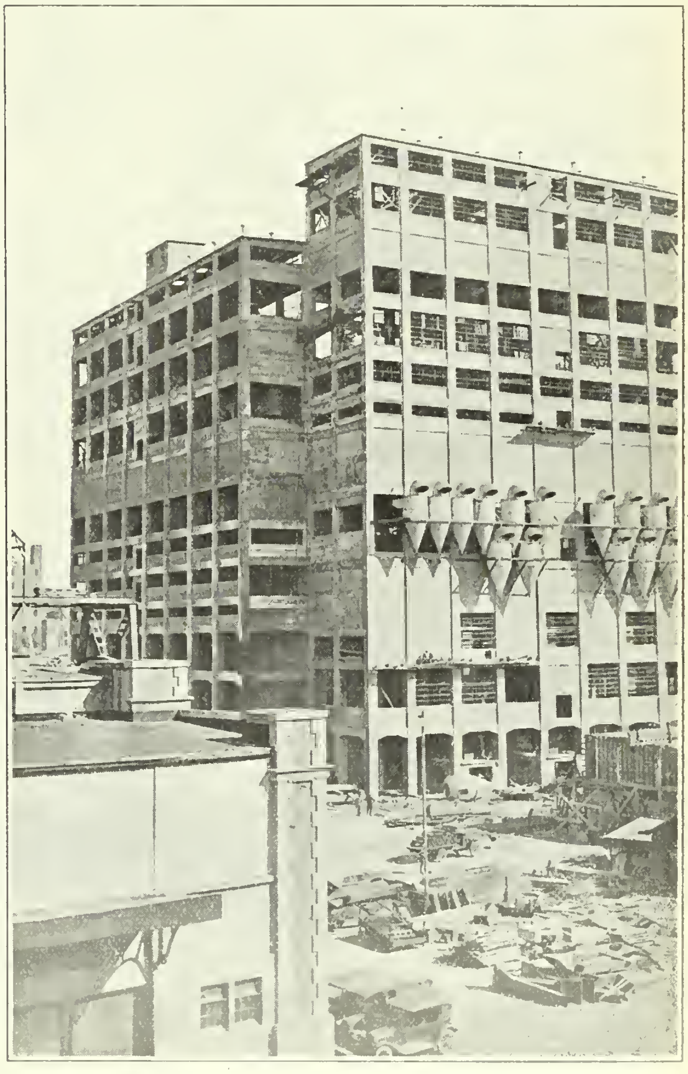


Figure No. 33.—Vancouver Harbour Commissioners Elevator No. 2.Storage capacity 1,500,000 bushels.

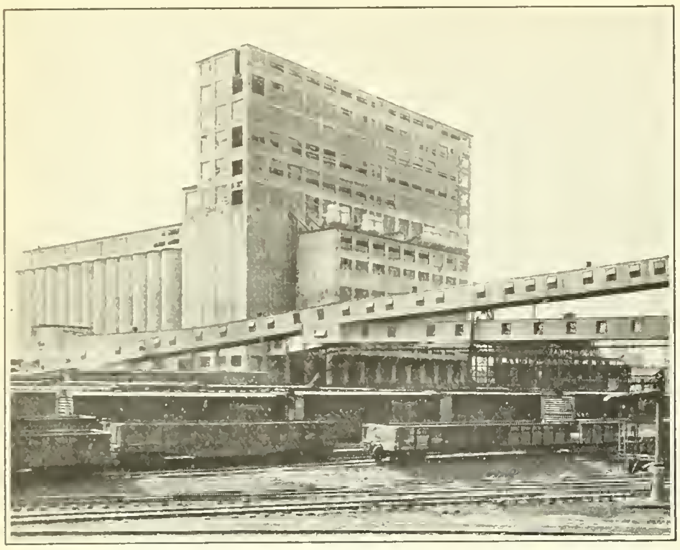


Figure No. 34.—Baltimore and Ohio R.R. Elevator, Baltimore, Ohio. Storage capacity 3,800,000 bushels.

means of heavy concrete walls, and from the shipping house by the outside air. Separation of the upper part of shipping house from the storage house is also effected by heavy concrete walls.

All elevator heads have openings to the outside air through the roofs, covers being provided, which, while weatherproof, will offer little resistance to air pressure from the inside of the elevator casings.

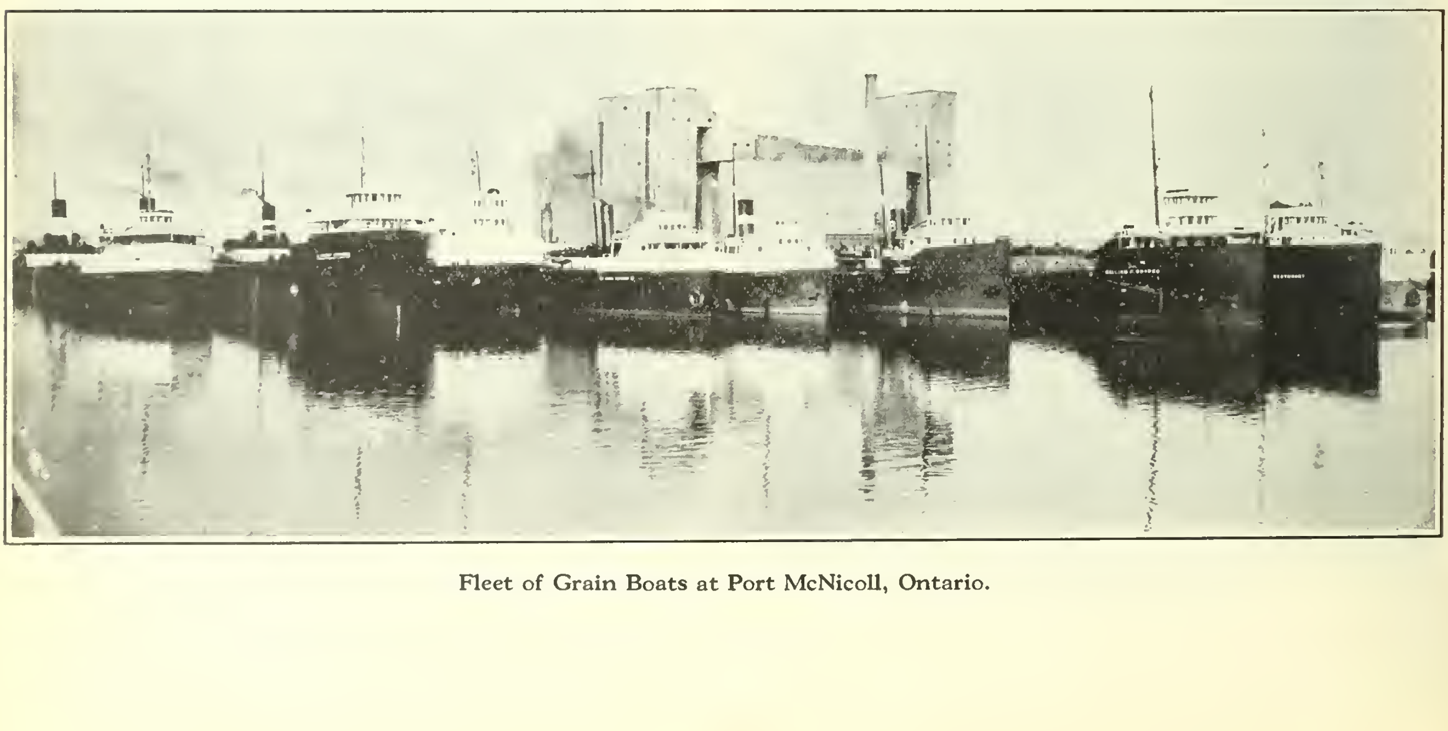
Each bin is vented with a separate vent pipe, run vertically from the bin to approximately four feet above the roof, with no air connection between any two bins, each bin being completely isolated from all other bins. Ample ventilation is provided throughout the plant by means of windows and monitors, (see figure No. 32), all windows being designed to swing outwards with the least pressure from the inside of the house. The Harbour Commissioners of Montreal elevator No. 3 is not the only elevator in which we have introduced the feature of providing all possible window area. Formerly, standard elevator specifications called for Underwriters' wire glass windows throughout the building, whether exposure hazard was probable or not. Now, we go to the other extreme and put in a light plain glass which will be easily blown out by an explosion.

Figure No. 33 is not a factory building as might at first glance be supposed; it shows the working house and shipping house of the Vancouver Harbour Commissioners' elevator No. 2; nor is it a line of papooses hanging on the wall, — they are dust collectors. This view also shows the use of light, easily displaced, wall construction in all locations, except where such construction would permit the spreading of an explosion from one part of the plant to another, in which case heavy and unyielding wall construction is employed, and the use of non-combustible building materials throughout, combined with the use of an efficient system of dust collecting and handling.

Figure No. 34 is a view of the recently completed Baltimore and Ohio R.R. elevator, at Locusts Point, Baltimore, showing a cupola having practically all glass sides.

As remarked earlier in this paper, we do not believe it possible to entirely avoid the danger of an explosion in buildings where great quantities of grain are handled, but we do think that in these plants we have not only taken all the general and up-to-date precautions to prevent such an explosion, but have gone farther and produced buildings in which any explosion which may occur will be localized, and even in the event of its spreading from one unit to another, I think that a glance at either the Vancouver elevator, (figure No. 33), the Montreal elevator No. 3, (figure No. 27), or the new Baltimore and Ohio R.R. elevator at Baltimore, will be sufficient to suggest the idea that the most serious damage likely to result would be a pretty heavy glazier's bill.

AUTHOR'S NOTE — At the close of this paper a question was asked by a member as to whether he was correct in assuming that the author did not attach much importance to dust collecting systems. Nothing could be further from the truth and an examination of the paper fails to show anything that should lead to such an impression, to abolish the dust collecting system, because the different units of a plant are segregated in order to minimize the effect of a possible explosion, would be akin to abolishing the lookout at sea because your ship was divided into watertight compartments to minimize the effect of a possible collision.



Fleet of Grain Boats at Port McNicoll, Ontario.

The New Niagara Arch Bridge

Details of design and construction of the new bridge over the Niagara River for the Michigan Central Railroad Company.

H. Ibsen,
Bridge Engineer, The Michigan Central Railroad Company.

Paper read before The Toronto Branch, The Engineering Institute of Canada, February 19th, 1925.

The cantilever bridge carrying the Michigan Central Railroad tracks over the Niagara river, which the new bridge replaces is located about two miles below the Niagara Falls and about 330 feet south of the arch bridge commonly known as the Grand Trunk Arch. It connects the city of Niagara Falls, New York and the city of Niagara Falls, Ontario. This structure which is one of the historical bridges of this country was designed and built by the late C. C. Schneider.

The contract for the construction of the cantilever bridge was awarded to the Central Bridge Works at Buffalo on April 11th, 1883, and the bridge was opened for traffic on December 20th, 1883.

The total length of the cantilever bridge is 910 feet, the length of each of the cantilevers 395 feet, the length of the suspended span is 120 feet and the towers are 130 feet high. The height of rail above water is 240 feet. The trusses are spaced 28 feet apart centre to centre, and were designed for a loading on each of the tracks approximately equal to a Cooper's E-23 loading. The total weight of the superstructure as originally built was 2,250 tons. It was strengthened in 1899-1900 by adding a new centre truss on centre tower bents and piers and doubling the floor stringers.

By this work the carrying capacity of the bridge was increased 50 per cent and that is all that it could be strengthened owing to the design of the original structure. This addition increased the capacity of the bridge to a Cooper's E-35 loading. The weight of trains run over the bridge has kept on increasing and for some time the loading permitted has corresponded to Cooper's E-45 loading and as this could not be increased the restriction against heavier loads was becoming burdensome. The bridge also commenced to show the effects of over-loading in *wear of pin holes*, crackings of various members etc., and extensive repairs had to be made from time to time. It was therefore decided best to start planning for a new bridge.

The New Bridge

Before deciding upon the general dimensions of the new bridge it was necessary to investigate the outlines and condition of the rock formation underlying the talus slope adjacent to the existing cantilever bridge.

The Niagara River gorge which is 860 feet wide at the point selected has at the top a vertical bluff about 50 feet high, with the top layer of hard limestone overhanging the lower part in some places more than 20 feet. From the foot of the bluff a talus slope runs on an inclination of 1.3 horizontal to 1 vertical to the water's edge.

To establish the outline of the solid rock underlying the talus slope a large number of diamond drill core borings were made adjacent to the cantilever bridge. The borings showed the rock profile to be very uneven, with vertical cliffs connected by steep slopes, the average slope of the rock being about 1.0 horizontal to 1.3 vertical. At a distance of about 120 feet from the top of the bluff, is a hard limestone formation known as the "Clinton Ledge" which is the most suitable rock for foundation purposes at this point.

The gorge widens rapidly toward south from this point, so that, while the Grand Trunk arch bridge is only 550 feet long, it would be necessary on the site of the cantilever bridge, which is only about 330 feet south of same, to build a bridge 700 feet long in order to secure the same foundation conditions.

This made it desirable to locate the new structure as far north as practicable, without encroaching too much on the Grand Trunk arch, so as to shorten the span of the bridge and to improve the track alignment on the approaches to same. With this in view the new bridge was located 51.1 feet north of the centre line of the cantilever bridge on the Canadian side, and 119.77 feet north of same on the American side.

For locations like the Niagara River gorge with its steep rocky slopes the arch is obviously the best and most economical design for a railroad bridge besides being the structure that harmonizes best with the natural surroundings.

The piers were located so as to bring the thrust from the arch span on the "Clinton Ledge". A span of 640 feet centre to centre of end bearings, was the shortest that could be used and after careful consideration a double track spandrel braced arch, three-hinged for dead load and two-hinged for live load, was selected for the design.

The span is divided into sixteen panels, each forty feet long. It has horizontal top chord and parabolic bottom chord. The rise of the bottom chord at the centre is 105 feet and the depth between the chords is 20 feet, making the total height 125 feet, measured in the plane of the truss. The height of the base of rail to mean water level is 240 feet. The distance apart of the trusses centre to centre of the top chords is 30 feet and the trusses are battered 1 horizontal to 8 vertical, making the distance centre to centre of bottom chords 61 feet — 1-8 inch at the hinge pins and 35 feet — 3-8 inch at the centre of the span. The floor system which consists of independent girder spans, for each panel, with transverse floor beams and I-beam stringers to which a solid floor plate is rivetted, sets on castings, bevelled to compensate for the inclination of the truss. The castings are located on top of the top chord immediately over each panel point. On each side there is a 3-foot wide concrete slab sidewalk with pipe railing.

The placing of the floor system as described is an unusual feature. There were several reasons that led to its adoption. First, there is a city immediately at the end of the bridge on each side of the river and it is difficult to tell what change in grades might be required in the future. The floor as designed can easily be raised to take care of such changes. Second, it was thought best to have a floor system that would act as independently of the truss action as possible and would not cause the trouble that has been experienced in the cantilever bridge from having the floor beams rigidly connected to the truss, in which position the floor is liable to cause secondary bending stresses in the truss members, and trouble is likely to arise in the floor beams, from the longitudinal deflection of the truss. Third, with the top chord and

The New Niagara Arch Bridge.

truss posts inclined as they are in this bridge it is difficult to provide entirely satisfactory floor beam connections.

The solid ballast floor was adopted principally as protection against brine drippings from refrigerator cars, which in the old bridge had been the cause of very large maintenance expense. Besides this there is an additional safety in case of derailment; it adds to the rigidity of the bridge; and it cheapens the maintenance of the track, which all together counteracts the additional first cost to a great extent.

As first designed the arch span was flanked on either end by 100-foot deck plate girder spans, supported on and fastened to very heavy transverse girders, which were rivetted to the vertical end bent of the arch span. At the shore end the girders are supported on rollers, on the concrete piers on top of the bluffs of the gorge. After starting construction it was found necessary, for reasons which will be explained later, to increase the length of the approach span on the American side to 125 feet.

The arch span as designed is three-hinged for all the dead load up to and including the floor plate and is two-hinged for the balance of the dead load and for the live load, wind and lateral load and temperature stresses. The labour involved in the design of the two-hinged arch is very much more than that required for the three-hinged arch, but for a railroad bridge carrying heavy moving loads the additional rigidity of the former fully justifies the extra labour.

Arch Design

For the preliminary design a ratio of the main material to the total weight of the arch truss was assumed, also the ratio of the weight of the bottom chord to the total weight of the arch truss. By computing the dead load stresses, for these values, it is possible to form a general idea of the unit stresses available for the dead load of the floor and track and for the train load.

The sectional areas of the members of the trusses were accordingly approximated. On basis of these areas was drawn a Williot's diagram for an approximate determination of the influence ordinates for the horizontal thrusts.

Preliminary influence lines were then drawn; and the dead load and live load stresses were computed, and new sections found for all members of the arch truss, which were used for the exact computations.

Two-Hinged Arch Design, Vertical Loads

The stresses in the two-hinged arch were computed as the difference between the stresses in a simply supported arch truss caused by vertical loads and caused by a horizontal thrust at the support. The thrust is of such an amount that it prevents the arch truss from expanding horizontally under the vertical load. An influence ordinate for the horizontal thrust is determined by

$$Ho \sum \frac{Tu^2.L}{E.A} + \sum \frac{So.Tu.L}{E.A} = 0$$

Where, So = Stress due to a unit load acting downward and applied at a panel point on the truss which is simply supported.

Tu = Stress due to unit horizontal force applied to Bo of the simply supported truss and acting inward.

$\sum \frac{Tu^2.L}{E.A}$ is then the inward deflection at Bo due to Tu.

$\sum \frac{So.Tu.L}{E.A}$ is the inward deflection at Bo due to So.

This equation states then that the summation of the horizontal deflections at Bo is zero. We find accordingly

$$Ho = -\frac{\sum \frac{So.Tu.L}{E.A}}{\sum \frac{Tu^2.L}{E.A}}$$

The influence ordinates for Ho were computed in this way for each panel point of the top chord and were checked by computations by the elastic load method. Having found Ho we find the influence ordinates for the stress in a member in the two-hinged arch as $S = So + Ho.Tu$.

Braking Stresses

An exact computation of the braking stresses was made because the arch is a long and tall deck structure in a location where starting and stopping of trains continually occur.

The method was similar to the one used in determining the influence ordinates for stresses from vertical loads.

The braking force in the arch truss is assumed to be 10 per cent of the train load, but no impact is added to the braking. The impact for the vertical loads is 10 per cent so that the braking is 1/11 of the combined train load and impact.

The influence ordinates for the braking were combined with the ordinates for the vertical loads. There were accordingly drawn three influence lines for each member, one with braking from the right, one with braking from the left, and one without braking.

The maximum live load stresses at the crown are 2,720,000 pounds for B7B8 and 1,480,000 pounds for T7T8, and the total resultant stresses are 7,760,000 pounds and 2,600,000 pounds respectively. Maximum live load stress at the support is 4,360,000 pounds for BoB1, and the total resultant stress 9,700,000 pounds.

The temperature stresses were computed for a variation of ± 70 degrees F., causing an increase or decrease of 170,000 pounds in the horizontal thrust. The bottom chords and diagonals are compressed for a rise in temperature, and the top chords and verticals are compressed for a fall in temperature. As compression is the deciding stress for all members except for three of the diagonals, the summer condition is the worst for bottom chord and diagonals, and the winter condition for the top chords and verticals.

Maximum temperature stress in the top chord T7T8 is 890,000 pounds and for the bottom chord B7B8, 980,000 pounds, and for the bottom chord BoB1 200,000 pounds. Snow and ice was taken as approximately 525 pounds per lineal foot of one truss.

The weight of the arch truss with details and rivet heads, laterals, bracing, platforms and drainage is approximately 61½ per cent larger than the stress carrying main material, if all members are considered as extending from panel point to panel point. This value was used in computing the dead load stresses. All vertical loads were multiplied by 1.0078 on account of being transferred from a vertical direction into the direction of the truss plane.

Secondary Stresses

On account of the posts near the centre being very short, it was decided to make a careful determination of the secondary stresses for a system consisting of the eight centre panels. It was assumed that the members in the four end panels on each side would have only a small influence on the secondary stresses in the members nearest to the centre.

The computation was made for the assumption that all members had rivetted connections. The computations covered secondary stresses for dead load, temperature variation and live load over ten panels. As the members are short and the gusset plates large and heavy, the stiffness of the gussets was taken into account.

The moment of inertia at the panel points was fot the bottom chord assumed to be 2.2 times the momenr of inertia of the body of the member; for the top chord this factor was 5; for the web members it was assumed to be infinite. Between the panel point and the edge of the gusset $\left\{\frac{M}{I}\right\}$ was assumed to vary as a straight line. These assumptions necessitate extensive computations of the constants which enter into the equations, $\sum M=o$ but otherwise the method is the customary. When the moments were computed, the stresses at the edge of the gussets were found and the results of the separate computations for dead load, temperature and live load were combined. The secondary stresses for T6B6 were found to be 14,000 pounds per square inch and for T7B7 22,700 pounds per square inch. These members were therefore made pin connected instead of rivetted.

The results of the computations of wind, lateral, and torsional stresses from live load on one track show that the greater part of the wind load, which is applied at the top chord, is transferred to the bottom lateral system by way of the sway bracings. The reason for this is that the bottom lateral system is nearly ten times as stiff as the top lateral system. The bottom lateral system is fixed at the ends, while the top laterals must be considered as hinged to the top of the end sway bracing. The bottom lateral system is also wider and heavier than the top lateral system. Taking the torsion on the arch into account computations show that approximately 65 per cent of the wind is resisted by the bottom laterals, 10 per cent by the top laterals and 12½ per cent by each of the main trusses; this 12½ per cent is the horizontal component of the total wind effect in the plane of the trusses caused mainly by orsion.

The bottom lateral system was designed so that 2/3 of the shearing stress was resisted by the diagonals in tension and 1/3 by the diagonals in compression. The struts were designed to resist 2/3 of the shearing stress so as to be on the safe side.

The bottom laterals were also proportioned so as to act as a lacing system for the bottom chords, which requires them to be able to resist a shear of 300 times the areas of both bottom chords in the panel considered. The top laterals were governed by this latter consideration and are designed as lacing system for the top chords.

The sway bracing is designed so as to tie the four corners of a cross section together during the action of the lateral forces and the torsional moments, and transfer therefore the major part of the lateral forces from the top lateral system to the bottom lateral system.

The wind stresses in the main members were found to be smaller than 25 per cent of the combined stresses due to the other loads.

Erection Computations

Influence ordinates were computed for the stresses in all members and for the deflections at all points for all stages of erection, so as to be able to verify the effect of any loading, and to see if all points were in the right position longitudinally and at the correct elevation. In these computations for the deflections were considered the camber, the backstay deformations and the temperature variation.

Loading

The structures were designed for the following loads:– (*a*) Dead load; (*b*) live load; (*c*) wind load; (*d*) erection load; (*e*) temperature; (*f*) lateral force from moving loads.

The viaducts over the streets, the approach spans to the arch and the floor system of the arch span were designed for Cooper's E-70 loading, on each track. For the arch span a uniform load of 9,000 pounds per foot for 110 feet followed by a uniform load of 7,000 pounds per foot, on each track was used. This uniform load produces stresses in all members practically equal to those caused by Cooper's E-70 loading and simplifies computation somewhat. For members which receive their maximum stresses only when two tracks are loaded, only 95 per cent of the loading mentioned was used.

Impact was added to the live load static stress as determined by the formula:—

$$I = S \times \frac{15000}{30000 + L^2}$$

Where, I = Impact stress. To be not less than 10 per cent of S.

S = Live load static stress.

L = Length of span.

The wind was specified as a moving load of 30 pounds per square foot on 1½ times the vertical projection of the structure and a moving load of 360 pounds per foot applied 8 feet above the rail.

The wind load used in figuring erection stresses on the arch span was 50 pounds per square foot on 1½ times the vertical projection of the structure and the derrick car used for erection. The lateral force due to the moving live load was assumed as 500 pounds per foot applied 6 feet above the base of rail.

The longitudinal force due to braking was taken as 10 per cent of the live load for the arch trusses and 20 per cent for all other parts of the bridge, acting in either direction at 6 feet above the rail. No impact was added to either wind, lateral or longitudinal forces.

The wind and lateral force stresses in any main member were not considered unless their combined sum exceeded 25 per cent of the combined stresses due to other loads and only the excess above 25 per cent was combined with the other stresses in proportioning the member.

The unit stresses permitted in the arch trusses for dead load and erection stresses, were for axial tension on net section 20,000 pounds per square inch and for live load 18,000 pounds per square inch and for axial compression on gross section for dead load and erection stresses $18{,}000 = 80 \frac{L}{R}$ but not to exceed 17,000 pounds per square inch and for live load $16{,}000 = 70 \frac{L}{R}$ but not to exceed 15,000 pounds per square inch.

The unit stresses permitted for the floor of the arch span and for the approach span for dead and live loads were according to the New York Central lines specifications.

Reversal of stresses was provided for by determining the resultant compressive stress and the resultant tensile stress in the members and increasing each stress by 50 per cent of the smaller and then designing the members so that it was capable of resisting either increased resultant stress.

The connections were designed for the sum of the resultant stresses.

Stresses due to eccentricity and transverse bending were combined with the axial stress in designing the members without any increase in unit stresses but where secondary stresses in truss members due to rigidity of joints and the deflection of the truss were combined with the axial stress in the members the unit stresses were increased one-third.

Material

The specifications for the structural and rivet steel were practicably the same as the N.Y.C. Lines Specifications, for medium open hearth steel.

The eye-bars used in the backstays were made of special heat treated steel with a minimum ultimate strength of 80,000 pounds and a minimum yield point of 50,000 pounds a square inch required. Four of the finished bars were selected and tested to destruction. They all ran well above the required limits.

Details of Design and Workmanship

Throughout the design the aim was to produce a well balanced structure with the details fully as strong as the main members. Rivetted members are used throughout for both main members and bracing and the connections are all rivetted, except for the two first vertical posts each side of the centre of the span. These posts were designed with rivetted connections, but the secondary stresses were so high in these short, stiff members that it was necessary to connect them with pins to the gusset plates. The lacing of all members including bracing are either angles or channels, connected to the members with enough rivets to develop the strength of the lacing. The connections have a strength 10 per cent in excess of that of the members connected. Splices of tension members also have an excess strength of 10 per cent over that of the member, while compression members are fully spliced without dependence upon the contact of abutting ends, although the ends are finished to bear. The bottom chord which carries the largest amount of the load is a box girder section, with inside dimensions 36¼ inches wide by 66½ inches deep. This makes a closed section but there is a manhole at each panel point, with removable cover and the inside dimensions are ample for easy access to all points. The sectional area of end bottom chords is 714 square inches the centre 557 square inches. Each side girder of the section has four web plates 66 inches deep by 5/8 inch thick, rivetted together with stitch rivets with two angles at the top and at the bottom and 2 angles on the centre line of the inner face of the web. These angles are all 8 by 8 inches by ¾ inch thick. These two side girders are of the same section throughout the bottom chord and the variation in section between the end panel and centre panel is made entirely in the top and bottom cover plates, which in the end panel are 60 inches wide and 2 1-16 inches thick, and in the centre panels 60 inches wide and ¾ inch thick, with the thickness varying in the intermediate panels to suit the stresses. The angles on the centre line of the webs are connected with batten plates and there are also transverse diaphragms on the inside connecting the sides and the top and bottom of the box. The weight of the end panel of the bottom chord is 70½ tons and this is the heaviest member of the span. The weight of the panels next to the centre is 50 tons. The gusset plates connecting the web members of the truss to the bottom chords are all 1¼ inches thick, permitting them to take the place of the two inner web plates at the joints and acting as inner splice plate for the two outer web plates at the panel point, while the two inner web plates are spliced at end of the gusset plates.

The outer web plates which join at the panel points are finished to bear on the centre 30 inches of the webs only, the upper and lower 18 inches being planed on a bevel to 1/16 inch clearance at the top and bottom. This was done to help in the adjustment from the cantilevered condition during erection to the final arch condition. At the centre panel point a 19-inch pin was provided to facilitate the joining of the two halves of the arch. After the top chord centre joint had been connected, splice plates were rivetted across the bottom chord centre joint.

The top chord is an ordinary chord section 36 inches wide out to out of web plates and 39¼ inches deep back to back of angles, and with cover plates on top and channel lacing on the bottom. There are transverse diaphragms in all top chord panels. The first vertical post which is 120 feet long is the only web member not made in one length. It was spliced at the connection point of the longitudinal stay bracing. This post is 36¼ inches by 42¼ inches, and is made up of two cover plates 42 inches by 1 inch with four angles 8 by 8 by 7/8 rivetted to the plates and with channel lacing on the open sides. There is a vertical centre diaphragm the full length of the post.

The other posts in the span except the centre post and the first two posts each side of the centre are made up the same as the end post but of lighter sections, and their outside dimensions are only 36¼ by 36¼ inches. The first two posts each side of the centre which are pin connected to the gusset plates are 33¼ by 36¼ inches outside dimensions, and the centre post is 25¼ by 36¼ inches outside dimensions. These posts have no diaphragm in the body of the post, but there is a diaphragm between the gusset plates to which they connect.

All of the diaphragms at the top of the posts are fitted tight to the underside of the cover plate on the top chord and are connected to same with lug angles, so that the load from the floor system, carried by the castings on top of the top chord is transferred direct to the posts.

The diagonal web members are all 36¼ by 36¼ inches outside dimensions and consist of two cover plates 35¾ inches wide and four 8 by 8 inch angles with lacing on two faces and transverse diaphragms.

Hinge and Base Castings

The skew backs or base castings are 14 feet wide, and 14 feet 8¾ inches long on the bottom and 4 feet 4½ inches high and weigh 53½ tons each. They had to be cast in two pieces on account of their size and the joint was made on the longitudinal centre line. On top of the base casting and firmly bolted to same is the lower hinge casting, supporting the 19-inch by 6-foot hinge pin. Above the pin is the upper hinge casting to which the bottom chord and the first vertical post of the truss are bolted. There are lugs on this casting to which the end bottom lateral strut is bolted. The surfaces of this casting to which the members of the truss connect are inclined to suit the inclination of the truss and the hinge pin is horizontal.

This paper will be continued in the May issue of the Journal.

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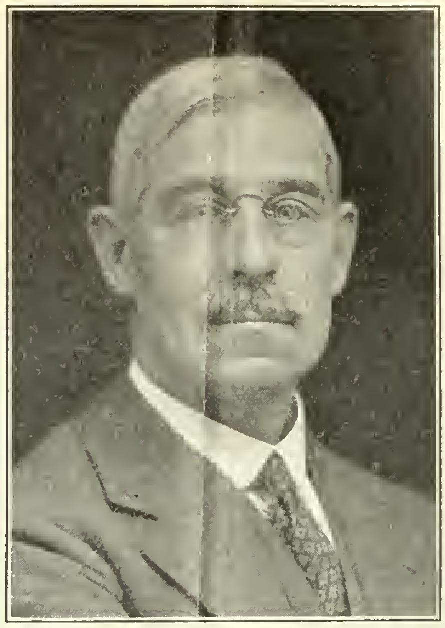
Secretarial Appointment



RICHARD JOHN DURLEY, M.E.I.C.

Richard John Durley, B.Sc., Ma.E., M.B.E., M.E.I.C., has been appointed to the secretaryship of *The Engineering Institute of Canada*. The recommendation was made by a special committee of Council and afterwards confirmed by that body. Mr. Durley will assume office the beginning of May.

Richard John Durley was born in England and received his technical training at University College, Bristol, and University College, London. He served his apprenticeship as a mechanical engineer with Earle's Shipbuilding and Engineering Co. Hull (England) and afterwards remained in the service of that company. In 1893 he obtained a Whitworth Scholarship, later taking charge of the Mechanical Engineering Department at the newly formed Hull Municipal Technical School. In 1898 he came to McGill University and in 1901 succeeded the late Dr. J. T. Nicolson as Professor of Mechanical Engineering. From 1911 to 1915 he was in practice as a Consulting Engineer in Montreal. During the war he was Officer in charge of the Division of Gauges and Standards in the service of the Imperial Ministry of Munitions, Inspection Department (Canada) and in 1919 was appointed Secretary to the Canadian Engineering Standards Association.

He holds the degrees of B.Sc. (London) and Ma.E. (McGill), and is a Member of *The Engineering Institute of Canada*, the Institution of Civil Engineers (Great Britain), and of the American Society of Mechanical Engineers. In 1918 he was awarded the Order of the British Empire (M.B.E.).

Mr. Durley brings to the position ripe experience in engineering, secretarial and committee work. As officer in charge of the Division of Gauges and Standards during the war he performed splendid service for the Empire. As Secretary of the Canadian Engineering Standards Association he built up an organization which has performed signal service for the engineering profession and manufacturing interests. It is certain that Mr. Durley will receive the warm support of the entire membership in his efforts on behalf of *The Institute.*

Presentation of Leonard Medal

February 12th, 1925.

THE SECRETARY,
THE ENGINEERING INSTITUTE OF CANADA.

Dear Sir:—

I thank you very much for the Leonard Medal, which was handed to us yesterday in my absence from the office. This medal went forward last night by registered mail to H. Mortimer-Lamb, secretary of our British Columbian Division and will be awarded to Dr. W. L. Uglow, personally, at the Divisional meeting of the Institute to be held in Vancouver from February 18th to 20th inclusive.

With appreciation.
Yours faithfully,

GEO. C. MACKENZIE,
Secretary-Treasurer.
The Canadian Institute of Mining and Metallurgy.

OBITUARIES

Leslie R. Calder, A.M.E.I.C.

Regret is expressed at the death of Capt. Leslie R. Calder, A.M.E.I.C., which occurred at St. Katharine's Sanatorium, Woking, Surrey, England, on January 16th, 1925, following a long illness which necessitated his confinement to bed during the past two and one half years.

The late Capt. Calder was in his thirty-first year, having been born at Cannington, Saskatchewan, on May fifth, 1894. He was a graduate of Queens University from which he received his degree of B.A., in 1914, and was commissioned as a Dominion Land Surveyor in February 1920. During the seasons of 1911 and 1912 he was on survey work first as chainman and later as instrumentman with a party under H. K. Moberly on townsite survey work in Saskatchewan. The following season he was rodman with the Grand Trunk Pacific Railway on construction work. In 1914 he was articled assistant on surveys with C. M. Walker, A.M.E.I.C., Alberta and Dominion Land Surveyor on townsite and miscellaneous surveys in Rocky Mountain Park.

On enlisting for overseas service, he was commissioned lieutenant in No. 3 Railway Construction Company, which was stationed in France. In May 1917 he was promoted to Captain of No. 3 Railway Survey and Reconnaissance Section of the Royal Engineers and was in charge of a survey party on railway location and miscellaneous surveys in France until October 1918. The illness from which he suffered for so long a time and which resulted in his death was due to his war service, and upon his return to Canada he was for some time confined to the Brett Hospital at Banff, Alta., The late Captain Calder was elected an Associate Member of *The Institute* on December 21st, 1920.

John Edmund Paddon, S.E.I.C.

It is with sincere regret that we record the death of John Edmund Paddon, S.E.I.C., which occurred at his home in Montreal on February second, 1925.

JOHN EDMUND PADDON, S.E.I.C.

Mr. Paddon was born in Montreal on September twenty-seventh, 1896 and graduated from McGill University in 1922. Following his graduation he was unable to engage in his chosen profession due to illness which was the result of his war service. While recuperating he went to Western Canada in 1923 where he took a temporary position with the East Kootenay Power Company at Elco, B.C. In March 1924 he returned to Montreal and in July of that year had a relapse which resulted in his death some seven months later. Mr. Paddon was admitted to *The Institute* as a Student in January 1921.

Frank Oliver Taker, Jr.E.I.C.

Regret is expressed at the death of F. O. Taker, Jr. E.I.C., which occurred on October tenth, 1924. Mr. Taker was born in the Magdalen Islands on October tenth, 1899. He obtained his engineering degree at the Nova Scotia Technical College, Halifax, N.S., from which he received a diploma in Land Surveying, and during the past year he was taking the civil engineering course with the International Correspondence Schools. In 1920 he was engaged in highway engineering work with the Nova Scotia Highway Board, and in 1923 he was on land survey work in Northern Ontario. Prior to his death he was with the Hollinger Consolidated Gold Mines, Limited, at Timmins, Ontario, as surveyor on the engineering staff for approximately two years. Mr. Taker was admitted to *The Institute* as Junior on June seventh, 1924.

The late Alexander Lundberg

For more than a generation Alexander Lundberg guarded the portals of the headquarters of *The Institute* and during that time became known to the great majority of the membership. On March second, nineteen twenty-five, he passed away following a stroke of paralysis, having been placed on a pension about a year ago. As a careful guardian of the Institute's building he was all that might be desired, being a hard worker and zealous.

He was born in Sweden on September 11th, 1846, and up to the age of thirty-two sailed the high seas, to every portion of the globe. He landed in Montreal in 1880, starting work in the St. Lawrence Sugar Refineries. For ten years he worked for various firms and in 1900 came to the Canadian Society of Civil Engineers in the old headquarters on Dorchester Street. He is survived by his widow.

Malleable Castings Improved through Research

An instance of an industry giving tangible recognition of the responsibility to be met by its product is that of malleable castings.

Ten years ago the principal producers on this continent of malleable castings retained an eminent metallurgical engineer to improve the uniformity and integrity of malleable castings, and to raise the standards of the entire industry.

Although scarcely ten years have elapsed since this work started, improvement in such physical properties as uniform structure, great strength, easy machining, and rust resistance has been far beyond the expectations of those who sponsored the work. It is doubtful if, in the entire history of industry on this continent, there exists a similar instance of an industry recommending, without solicitation, that the leading engineering societies increase the rigidity of the specifications covering the product of its members.

By reason of the research work conducted by the malleable castings industry of this continent, such vital properties as tensile strength and elongation have constantly exceeded the specifications of different engineering societies so that the industry has frequently requested higher physical and mechanical requirements at which its members could aim.

The extent of the vast improvement in the quality of malleable castings, that has resulted from the years of co-operative effort between able scientists and practical foundrymen is indicated by the fact that from October 1, 1922, new specifications of 50,000 pounds tensile strength, and 10 per cent elongation became effective; representing the remarkable increase of 32 per cent in tensile strength and 100 per cent in elongation, over the requirements before the research work of the malleable castings industry commenced.

PERSONALS

John B. Nayler, S.E.I.C., is with the Commonwealth Power Corporation at Jackson, Michigan.

H. A. Icke, A.M.E.I.C., consulting engineer of Victoria, has been engaged to report on both the old and new water supply system of Duncan, B.C. Vancouver Island.

G. M. Hamilton, A.M.E.I.C., has been appointed town engineer of Port Colborne, Ontario. Mr. Hamilton is a graduate of Toronto University of the year 1912.

A. A. Turnbull, Jr. E.I.C., plant engineer with the New England Telegraph and Telephone Company, St. John, N.B., is taking a special course in telephone transmission on this company's works at Boston, Mass.

R. W. Mauer, S.E.I.C., formerly with the Canadian Pacific Railway Company has accepted a position in the office of the chief engineer of the Atchison, Topeka and Santa Fe Railway and is located in Chicago.

F. I. C. Goodman, A.M.E.I.C., formerly of the engineering department of the Canadian Pacific Railway Company at Montreal is with Messrs. Monsarrat and Pratley, consulting engineers, Montreal. Mr. Goodman graduated from McGill University in 1914.

Walter A. Rutter, A.M.E.I.C., has been appointed production engineer with the Firestone Steel Products Company at Akron, Ohio. Mr. Rutter was previously chief engineer and vice-president of the Canadian Milk Products, Limited, Toronto, Ontario.

Professor R. DeL. French, M.E.I.C., has been appointed engineer for the filtration plant to be installed at St. Lambert, Quebec. Professor French is professor of highway and municipal engineering at McGill University. The estimated cost of the new filtration plant is $125,000.00.

V. R. Davies, A.M.E.I.C., is acting assistant professor of civil engineering at the University of Saskatchewan, Saskatoon. Mr. Davies graduated from McGill University with the degree of B.Sc., in 1920 and M.Sc., in 1923. He also received the degree of M.C.E., from the University of Manitoba in 1923.

H. S. Wilson, S.E.I.C., formerly of the head office of the St. Maurice Paper Company, Montreal, has been appointed assistant to the chief engineer of the Hawkesbury plant of the Riordon Pulp Corporation. Mr. Wilson graduated from McGill University in Mechanical Engineering in 1922.

R. A. Kirkpatrick, A.M.E.I.C., senior assistant engineer, Public Works of Canada has been transferred from Nelson, B.C. to Winnipeg, Manitoba. Mr. Kirkpatrick has been with the Department of Public Works since March 1913, when he was appointed junior assistant engineer for the Kootenay District, his appointment to the senior position having taken place in February 1914.

C. H. Timm, A.M.E.I.C., formerly maintenance engineer of the Dominion Engineering Works, Montreal, has been appointed sales engineer in the Northern Foundry and Machine Company, Sault Sainte Marie, Ontario, with full supervision over the pump department and designing of machinery for the reclaiming of bark from pulpwood as fuel for pulp mills.

Robert Ford, Jr. E.I.C., has been appointed mechanical superintendent of the Port Alice plant of the Whalen Pulp and Paper Mills Company. Mr. Ford graduated from McGill in mechanical engineering in 1922 and in September of that year was appointed construction, engineer with the Riordon Pulp Company, Limited, at Temiskaming, Quebec.

A. B. Cooper, M.E.I.C., has been elected president of the Engineers' Club of Toronto for the year 1925. Mr. Cooper is a graduate of Tufts College from which he received the degree of B.Sc. in electrical engineering in 1903. Mr. Cooper is at present general manager of the Ferranti Meter and Transformer Manufacturing Company of Toronto.

G. E. Martin, A.M.E.I.C., who has been senior assistant engineer of the Department of Public Works of Canada with headquarters at St. John, N.B., has been transferred to London, Ont. Mr. Martin graduated from McGill University in 1908 and prior to graduation was engaged in railway work first with the Intercolonial Railway and subsequently with the Canadian Pacific and Grand Trunk Railways. He entered the service of the Federal government as assistant engineer in September 1908.

G. F. Binns, S.E.I.C., who graduated from McGill University in mechanical engineering in 1923 has been appointed to the engineering staff of the Riordon Pulp Corporation at their Temiskaming mill. Since graduation Mr. Binns has been with the Canadian Car and Foundry Company at their Montreal plant engaged in general maintenance and improvement work consisting principally of designing estimating and installing new equipment and various construction work.

H. R. Safford, M.E.I.C., has been elected executive vice-president of the Gulf Coast Lines of the International Great Northern Railroad Company and also vice-president of the Missouri Pacific Railroad Company with headquarters at Houston, Texas. Mr. Safford was for some years engaged in railway work in this country and in 1912 was chief engineer of the Grand Trunk and in 1920 he was appointed assistant to the President of the Colorado and Southern Railroad Company with headquarters at Chicago, Ill.

James M. Begg, A.M.E.I.C., has been appointed engineer for the Vancouver and Districts Joint Sewerage and Drainage Board, with headquarters at Vancouver, B.C. Mr. Begg has had extensive experience in this branch of engineering having been engaged on the design and construction of water and sewerage systems in the Old Country prior to his coming to Canada. He was engaged in this class of work for five years in the suburbs of Montreal, and in 1912 was appointed sewerage engineer for the city of Edmonton, Alta. On his return from overseas Mr. Begg was appointed in 1920, assistant engineer on the staff of the engineering department of the city of Montreal and later in that year became city engineer of Brandon, Man.

Engineers Appointed to Study Toronto's Waterworks System.

H. G. Acres, D.Sc., M.E.I.C., formerly chief hydraulic engineer and now consulting engineer of the Hydro-

Electric Power Commission of Ontario and William Gore, M.E.I.C., senior partner of the firm of Gore, Nasmith and Storrie, have been appointed to the Toronto Board of Control as engineering experts to report on the Works Commission plans for the fourteen million dollar duplicate waterworks system.

Appointment in India

H. A. Elgee, M.E.I.C., formerly junior deputy chief engineer of the Back Bay Reclamation Scheme, Government of Bombay, India, has been appointed chief engineer of this work succeeding L. W. Lewis, M.E.I.C. who retired last July. Mr. Elgee was for a number of years with the Sir John Jackson (Canada) Limited, during which time he was engaged on breakwater construction at Victoria B.C., from 1915 to June 1917. For six months of the latter year he was located at the company's head office in Montreal, subsequently leaving Canada to join the Royal Engineers on overseas service. On demobilization in 1919 he returned to the London office of the Sir John Jackson Limited and in the latter part of that year was located in South and East Africa on various works. His appointment to the position from which he has recently been promoted, took place in 1921.

W. Nelson Smith, M.E.I.C., returns to Winnipeg

W. Nelson Smith, M.E.I.C., consulting electrical engineer of the Winnipeg Electric Company has returned to Winnipeg after a leave of absence of about a year in Vancouver, B.C., where he assisted the Sydney E. Junkins Company, B.C. Ltd., in preparing a report on the electrification of the mountain district of the Canadian Pacific Railway. Mr. Smith's experience in steam railway electrification reaches back more than twenty years. After designing a number of long interurban railway systems, he took a leading part in laying out the electrifications of the Long Island Railroad, and the Erie Railroad at Rochester, N.Y., which were among the foremost instances of direct current and alternate current railway electrifications, respectively, at the time they were installed. Mr. Smith is now engaged in a valuation of the extensive light and power distribution system of the Winnipeg Electric Company.

J. M. R. Fairbairn, D.Sc., M.E.I.C., heads American Railway Engineering Association.

J. M. R. Fairbairn, D.Sc., M.E.I.C., chief engineer of the Canadian Pacific Railway, past-president of *The Institute*, has been elected president of the American Railway Engineering Association, of which association he was formerly a director. Mr. Fairbairn's position with the Canadian Pacific Railway is one of the highest importance and responsibility in the engineering profession. His connection with the Canadian Pacific Railway has been continuous since August 1901, and during this time he has been:— principal assistant to D. McPherson, division engineer at Montreal, August 1901-November 1902; resident engineer at Ottawa, November 1902 to August 1904; assistant engineer in chief engineer's office, Montreal, August 1904 to August 1905; acting division engineer, Eastern Division; August 1905 to March 1906; division engineer, Ontario, at Toronto March 1906 to November 1907; division engineer, Eastern Division at Montreal, November 1907. The following year he was appointed principal assistant engineer, followed by engineer maintenance-of-way in 1910, and later assistant chief engineer. On July first, 1918, Mr. Fairbairn was appointed chief engineer of the Canadian Pacific Railway System. Mr. Fairbairn's untiring work in connection with *The Institute* is well known to all its members. He was on the Council during the years 1910, 1913, 1914, 1915, and 1916 and was vice-president during the years 1917 and 1918 and president in the year 1921.

Montmorency Falls Bridge Design Competition.

The award in the competition in the design of the proposed bridge at Montmorency Falls, Quebec, for the Department of Public Works has been announced.

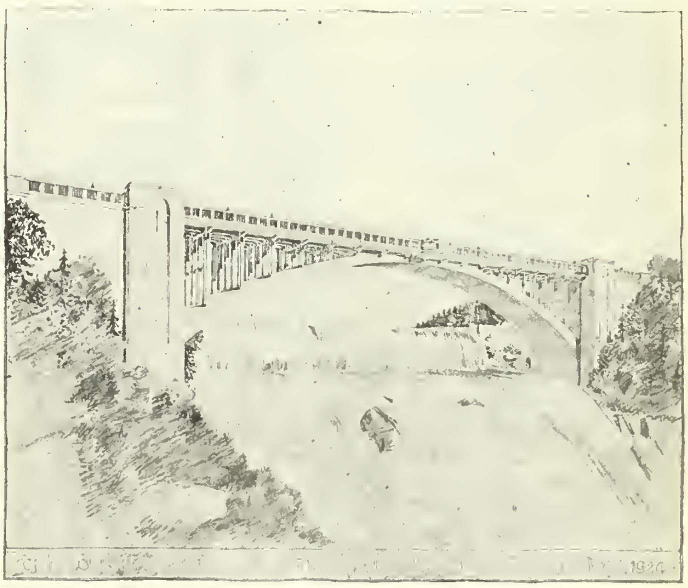
First Prize awarded to Dr. Arthur Surveyer, M.E.I.C.

The design placed first was that submitted by Dr. Arthur Surveyer, and shows a design for a reinforced concrete bridge with a total length of roadway of 350 feet.

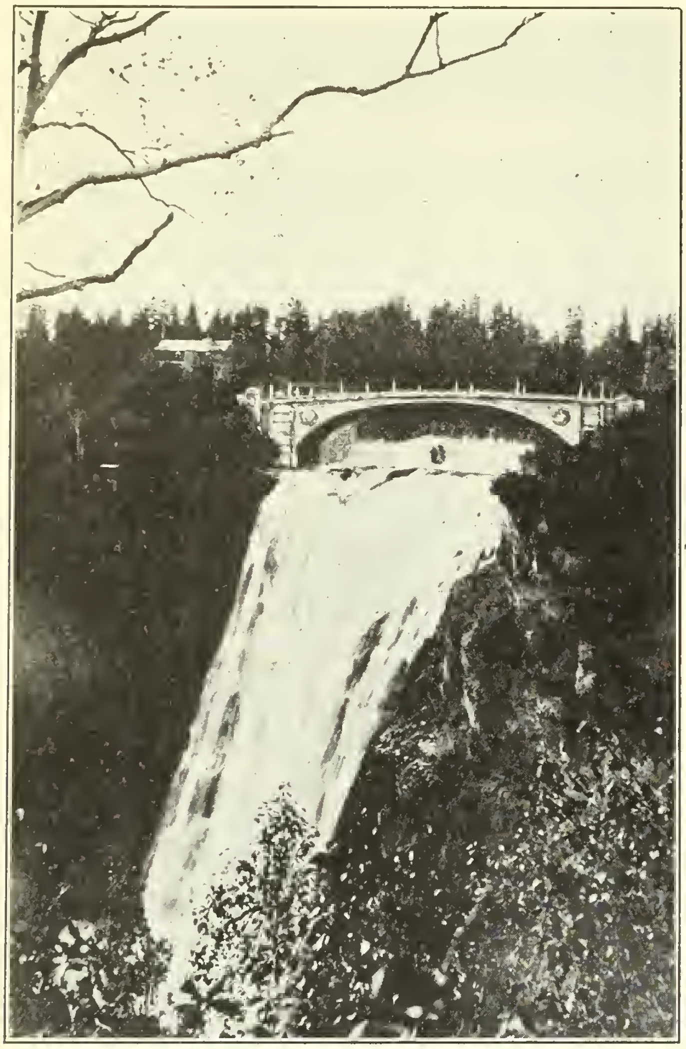
The project consists of a fixed arch, without hinges, of 225-foot span with 37½-foot rise. This height was adopted after numerous trials in order to get the most economical result considering the approaches, thickness of arch, size of abutments, and footings. The thickness of the arch varies from 3 feet 6 inches at the crown to 7 feet thick at the springing line.

The arch was designed after the method suggested, by N. M. Strassner, notes of which were recently published in the proceedings of the American Society of Civil Engineers.

The final design was calculated according to the method of Professor Mersch published in the Schweizerische Bauzeitung 1907. Maximum bending stress in concrete is 695 pounds per square inch and stress in steel 16,000 pounds per inch. Percentage of reinforcing steel in arches is about 0.8. In order to keep the superstructure as light as possible open spandrels with columns and beams carried on the arch were adopted. The construction of the roadway is somewhat unusual. A lower slab about 10 inches thick is sloped to a seepage drain in the centre discharging to either end. Over this is placed cinder concrete and on this the final slab to take the finished surface. This ensures particularly good drainage and protects the reinforced concrete slab from the direct



Design of Montmorency Falls Bridge, by Dr. Arthur Surveyer, M.E.I.C., which won first prize.



Artists sketch of Montmorency Falls Bridge designed by Messrs. Monsarrat and Pratley.

sun and exposure to wear. The main drain and pipes at the sides are insulated in sand in order to protect them from frost. Moveable portions in the sidewalk give access to them from various points.

As the view from the bridge is of very considerable interest observation balconies have been formed in the centre on either side. Another reason for using a bridge of this type was to mask a somewhat unsightly "Gate-house" immediately above the site. A flume runs at the side of the west abutment and this is not interfered with in any way.

Award of Second Prize

The second prize in the competition was awarded for the design submitted by Messrs. Monsarrat and Pratley, consulting engineers, Montreal, Quebec.

This design is for a hingeless spandrel-walled, gravel-filled arch bridge, with a span of 220 feet between springings, and a rise of 30 feet from springing to crown. The springing line is at El. 101.5, the crown at El.131.5 and the roadway surface over the crown at El. 136.0.

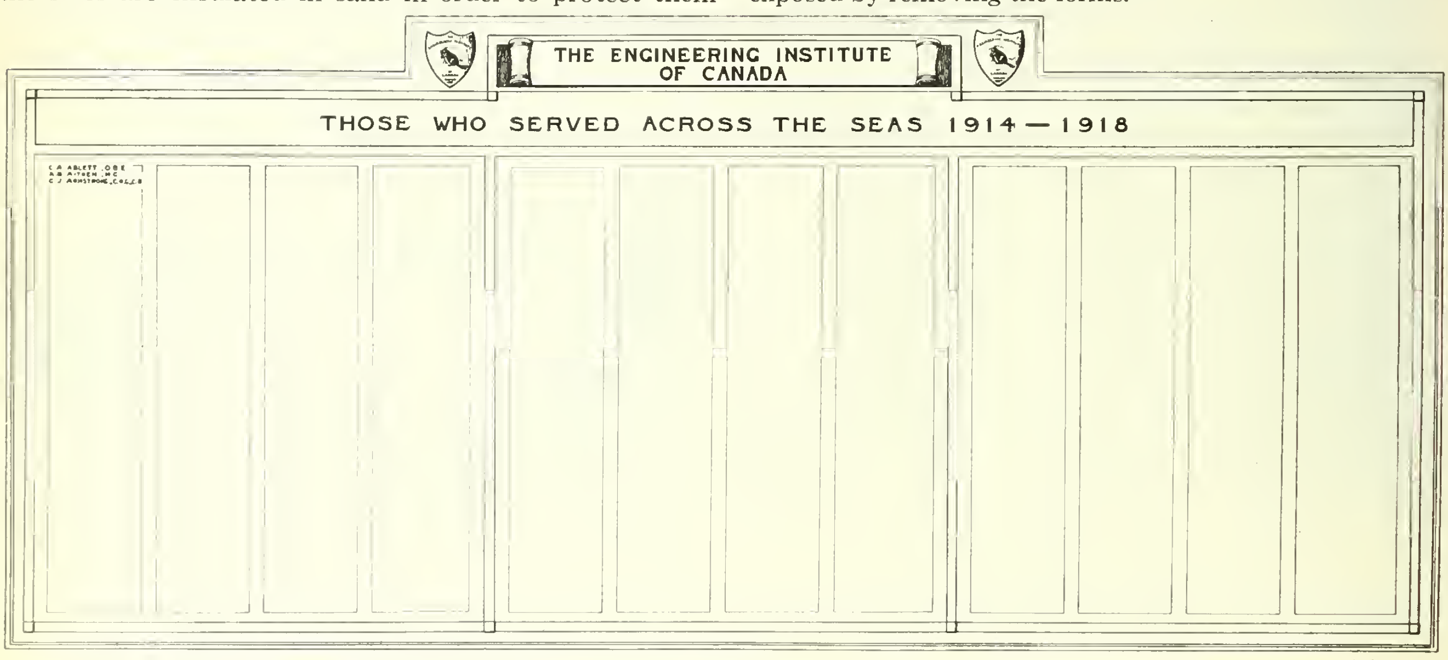
The thrusts from the arch-rib are carried through solid piers to the natural rock which needs but little surfacing to form very satisfactory foundations.

The rib is in one solid unit 19 feet wide, and carries the fill and the enclosing walls in addition to the live loading. Beyond the springing points the fill is enclosed by retaining walls supported on a solid bed of concrete except where the flume necessitates a subsidiary slab-span from this bed to the rock-wall.

The enclosing and retaining walls are extended upward and horizontally to form the continuous cantilevered sidewalk brackets.

Being continuous and hingeless the arch is statically indeterminate, and its treatment involves consideration of its elastic properties. The arch axis is laid out to the curve of the "transformed catenary" in order that the rib shall experience no bending stresses from its dead load.

The architectural treatment is adequately suggested in the accompanying sketch. The general idea is to preserve the simple mass effect consonant with both purpose and surroundings. The natural rocky features of the site and the inevitably massive rib required in so long a span would seem to preclude any attempt to secure the light airy lines susceptible to richer decoration, such as would be proper in a city boulevard. The finish is simply a neat cement surface, secured by flushing up the faces exposed by removing the forms.



Major Cross' design for War Record.

Institute's War Memorial and Record

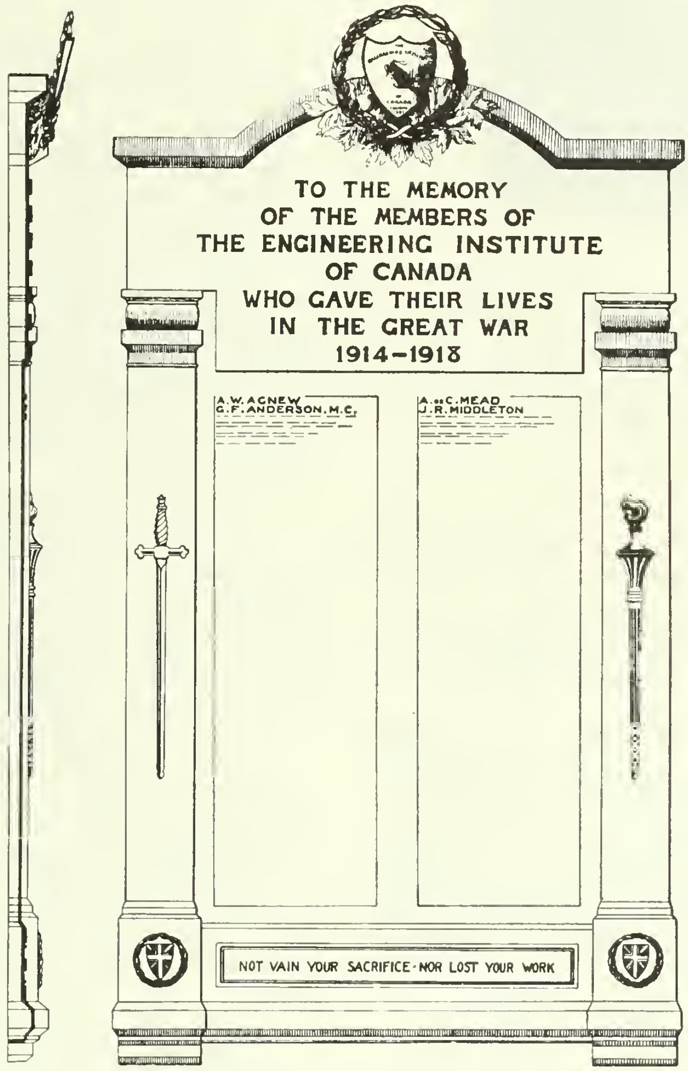
Major Fred. G. Cross, A.M.E.I.C., awarded prizes for both designs

THE report of the Honour Roll and War Trophies Committee of *The Institute* as presented at the annual general meeting and published on page 51 of the February 1925 *Journal*, contains the announcement of the award of the prizes in the war memorial and record competition to Major Fred. G. Cross, A.M.E.I.C., of Brooks, Alberta.

Major Cross is canal superintendent with the operation and maintenance department of the Canadian Pacific Railway Company, Eastern Section Irrigation Project. He is a native of the Old Country, born at Exeter, Devonshire, England, on September 2nd, 1881, and educated at St. Johns, Exeter, and under private tuition in engineering. From 1901 to 1905 he was with Messrs. Gonzalez-Byass and Company, London, being promoted to chief of staff in 1902, and, after passing the first chartered accountants' examination, assumed the dual position of secretary and chief of staff in September of the same year. In 1905 he resigned to take an educational trip on the continent.

Coming to Canada in 1906 Major Cross became connected with a survey party of the Canadian Pacific Railway in the capacity of chainman and rodman, and during the following two years was engaged in transit and level work on location and construction of canals and laterals for the Western Section Irrigation Project of the company. In the spring of 1909 he was inspector of construction and later when the construction programme was increased, he was appointed general inspector in charge of structure construction, during which time he assisted Major H. B. Muckleston, M.E.I.C., chief divisional engineer, in the design and construction of the first reinforced concrete structures built for the company's irrigation project. In 1911 he was appointed assistant engineer in charge of earthwork on the Eastern Section Project in connection with the main canal, the earth embankment of the Bassano dam and the East Branch dam. In the spring of 1912 at the commencement of the construction programme of the Eastern Section, he was placed in charge of all general structure construction, with the exception of three special structures, the Ambursen dam at Bassano, the Brooks aqueduct and the Antelope Creek siphon.

In January 1915, Major Cross left Calgary to join the Canadian Overseas Railway Company, then being mobilized in Montreal, but as they were up to strength, it was not until some months later that he went overseas. In the meantime he was works superintendent of the Canadian Refining and Smelting Company. Major Cross' distinguished service overseas covers a period from 1916 until demobilization in 1919. He went over with No. 1 Canadian Construction Battalion, which later became the First Battalion — Canadian Railway Corps. He was commissioned as lieutenant with the Canadian Engineers, gained his captaincy and was a company commander with this rank until January 1917, when he was promoted in the field to the rank of major. In December 1917 he was evacuated from France to England and upon leaving hospital received three months' home service and became second in command and then general officer commanding the Purfleet Military Depot. At the end of three months he was passed as fit for active service again and returned to his unit in France.



War Memorial designed by Major Fred. G. Cross, A.M.E.I.C.

Since demobilization he has been canal superintendent with the operation and maintenance department of the Canadian Pacific Railway Company, Eastern Section Irrigation Project and has had charge of the Bantry Division, including the districts of Sutherland, Millicent, Patricia and Princess.

Major Cross was married on April 16th, 1914, to Margery Hamar Greenwood, daughter of the late John Hamar Greenwood, barrister of Toronto and Whitby, Ontario, and sister of Sir Hamar Greenwood, Bart., the last chief secretary for Ireland.

Major Cross is president of the Brooks Agricultural Society; president of the Brooks Great War Veteran Association, and on the executive of many other organizations.

The art work on the designs submitted by Major Cross is his own production. He has always been interested in art as applied to painting and designing and his success along these lines is the result of self-tuition, as he has never attended an art school or taken lessons from a master. In 1901 he had three paintings accepted for exhibition in England; a number of his designs for advertising purposes have been published; and three paintings were loaned by him to the Canadian Pacific Railway Company for their exhibit at the British Empire Exposition. One of his large posters, representing "Canada", has been exhibited at the Royal Academy, Montreal.

Major FRED. G. CROSS, A.M.E.I.C.

ELECTIONS AND TRANSFERS

At the meeting of Council held on March 24th, 1925, the following elections and transfers were effected:

Members

DAVIES, Percy Trevor, Commercial manager, Southern Canada Power Company, Montreal, Que.

DAVIS, George H., asst. dist. engr., Ontario district, C.P.R., Toronto, Ont.

JAMIESON, William, (Engrg. Diploma, Liverpool Univ.), in charge of inspection work on Powell River Dam, for Powell River Pulp & Paper Co., Powell River, B.C.

LOCKE, Thomas Johnson, B.A. (Acadia Univ.), dist. engr. for Nova Scotia, Dept. Public Works of Canada, Halifax, N.S.

THOMSON, Oscar Roland, B.A.Sc. (Univ. of Toronto), in charge of operation and mtce., Central Ontario Region, H.E.P.C. of Ontario Belleville, Ont.

Associate Members

ALLISON, Laurie MacCallum, junior engr., Dept. Public Works, Halifax, N.S.

BAKER, Reginald Stennett, asst. mill engr. and research engr., Riordon Pulp Corpn., Temiskaming, Que.

BRANCH, Alec John, watermaster, Monarch unit, Lethbridge Northern Irrigation District, Monarch, Alta.

BRISTOL, Wesley Malcolm, (Grad. S.P.S., Tor.), dist. sales mgr., Maritime Provinces, Canadian Westinghouse Company, Halifax, N.S.

COTTER, James Peter, manager, Sydney branch, Canadian Ingersoll-Rand Co., Sydney, N.S.

DORAN, Henry T., sales engr., Dominion Flow Meter Co. Ltd., Montreal, Que.

DWYER, Michael, president and gen. mgr. in direct charge of operations, Indian Cove Coal Co. Ltd., Sydney Mines, N.S.

GILBERT, Frederick Arthur, chief surveyor for Frank Barber & Associates, Ltd., Toronto, Ont.

GODFREY, Albert Earl, Squadron Leader, commanding R.C.A.F. Station, Vancouver, B.C.

GRAHAME, Dallas Forrest, B.Sc. (McGill Univ.), supervisor of bldgs., Bell Telephone Company of Canada, Montreal, Que.

GRANT, Elmer Gordon, apparatus salesman, St. John office, Canadian General Electric Company, St. John, N.B.

KEANE, Jeffery Francis, dist. mgr., R. W. Hunt & Co., Toronto, Ont.

MACKINNON, John George, (Grad. S.P.S. ,Tor.), engr. and asst. to bldg. supt., T. Eaton Co., Moncton, N.B.

McLELLAN, Harold Elmer, B.Sc. (McGill Univ.), engr. in charge of lab. conducted by the Committee on the Combustibility of Roofing Materials, Dominion Fire Prevention Assn., Montreal, Que.

McHUGH, Frederick Joseph, asst. chief dftsman., Dominion Bridge Company, Lachine, Que.

SALTMAN, Fred Everett, B.Sc. (Dalhousie Univ.), B.Sc. (E.E.), (N.S. Tech. Coll.), Canadian General Electric Company, Peterborough, Ont.

SCOTT, James Stanley, Group Captain, R.C.A.F., acting director, R.C.A.F., Ottawa, Ont.

STOKES, Percy Frank, asst. in charge of industrial drawing office, Canadian Vickers, Limited, Montreal, Que.

WYMAN, Hugh Kennedy, B.A.Sc. (Univ. of Tor.), master mechanic in charge of elect'l. and mech. work with Shawinigan Engineering Company, for Shawinigan Water & Power Company, at Shawinigan Falls and La Gabelle, Que.

Juniors

BROWN, Thomas Alan, Jr., B.Sc. (Queen's Univ.), asst. engr., Hull Electric Co., Hull, Que.

CRATCHLEY, Reginald Henry, dftsman., C. D. Howe & Co., Port Arthur, Ont.

JOHNSTONE, Ralph George, B.Sc. (N.S. Tech. Coll.), in charge of elect'l. equipment for new plant now under constrn., Newfoundland Power & Paper Co., Cornerbrook, Nfld.

Affiliates

LAVOIE, Alphonse Joseph, president, Lavoie Automotive Devices Ltd., and Lavoie 4 Limited (Motor Cars), Montreal, Que.

SPENCER, Everett Benjamin, dept'l. chief clerk and asst. to mech. supt., Dominion Coal Company, Glace Bay, N.S.

Transferred from the class of Associate Member to that of Member

BUNNELL, Arthur Edward Kennedy, B.A.Sc. (Univ. of Tor.), member of firm, Wilson & Bunnell, transportation and town planning engineers, Toronto, Ont.

CHRISTIE, Clarence Victor, M.A. (Dalhousie Univ.), B.Sc. (McGill Univ.), associate professor, elect'l. engrg., McGill Univ., and consltg. engr., Shawinigan Water & Power Company, Montreal, Que.

FRITH, Hugh Walter, asst. chief engr., Vancouver Harbour Commissioners, Vancouver, B.C.

GREGORY, Philip Stancliffe, B.Sc. (McGill Univ.), asst. to vice president, Shawinigan Water & Power Company, Montreal, Que.

HUNT, William Henry, sectional engr., Takoradi Hbr., British West Africa, with Sir Robert McAlpine & Sons.

PARKER, Guy Cameron, B.A.Sc., M.A.Sc., C.E. (Univ. of Tor.), secretary, Ontario Dept. Public Highways, Toronto, Ont.

SMITHER, William James, B.A.Sc. (Univ. of Tor.), asst. professor, struct'l. engrg., University of Toronto, also private practice, consltg. engr., Toronto, Ont.

WILSON, Norman Douglas, B.A.Sc., C.E., (Univ. of Tor.), member of firm, Wilson & Bunnell, transportation and town planning engrs., Toronto, Ont.

Transferred from the class of Junior to that of Associate Member

FORD, Robert, B.Sc. (McGill Univ.), engr. in charge barking plant, wood room and log yard, Riordon Pulp Corpn. Ltd., Temiskaming, Que.

HARRISON, Ronald, B.A.Sc. (Univ. of Tor.), engr. and supt., Scarboro Township Waterworks System, Birch Cliff P.O., Ont.

Transferred from the class of Student to that of Associate Member

CUNNINGHAM, A. Irwin, B.Sc. (McGill Univ.), in charge of constrn., St. Maurice Lumber Co., paper mill, Three Rivers, Que.

Transferred from the class of Student to that of Junior

CULPEPER, Bernard Armel, B.Sc. (McGill Univ.), inspr. and asst. to engr. in charge of constrn. of grain elevator, C. D. Howe & Co., Port Arthur, Ont.

DUNCAN, James Edgar, B.Sc. (Univ. of Man.), development engr. on magnetic materials investigation, Western Electric Company, Hawthorne, Ill.

REID, Anthony Meredith, B.A.Sc. (Univ. of Tor.), on staff of outside plant engr., Bell Telephone Co. Ltd., Montreal, Que.

The following students were admitted:—

BELL, Douglas E., 4544 First Avenue West, Vancouver, B.C.

BICKFORD, Andrew Arthur, 686 Sherbrooke Street West, Montreal, Que.

DAGENAIS, Ennhen, B.A. (Laval Univ.), 546 Plessis Street Montreal, Que.

GRINDLEY, Frank Llewellyn, 10946–80th Avenue, Edmonton, Alta.

LUSBY, Gerald Winkworth, Nova Scotia Technical College, Halifax, N.S.

MacDONALD, Frank Sanborn, Nova Scotia Technical College, Halifax, N.S.

MacLACHLAN, Ian, 172 Barrie Street, Kingston, Ont.

MORRISON, George Hawley, Nova Scotia Technical College, Halifax, N.S.

NORRIS, Herbert Bethel, 116 Aberdeen Avenue, Montreal, Que.

PAUL, Bon Behari, Overseer, P.W.D., Thanatpin P.O., Pegu Dist., Burma.

RIGBY, Charles Arthur, 403 Burnell Street, Winnipeg, Man.

ROSS, Hugh Gordon, Strathcona Hall, Sherbrooke Street West, Montreal, Que.

PATERSON, A. Pierce, 127 Drummond Street, Montreal, Que.

WILSON, Valentine William Gibson, 756 University Street, Montreal, Que.

WISE, Alfred John, 6686 Third Avenue, Rosemount, Montreal, Que.

Employment for Recent Graduates

Student Members of The Institute, graduating this year, who desire to secure positions should keep in touch with headquarters of The Institute by placing on record their qualifications and other pertinent information and by communicating with headquarters at regular intervals.

It is equally important to advise headquarters when you have secured a position so that the employment records may be kept up to date.

Employers requiring the services of recent university graduates in engineering may secure full details of those available for positions by communicating with the headquarters of *The Engineering Institute of Canada,* 176 Mansfield Street, Montreal, Que.

Additions to the Library

Transactions, Proceedings, etc.

Presented by the Societies.
List of Members of the Northeast Coast Institution of Engineers and Shipbuilders.
Scientific Proceedings of the Royal Society of Dublin, vol. 18, nos 1-4, November 1924 and index to volume 17.
Bulletin of the Mysore Engineers Association, vol. 2, no. 2, April-June 1924.

Reports

Presented by the Ontario Department of Mines.
Bulletin 53, Mineral Production in Canada, 1924.
Annual Reports 1922 and 1924.

Presented by the Dominion Water Power and Reclamation Service, Department of the Interior, Canada.
Hydro-electric Progress in Canada during 1924.
Bulletin 854 Water Resources of Canada.

Presented by the Dominion Bureau of Statistics, Department of Trade and Commerce, Canada.
Annual Report of the Trade of Canada, 1924.
Central Electric Stations in Canada, 1924.
Sixth Census of Canada Bulletins 17, 18, 19.

Presented by the Department of Mines, Canada.
Investigations in ceramics and road materials, 1923.
Annual Report, 1924.
Memoirs 140, 141, and 142 of the Geological Survey.
Summary Report of the Geological Survey, 1923, Parts B, CI and CII.
The Smoky River Coal Field Examination and Comparison with the Kananaskis Area by James McEvoy.

Presented by the United States Department of Commerce, Bureau of Standards.
Circulars 194 to 198 inclusive.
Miscellaneous Publications 59 and 62.
Technologic Papers 266, 269, 270, 274.
Scientific Papers 495, 496 and 498.

Presented by the United States Senate Commission on Gold and Silver Enquiry.
Report on European Currency and Finance, February 13th, 1925.

Presented by the United States Department of the Interior.
Geological Survey:—Mineral Resources of the U.S. I-18, I-17, II-27.
Water Supply Papers 513, 519, 520E, 532, 538, 560A.
Bulletins 750G and 761.
Bureau of Mines: — Technical Papers 352, 359.

Presented by the Board of Trustees of the Sanitary District of Chicago.
Recommendations of the Engineering Board of Review of the Sanitary District of Chicago on the Lake Lowering Controversy and Program of Remedial Measures.

Presented by the Public Works Department of the City of Boston.
Annual Report for 1923.

Technical Books

Presented by John Wiley & Sons, Incorporated.
Engineering Geology by H. Ries and T. L. Watson.

Presented by Chapman and Hall.
The Chemical Coloring of Metals by S. Field and S. R. Bonney.
Tables for Reinforced Concrete Floors and Roofs by R. Travers Morgan.
Theory and Design of Structures by E. S. Andrews.

Discussion on Export of Power

Discussions Presented at a Meeting of the Montreal Branch, The Engineering Institute of Canada, held on February 26th, 1925.

Frederick W. Cowie, M.E.I.C.

Consulting Engineer, Harbour Commissioners of Montreal.

You, Mr. Chairman have ruled against politics and propaganda. If, therefore, we may not enter into the fields of political economy or unfold the tenets of class interests, and confine ourselves to facts and figures, we may, the more reasonably, recognize different points of view and satisfy our anxious minds as to some phases of this important problem.

The question of the export of power may be considered from the point of view of economics, to better advantage, among engineers than elsewhere, and we may as well be frank by acknowledging that we are interested, and yet we hold no love of the good of Canada, higher than our own. Moreover, as may be illustrated by a quotation, "There is hope in most any situation, if you look for it. Our immediate duty is to be hopeful".

The speaker has no intention to cover the whole ground, he will limit his argument to two distinct phases, and the conclusions that may be drawn therefrom:—

1. Canadian water power resources and their development, present and future.

2. A theoretical, typical unit of development, quite sound and possible of achievement, with conditions relating to its actual accomplishment, and the values to Canadian citizens, which would result, if realized.

Canadian Power Resources

The most admirable paper presented at the World Power Conference, London, England, in 1924, by J. B. Challies, M.E.I.C., who is acknowledged to be an earnest, creative engineer, and for many years a distinguished public servant, contains much information which should be carefully read by every student of Canadian economics.

In the synopsis, one may read:

"Canada is indeed fortunate in the nature, extent and location of her power producing resources. These resources of power assure beyond peradventure a continuous and progressive industrial development".

"During the last ten years, while the population increased twenty-two per cent," which the speaker will not more than question, "the developed water power increased one hundred per cent".

"The most recent investigations estimate the total water power throughout the Dominion at over 40,000,000 commercial horse power at ordinary minimum flow, of which about 3,000,000 horse power has been developed."

"The capital invested in water power development, transmission and distribution, has grown from $121,000,000 in 1910 to $688,000,000 in 1923."

"Eight per cent of the available water power is already developed."

These figures are striking, easily visualized and on analysis, yield ample factors for those who would attempt to solve the problem set to this gathering, this evening.

The cost of the 8 per cent already developed is given as $688,000,000, including transmission and distribution.

If all Canadian power resources were developed at the same rate of cost, the total cost would amount to the comfortable figure of $8,656,000,000.

At the same rate of development, that is, doubling every 10 years, the figures would be as follows:—

Date	H.P. developed	Cost
1923	3,000,000	$ 688,000,000
1933	6,000,000	1,400,000,000
1943	12,000,000	2,800,000,000
1953	24,000,000	5,600,000,000
1960	40,000,000	8,600,000,000

In plate No. A-2 in Mr. Challies' paper, as published by this *Institute*, the figure of utilization of water power resources in Canada, it may be noted that 23 per cent of the total, or 726,000 h.p., is absorbed by the pulp and paper industries, and 318,000 h.p., or 9.9 per cent, absorbed by other industries. From other sources, we learn that 16.6 per cent of the total Canadian water power output is now exported to the United States.

If 726,000 h.p., is now absorbed in manufacturing 85 per cent of Canadian pulp wood into mechanical pulp and 60 per cent of it into paper, the limit of water power to be absorbed to the complete exploitation of that industry in the future may be assumed at 1,000,000 h.p. Moreover, the immediate power requirements of many Canadian centres, which commenced within the last few years, will not expand at the same rate.

It is not necessary to be a special pleading advocate, but only one of open-minded painstaking spirit, to force one to declare that Canadian water power resources are ample, not only for all possible requirements, but for the sale and export of an equal amount, and 'get some foreign money into our camp".

We may go further into facts and figures: — (Reading further from Mr. Challies' paper):—

"The varied resources of raw material are exceptionally abundant" in Canada.

Now what are they, what abundant raw materials have we for manufacture, having special reference to Ontario and Quebec, and what power may be the outside limit of absorption?

Pulp and paper (admit)	1,000,000 h.p.
Mining	1,000,000 h.p.
Other industries	3,000,000 h.p.
Municipal	20,000,000 h.p.
Electrification of railroads	2,000,000 h.p.
Heating and domestic	2,000,000 h.p.
Fertilizer plants and contingencies	1,000,000 h.p.
Present	3,000,000 h.p.
	33,000,000 h.p.

The above estimate of absorption of Canadian water power resources, estimated by Mr. Challies at 40,000,000 commercial horse power, would fully serve a population of ten times the present population, added to the present 9,000,000 or 99,000,000.

In Canada, we may affirm that the assets left to us by our fathers have been, on the whole, improved. We would leave them to our children unimpaired. Would this not be assured even if we exported ome of this power so as to take care of our present urgent needs?

Put the argument in another form. The total development for all Canada, according to Mr. Challies, averages 353 h.p. per thousand of population, *an outstanding figure.*

That is 3,000,000 h.p., for 9,000,000 population, or for 40,000,000 h.p., for 112,000,000 population. Would it be sound economics, for Canada, to refuse to sell for export when there is such abundance?

Mr. H. M. Marler, M.P., made a very wise statement a day or two ago, which I would ask permission to quote: "The picture is not all black. Have we not great resources to develop? Our whole difficulty is to bridge over a period of difficulty".

The argument of the engineer may be different from that of the ordinary citizen. It may be more or less personal. Possibly it may be to some extent selfish.

Where does *engineering* stand to-day in Canada, comparatively? Ten years ago the outlook was brighter than in any other part of the world. Is it so to-day, even comparatively? Must our young engineers go to another country to get a job? The engineers, of to-day, can accept and take for their own urgent need, some of the resources of Canada, develop them, and yet leave them unimpaired, and look to the next generation with calm confidence that they will not do better.

Canadian Resources

Of the most important Canadian resources, we may analyze present economic profits with future unimpaired values.

Agriculture

Unquestionably the life blood of Canada is agriculture. It is now, and must continue to be. It should be encouraged. It should be made attractive. It should be made to pay, better than it does. We cannot reduce distance to markets. It is not in our power to open the barriers into the nearest markets, but agriculture must be made enduring.

We do not all need to go west. Quebec and Ontario have many advantages. The essentials are closely related to water power and hydro-electric development, and cheap and widely distributed domestic power, and abundant and cheap fertilizers.

As regards export, only 20 per cent of Canadian wheat is manufactured before export. Only 10 per cent of other grains. Every crop takes value from the soil. But Canada would fare badly but for agricultural exports.

Forest Products

This is a subject in itself. It has been estimated, however, that Canadian assets are impaired by fully 80 per cent of every dollar's worth exported.

Mines

Of every dollar's worth exported, Canadian assets are impaired to the extent of 100 cents, and less than 20 per cent is manufactured for profit in Canada.

Water Power Resources

The speaker has in his possession a map of Canada of the period of the great tide of emigration to Upper Canada, (about 1820). Almost on the site of his birth place, near Niagara, is indicated "City of the Falls". This *city* was quite imaginary, but it was the text of some interesting sketches by an English traveller, published in 1838.

"Were a city to rise here, it would necessarily become a manufacturing place, because of the water powers, which would then be turned to account. Fancy if you can a range of factories where now the waters rush along in glee and liberty."

"Sacrificed for the promotion of selfish interests, horrid sign of sordid industry."

"Hamilton is one of the most flourishing places in Upper Canada. Seventeen thousand bushels of wheat were shipped from here in one month."

Such sentiment as waters rushing along in glee and liberty, the horrid signs of sordid industry, and the seventeen thousand bushels of export in one month, may not appeal to citizens of Montreal, who take pride in the great power developments, the growing industrial expansion and their harbour, with its record of shipping nearly 2,000,000 bushels in one day.

A Theoretical Typical Unit

The study regarding the advisability or otherwise, of the export of power, would be incomplete without an example.

Let us assume a water power development in the vicinity of Montreal: Medium head; balanced storage; natural discharge 2½ to 1; excellent construction conditions; excellent navigation combination for a development of 1,000,000 h.p.; with regulation and balanced storage to meet the typical load, the commercial output would be 1,500,000 h.p.; domestic market, Montreal district; New England market, distant 300 miles; estimated cost $150,000,000, including interest during construction.

The speaker does not pose as a water power expert, but he will accept any challenge as to knowledge of physical conditions, in Canada, in their relation to "improving the great sources of power in nature for the use and convenience of man".

This assumed development, commenced in 1928, is completed, and the date is 1935. The actual cost of construction, $125,000,000, is in the hands of Canadians and has an annual value of, say $7,000,000, if properly invested, *for ever*. Canadian engineers, Canadian contractors, Canadian manufacturers, Canadian labour and almost every citizen in this district would share.

In the meantime, the eight difficult years would have been bridged, and the next generation would be left an asset, fully to their advantage, and unimpaired from year to year.

The fixed charges, in 1935, would be:—

Interest on $150,000,000 at 5 per cent........	$ 7,500,000.
Maintenance and operation, 2 per cent on $125,000,000..........................	2,500,000.
Sinking fund, 2 per cent....................	3,000,000.
	$13,000,000 per annum.

A market for 1,000,000 h.p., at $13.00 would make shareholders look up. There would be 500,000 h.p. to exploit. There might be navigation contributions. There possibly would be industrial sites to dispose of. But with competing developments, with pulp and paper absorption served with municipal requirements fully met, what would be the available market, in Canada? railway electrification; fertilizer plants; domestic services; other industries.

According to favourable estimates, the probable market in 1935 would absorb say 200,000 h.p., by 1945, 400,000, and by ——, but why dream? The financial backers would be all ruined by this time.

For a *Canadian market alone*, the assumed unit of development would be *absolutely unsound*. But reverse the picture and pre-suppose an export of one-half the power to New England. What advantages and disadvantages to Canada?

Now it had been the privilege of the writer to make surveys both in New England and in the south eastern states, with regard to present and future transportation conditions, which bear such a close relation to enduring development and future expansion.

The south, with coal at her doors, with cheap labour, cheap oil fuel, and abundant raw products, openly hopes to be the "New England" of the future. New England realizes the danger. Coal is dear, transportation is unsatisfactory, but they are not discouraged. The brains of a nation is solving day after day better and cheaper methods. Finished goods trade is stable.

For first stage processes, they may not compete with the south, but with abundant and cheap power, they can. And yet, per capita, New England does not export as much as does the province of Quebec. Their market is the United States. They could not establish in Canada if they would.

Is not a prosperous New England of greater attraction to Canada than its exodus to Georgia and Tennessee? In 1935, New England would readily buy at the buss bar of this theoretical development 750,000 h.p. at $14.00, allowing fifty cents each to the province and the Dominion, to equal the Canadian price of $13.00. Transmission and distribution would bring the New England cost to $20.00 as against the Canadian price of say $14.00. There would still be an ample margin of cheaper power, in favour of new industrial development in Canada, for overseas markets.

It follows, therefore, that vitally valuable to Canada, as such a development would be, without export of power, thirty, forty or fifty years must elapse before it may be undertaken. With export, it would be an attractive, immediate, sound and economical proposition, and within our grasp.

The district of Montreal has many potentialities. There are 15,000 farms which, with domestic power and fertilizer, would make for agricultural and garden production, limitless of value. Must we, of this generation, after a war sacrifice for future peace, tighten our belts and refuse what is our present due, so that future generations may live in luxury and prosperity? The next twenty-five years will be critical, for present engineers and those now in the making. It is quite within our power to help bridge this period to our own advantage, and yet leave to future generations a more valuable heritage, than was our inheritance.

Frederick B. Brown, M.E.I.C.

Consulting Engineer, Walter J. Francis and Company.

Before opening his remarks, Mr. Brown stated that he wished to go on record as having an open mind on the question, that there was much to be said on both sides, and that any arguments he might put forward regarding the export of power were not to be considered as his own final opinions, but were presented in order that the facts might come before the meeting, and that both sides of the picture might be studied.

Mr. Brown went on to say:—

It has been said that power is the life blood of industry, and in making this statement many people have developed the idea that power is the principal factor in determining the location of an industry. The opponents of the export of power take the view that manufacturers in the United States would locate in Canada in large numbers if an embargo be placed on the export of power. They believe, no doubt, that the element of power must enter very seriously into the consideration for a location of a factory. This is not the case in most industries, and except for a few things, like the pulp and paper industry, cement, and iron and steel, where the power element is comparatively large, there are other factors of far greater importance than that of power. The elements determining the locat n of a factory are at least five in number, — (a) suitable and adequate supplies of raw materials, (b) efficient and cheap labour, (c) good transportation facilities, (d) cheap and reliable power, and (e) the market.

There are two considerations in connection with the export of power, one being sentimental and the other practical. The sentimentalist says, "Let us keep our powers for use in Canada, — they are our heritage, — we must never give them up. It is better to let them lie idle for fifty or a hundred years until we need them, rather than let anyone else use them in the meantime whether we can get them back or not. We are building up our neighbour's communities at the expense of our own. The industries must come here and use our powers if they are to use them at all". The other man says, "By all means bring the industries here if possible and let us keep our powers for ourselves if they can be used, but let us also consider the present generation as well as posterity. While it is true that one or two industries essential for the United States have located in Canada, and as a consequence the tariff bars have been let down to permit that particular product to enter the United States, it was not the power which brought them here primarily, but the other factors connected with the location of the factory. We are a small country and it will take a long time for us to build up a large industrial population. In the meantime, why not develop our powers and use them and obtain the benefit even if we have to export some of our power for a number of years until we require it for our own use".

Some of these arguments will be referred to again later. According to the census of the United States for 1919, the amount of power required for each $1,000.00 value of finished product for all industries in the United States was 0.47 horse power, or rather less than one-half of one horse power for each $1,000.00 value of manufactured product. There is published in the census, pages 484 and following, a full table of all industries in the United States in 1919, giving the capital invested, the cost of administration, raw material, fuel and power, and the value of the product. It is shown in the summary that for all industries the value of the product was $62,418,000,000, while the total amount of primary power was 29,504,792 horse power.

Some of the more interesting items given in the table are the following:—

	H.P. per $1,000. value of product	H.P. per person engaged in industry
Agricultural implements	0.42	1.92
Automobile factories	0.17	1.38
Cars and steam railroad shops	0.47	1.15
Cement	2.78	16.10
Cotton goods	0.87	4.14
Electric machinery	0.44	1.62
Foundry and machine shops	0.46	1.86
Iron and steel:		
Blast furnaces	2.00	33.70
Rolling mills	1.35	9.05
Lumber and timber	1.70	4.65
Paper and wood pulp	2.35	14.85
Printing and publishing	0.21	0.88
Flour mills and grist mills product	0.43	

NOTE: — Such a small percentage of power is not sufficient to offset advantages given by market, raw material, labour, etc.

Asbestos: — This product is produced entirely in the province of Quebec. In 1923 there were 233,000 tons extracted, — the value of which was $7,500,000. The power used was 15,000 h.p., or exactly 2 h.p. per $1,000 of manufactured product. (*Engineering Journal*, July 1924, page 479.)

A paper manufacturing company, operating a pulp mill in this province has stated that the power figured for 17 per cent of the cost of its product, but this includes the cost of steam generated for heating.

From the above figures it may be deduced that even a doubling of the cost of power in most industries would make very little practical difference in the sale value of the product. Another fact which is often lost sight of in talking of the export of power is that power is considered as hydro-electric power only. It must be remembered that power can be produced by other agencies than water power, and an industry is not compelled to use hydro-electric power in order to make a success of its business. Only a very small percentage of the thirty million primary horse power used in the United States is produced by water falls. There is a certain load factor where the cost of power produced from steam is equal to that supplied from a hydro-electric development transmitted to the point of use, and within a range of this equalizing point the cost of the power will not vary sufficiently to make any practical difference in the final cost of the product. Under ordinary conditions the annual load factor in many industries runs from 25 per cent to 40 per cent. With power supplied from a central station, generated by steam, and with a general load factor of about 40 per cent, it has been estimated that the total cost of energy at the bus bars of the plant is in the neighbourhood of one cent per kilowatt hour. There are many cases where the cost of hydro-electric energy transmitted to distant markets in large blocks, is from one-half cent to one cent per kilowatt hour, depending on distance of transmission, cost of development and numerous other factors. This sometimes makes it difficult for hydro-electric power to compete with steam powers, especially if the water-produced energy has to be transmitted long distances, and if the steam plants are located so that they can take advantage of cheap coal and low operating costs. This point is brought out for discussion to show that we must not forget that power can be and is being produced from steam plants and sold at attractive rates, and that very successful industries are being built up under those conditions, and that our friends in the United States do not actually require our water powers to continue in their successful career, nor do they have to move their plants to Canada in order to take advantage of cheaper power unless the other factors are so attractive that they can save money all round by moving the plant to this country.

There is a high tariff wall against the importation of goods into the United States. Imagine one manufacturer leaving the United States to manufacture in Canada because he could get cheaper power here, and then endeavouring to sell his goods in the United States in competition with his late fellow manufacturers. Do you imagine that they would permit the lowering of the tariff wall to suit the man who had left his country to manufacture at a very small fraction less cost?

There is another factor which should not be forgotten, and that is that we Canadians are importing the equivalent of millions of horse power annually in the form of coal. Whether we like it or not we need coal. In Quebec, as well as in Ontario, we must keep our homes warm in winter, and there cannot be any practical question of heating the homes with electricity. This has been proved without any doubt to be impracticable, both financially and physically, for general use. It would probably require over two million kilowatts to keep the homes of the city of Montreal warm, and there would be six months in the year where other uses would have to be found for the power. When the city is twice as large the necessary power would go up almost proportionately with the population, and the time would soon come when all the power in the province would not be sufficient to heat the homes of the province. This is easily understood when we remember that one horse-power-year of electricity used for heating is equivalent to about one ton of coal, whereas when used for power it represents eight to ten tons of coal.

If power be exported under certain conditions we would make it possible for our neighbours in the United States to save from eight to ten tons of coal for each horse-power-year that would be exported. If we export say one million horse power out of the ten million or twelve million horse power which it is believed may be developed in the province, we would be allowing our American friends to save from eight to ten million tons of coal per annum, which might be a very strong argument against a possible embargo on United States coal being shipped to this country. It should not be forgotten, however, that the United States is not our only source of coal supply and that British coal is available to take the place of American anthracite, and that our own Nova Scotia and Alberta coal mines can be developed and used to a far greater extent than they now are, and also coke.

Water powers are natural resources in a class by themselves. When not used the power is wasted and is continually lost without benefit to anyone. A timber limit or a mine, if not used for many years, might mean no decrease in value or might even represent a largely increased value, and leaving idle the timber limit or mine might under some circumstances be true conservation. In the case of a water power only its use gives it commercial value, and being constantly renewed and inexhaustible it is pure waste not to use the power, and very bad economics to let opportunity go by for its development and use.

One of the strongest arguments, and in fact the strongest argument put forward by the opponents of the export of power, is that once it is permitted to be exported it would not be possible to get the power back when needed in this country. If it be granted that electricity produced from water power when once exported can never under any circumstances be recalled or obtained for our own use when needed, then there is not much to be said in favour of the export of power except that we would obtain permanently a fair power revenue and employ a few people in making electricity from water power and selling it as a finished product. Some people consider that hydro-electric energy is a finished product and some would say it is one of the raw materials of industry. Be that as it may, it requires to be manufactured before it can be sold or exported, and its manufacture gives employment to a great many persons during construction, and to a comparatively small number of persons after completion. When used in industry it does give employment to a much greater number, as may be seen from the table already quoted.

A striking analogy to the export of water power from Canada to the United States is the export of coal from Great Britain and from the United States. Coal is a natural resource which is mined and it is depleted the faster it is mined. It cannot be renewed. Yet, both Britain and the United States derive a very large revenue from the export of coal, and the coal business is one of the leading industries of both countries. Some of the coal is used at home and some is exported. Cannot the same argument be applied to the export of power during the years when we have a large surplus, more particularly if we can get it back when the time comes to use it in Canada.

Another phase of the export question is, however, to what extent will the export of power retard the development of our own country. This is a very large and serious question. If power were the principal factor in deciding the location of an industry, the opponents of power output would have a much stronger argument, but as pointed out herein it is in most industries a minor consideration. The development of Canadian industry depends on both the growth and character of our population. This is linked up with the immigration question, with the natural increase of the people, with the tariff and with transportation, raw materials and other factors. Undoubtedly those communities having an ample supply of cheap and reliable power are in a better position to grow than those which have not, but we must not lose sight of the fact that a large variation in the cost of power makes only a very small variation in the cost of living or the price of any finished product except in a very few commodities as already outlined.

It therefore can be argued that if a means can be devised for safeguarding the export of power either on a permanent or temporary basis, Canada might well export a portion of her surplus under proper restrictions. It might even be justifiable to make a permanent export of a comparatively small fraction of our power in return for concessions in the form of coal and other things which we require from the United States and cannot produce in Canada.

It seems then that much depends upon the terms arranged for the export of power. The system of yearly licenses such as those in force for cutting and exporting pulp wood would not seem to have much merit for several reasons. It is unlikely that a purchaser of power would be willing to risk a large amount of capital for transmission lines, receiving stations, and so on, on a yearly license unless he felt quite sure that the export would continue. If export were allowed under a yearly license it would be very difficult to recall the power after a few years, because the purchaser would have invested his large sums in transmission lines and plant and it would not be fair to him to do so. It is therefore likely that under a yearly license system the power could not be recalled as long as the holder of the license complied with the conditions of the license. It might be very different, however, if the license to export power were issued for a definite period of years, say twenty-five or thirty, with the condition that the license may be cancelled upon the giving of at least five years notice prior to the expiry of the license. The company or person exporting under such a license would naturally protect itself against any claim by embodying the same conditions as to cancellation into the contract with its customers. A long term contract would give the exporting company and the consumer on the other side of the international boundary time to amortize the costs of their transmission and receiving systems, and in the case of the purchaser in the United States would give him plenty of time to make arrangements to revert back to coal or find other sources of energy which he could undoubtedly do without hurting his manufacturing conditions very seriously. Under such a contract, properly safe-guarded and agreed to by all parties, and with or without the approval of the governments of both countries, the agreement would be or could be considered the same as any other private agreement, and at the end of the period of the license, the cancellation of the latter could not cause any complaint from the interested parties provided they all knew at the beginning exactly what the terms and conditions were. By careful drafting of the documents, it is difficult to understand how any international complications could result. In the meantime our water power would not be wasted and its value would be just as great after many years of use. The government could derive a certain revenue by charging an export duty of a few dollars per horse power.

A point which seems to be quite important, if power export is prohibited, is that large developments of power require a large capital outlay, and that the financing of these big projects would have to be done from either one of two sources, namely, by the government, meaning public ownership, or else by a power trust or monopoly. If power export be permitted and the financing for the project come from the United States, it is quite likely that the common stock ownership of the companies would finally rest in the hands of United States financiers, who would control contracts made by the power company and who would naturally be inclined to keep on exporting power for use in the United States. Under these circumstances it would be necessary to have some governmental supervision on export licenses in order to ensure that the power could be made available for use in Canada as and when required.

Summing up, it may be said:—

1. Canadian water powers are inexhaustible natural resources which are beneficial only when used, and wasted if not used.
2. We should take advantage of every possible means to provide employment and revenue for Canada during the years of her growth and development, at the same time safe-guarding the future.
3. If we can use all our available water powers here, by all means let us do so, but if not, let us provide revenue for the present generation by exporting a portion of our surplus power under proper safe-guards and restrictions.
4. The principal point in the export of power seems to be whether it can be recalled for use in Canada when it is required.

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The question of export of power from Canada into the United States has been strongly to the fore during the last few weeks. There is no denying the fact that the most characteristic fault of the Canadians, and probably their greatest defect is unreasoned optimism. One has only to review the history of the last quarter of a century to realize that most of our financial difficulties have been caused by our habit of always exaggerating the requirements of the future.

It was this unreasoned optimism which led us to cover the country with railroads which we did not require and it was this same over estimation of future needs which led a great number of our municipalities to provide for populations which did not come and which even the next generation may not see. The unreasoned optimism which had led the country to our present financial straits is still rampant. It seems evident now that this exaggeration of our possible future power requirements is going to lead us again into financial errors, as there is no difference between expending money needlessly and refusing to receive payment for lending a product which we cannot use, and which will not be destroyed by its being used temporarily by others.

Many of those who have taken part in the discussion against the export of power have attempted to generalize and to formulate regulations which would be applied indiscriminately to all cases. This, however, is not sound and each proposition to export power should be considered on its merits and preference should undoubtedly be given to the very large water power developments which it would be impossible to finance without the help of power contracts from the United States.

Reasoning along these lines, it seems that the Quebec government when it granted a 60-year lease to the Canada Paper Company, (April 30th, 1924), for a 5,000-h.p. development was not justified in writing into this contract a clause which practically authorized the company to export power upon the payment of an additional royalty of 50 cents per horse power a year. In the same way the federal regulations, under which nine Canadian power companies are at present authorized to export, under one-year licenses, about 1,400,000,000 k.w.hrs. of electricity per year to the United States, are not in the best interest of the country since they constitute in actual practice permanent licenses. Such yearly permits should undoubtedly be cancelled at an early date and replaced by licenses for a longer but definite and practical term. In the future, export licenses should be granted for a definite number of years, sufficient to give the company a chance to amortize its transmission line. The power thus exported should be sold not directly to private industries, but to distributing companies, and it should be understood that no power would be delivered except beyond a certain distance from the boundary.

Let us examine the case of the National Hydro-Electric Company, which proposes to develop 400,000 h.p., at the Carillon dam, on the Ottawa river, and has asked for a permit to export 300,000 h.p., reserving, under the control of the Railway Commission, 100,000 h.p., to supply the Canadian demand. As the company is asking for a twenty-five year license, it is understood, to export power, it is interesting to investigate what will be our power requirements in 1950 in order to ascertain if Canada could spare the power which the company proposes to export.

Canada's Power Requirements in 1950

At the World Power Conference, held in London in July 1924, J. B. Challies, M.E.I.C., now of the Shawinigan Water and Power Company, but then director of the Dominion Water Power Branch, presented a paper entitled "Water Powers of Canada" from which it is possible to derive a good deal of information concerning the future power requirements of Canada. The total amount of power developed in Canada is given as 3,227,414 h.p., and the total possible commercial installation as 42,000,000 h.p. The following table, which is based on data contained in Mr. Challies' paper gives a summary of the present installation for each province, the total possible installation and the percentage developed at the beginning of 1924.

Province	Possible installation in h.p.	Present installation in h.p.	Percentage developed
British Columbia	6,680,000	355,517	5.32
Alberta	1,490,000	33,067	2.22
Saskatchewan	1,425,000	....	....
Manitoba	7,560,000	162,025	21.45
Ontario	8,910,000	1,445,480	12.85
Quebec	15,240,000	1,116,398	7.33
New Brunswick	160,000	44,539	27.85
Nova Scotia	168,000	54,950	32.70
Prince Edward Island	7,000	2,239	32.00
Yukon and North West	360,000	13,199	3.67
Total for Canada	42,000,000	3,277,414	7.68

In this paper, which was reproduced in *The Engineering Journal*, for July 1924, Mr. Challies estimates that the total power developed at the beginning of 1926 will be about 4,000,000 h.p. The average growth from 1910 to 1925 is shown as having been at the rate of 202,000 h.p. per year and that from 1920 to 1925 at the rate of 303,000 h.p. per year. On the basis of these increases Mr. Challies estimates that by the end of 1940 our developments should be between 7,000,000 h.p. and 8,500,000 h.p. Applying the same rates of growth during the next ten years would give us about 11,000,000 h.p. in 1950 or about 26 per cent out of a possible total of about 42,000,000 h.p.

Our present rate of utilization is at the rate of 353 h.p. per 1,000 of population and Canada ranks third in the per capita utilization of water power among the countries of the world, Norway and Switzerland only having a higher per capita utilization. It is apparent, therefore, even if our rate of utilization was increased to 600 h.p. per 1,000 of population, that the power available in Canada would be sufficient for a population of 70,000,000; the power in Ontario for a population of 15,000,000, and that in Quebec for a population of 25,000,000 and that even in 1950 it would be necessary to have a population in Canada of about 18,000,000 inhabitants to utilize the 11,000,000 h.p., figured above and representing less than 25 per cent of the power available in the country.

The population of Canada has been growing very slowly since the war, and at the present time we are nearly standing still. It seems, in view of the heavy financial burden which the Canadian tax payer will have to carry, that it is not rational to hope for a very great increase in our population during the next twenty-five years. The increase in population during the decade 1911 to 1921 was approximately 1,600,000, so that if the same rate of growth were to obtain in 1950, a very optimistic assumption, our population would be 13,400,000 in 1950, requiring about 8,000,000 h.p., or less than 20 per cent of the power available.

Now what about the growth in the demand in Ontario and Quebec? This growth has been spasmodic, one large plant going into operation being sufficient to affect the apparent rate of growth. The charts given on Mr. Challies' paper indicate that from 1910 to 1923 the increase in the province of Ontario has been at the rate of 75,000 h.p., and in Quebec at the rate of about 60,000 h.p. This period includes the increased demand created by war requirements plus the period of expansion in the newsprint industry so that it is very doubtful whether or not a similar increase will ever be seen during the next quarter of a century.

Figuring along these lines the power requirements of Ontario should be about 3,500,000 h.p., in 1950, and those of Quebec probably somewhat under 3,000,000 h.p., with population of about 4,000,000 and 3,500,000 respectively representing a rate of utilization of 875 h.p., per 1,000 capita in Ontario and 857 h.p., per 1,000 capita in Quebec. As these developments would only represent about 40 per cent of Ontario's available power, and in Quebec less than 20 per cent of the total possible power, it would seem as if these two provinces could very well spare the 300,000 h.p., which the National Hydro-Electric Company desires to export.

A few estimates and quotations borrowed from Canadian and American authorities will show that the estimates given above are not pessimistic but constitute a rather optimistic view of our future possible progress.

R. M. Wilson, chief engineer, of the Montreal Light, Heat and Power Company, testified in October 1920, before the International Joint Commission, declaring that there was no market for the St. Lawrence power on the Canadian side, at any rate so far as the Montreal district was concerned. He estimated that the increasing demand for hydro-electric power in this district amounted to about 10,000 h.p., per year and that the existing agencies had already made provision to take care of this development for the next ten years. He anticipated that at the end of that period the total demand would be about 400,000 h.p., and that this would be sufficient to take care among other things, of the electrification of the railways in and around Montreal. He contended that all this power could be supplied from power sites that are already under development. Mr. Wilson also stated that there was enough undeveloped power on the St. Maurice river to supply the Montreal district for 30 or 40 years. (See St. Lawrence Waterways Report, 1922, page 142.)

At the same time the engineers of the Ontario Hydro-Electric Commission, who cannot certainly be accused of lacking in optimism, calculated in 1921, (see St. Lawrence Waterways report, 1922, pages 150 and 151), the future requirements of Ontario on the per capita consumption which was then at the rate of 900 k.w.hrs. They would soon reach 1,200 k.w.hrs. and by 1941 they would have increased to 1,500 k.w.hrs. Based on these figures and the corresponding increase in population the future demand of the Ontario Hydro-Electric Commission system was given as 932,000 h.p., in 1931 and 1,340,000 h.p., in 1941 exclusive of possible railway electrification or of specialized new industries. As the capacity of the Hydro system is about 56 per cent of the total capacity installed in Ontario this means that the probable total capacity in 1941 would be about 2,400,000 h.p.

Several independent investigations have been carried on in the United States to determine the possible future power requirements of some of the greatest industrial centres in that country. The reports of these various committees offer a splendid opportunity of checking up our estimates of future requirements for Canada.

A study undertaken by the Great Lakes Division of the National Electric Light Association, over an area around Chicago and covering the denser portion of the states of Wisconsin, Illinois, Ohio and Michigan, shows that the installed capacity of the central stations in the area in question was, in 1923, about 2,560,000 h.p., for a population of about 8,600,000 or corresponding very nearly to the population of Canada. The committee estimates that the population would reach 12,940,000 in 1950, an increase of 51 per cent and that by that time 90 per cent of all industrial power in this area and all of the power required by urban and interurban railways would be supplied from central station systems. Railroad electrification would probably have progressed to include all terminals in the Chicago district and perhaps the divisions terminating in Chicago. The report concludes that on this basis the power required in 1950 will be at the rate of 2,100 k.w. hrs., per capita per year and that the maximum demand would be 7,600,000 h.p., corresponding to about 580 h.p., per 1,000 of population, (see *Electrical World*, July 12, 1924).

In the premises, it is obvious that there will be no dearth of power for future Canadian industries, over a period of at least 75 years, even if power is exported from the Cedars and Carillon developments. Further, it is clear that, under a system of export licenses for a definite term of years, sufficient to give the importing consumer a chance to amortize his transmission line, the power will upon the expiry of the license be available for Canadian demand.

Conclusions

I — Mr. Challies' estimate is 42,000,000 h.p., for Canada and 15,000,000 h.p., for Quebec with an average growth in Canada per year of 200,000 to 300,000 h.p. He estimates 7,000,000 to 8,500,000 h.p. in 1940. On the same basis, the figures for 1950 would be for Canada 11,000,000 h.p. or about 26 per cent of 42,000,000 h.p.

II — The present rate of utilization is given as 353 h.p. per 1,000 capita in Canada. On the basis of 600 h.p. per 1,000 capita, the water power in Canada is sufficient,—

for a population of 70,000,000 Canada, and
for a population of 15,000,000 Ontario, and
for a population of 25,000,000 Quebec.

In 1950, on that basis, it would be necessary to have a population fo about 18,000,000 to utilize 11,000,000 h.p.

III — The increase in population from 1911 to 1921 was 1,600,000. At the same rate of growth, the population would be 13,400,000 in 1950, requiring 8,000,000 h.p., only instead of the 11,000,000 h.p. estimated by Mr. Challies.

IV — According to Mr. Challies' estimate, the growth of power development is about 75,000 h.p., per year in Ontario and 60,000 h.p., in Quebec. Figuring on that basis for 1950, Ontario and Quebec would compare as follows:—

Province	H.P. in 1950	Population	H.P. per 1,000 capita	Per cent utilization
Ontario......	3,500,000 h.p.	4,000,000	875 h.p.	40
Quebec.......	3,000,000 h.p.	3,500,000	857 h.p.	20

V — Mr. Wilson estimated that there was enough power available from the St. Maurice for 30 or 40 years for the Montreal district.

VI — The Ontario Hydro-Electric Power Commission's engineers estimate that in 1941 the load on the Hydro-Electric *system* would be about 1,340,000 h.p. At present the Hydro's load is 56 per cent of the total load in Ontario, so that on this basis the total load in Ontario, in 1950, should be 2,400,000 h.p.

VII — Estimate of Great Lakes Division, near Chicago: Present population 8,600,000; 2,560,000 h.p., in 1923. Estimated 1950 population 12,940,000; 7,600,000 h.p., in 1950, or about 580 h.p. per 1,000 capita.

C. J. Desbaillets, M.E.I.C.

Chief Engineer, Montreal Water Board.

I will ask you to see in the ideas that will follow the expression of patriotism of a Canadian citizen who loves *This Country* and who would like to preserve it with its maximum strength and wealth, so that his children and the children of others may, in future, live in it in peace, let in freedom their energies develop the untouched resources of this land and ripe fruits on the tree of prosperity, which tree, despite the storms that may break its branches, will grow and will live because we will have preserved the roots.

Pardon me, if these words sound somewhat like a Sunday morning sermon. I am not a clergyman, I am only an engineer, but when this national subject is raised all the accuracy of the engineering principles are vanishing and before the man that can develop our water power, stands the one who can make good use of it. The *engineer* gives place to the *patriot*.

I have developed enough water power to know what can be done with it, I have seen the anxious faces of hundreds of workmen asking when the power will be turned on, because it meant work for them, and work meant happiness at home. I visited many factory manager's office in which they stated that every interruption or shortage in the power meant a loss of so much to them.

I have seen delegations of industrial commissions asking for power for their new factories and I have noticed that only the cities with power available were progressing, and that the ones without this commodity were stagnant. I have noticed after having sold the power to manufactures what can be done and I have come to the conclusion that the selling of power alone cannot make a country rich, but *what can be made with power*, labour and raw material will bring prosperity to all branches of industry. We have power, we have raw material, what shall we do with these?

I visited once our beautiful asbestos mines in the Eastern Townships, which mines are supplying almost one-half of the world market with asbestos, and I have witnessed the extraction of this material. I know that a few men will extract one ton of it in one day, these few men are receiving approximately $4.00 per day. They live ten crowded in a small room and the Canadian farmer sells them a cabbage per head per day. But the ton of asbestos is exported, it crosses the line and brings to the American manufacturers of asbestos products work for fifteen men for one week. These articles are then brought back to us and we can have them after paying duty on them. Have we a fair return in this deal?

To develop efficiently our country we must induce the investors by offering them raw material and power. Canada is a country of nine million inhabitants, and we can accommodate easily one hundred and fifty million people.

Referring to the International statistics on water power the potential power of the world is as follows:—

North America	80,000,000 h.p.
South America	60,000,000 h.p.
Europe	45,000,000 h.p.
Asia	75,000,000 h.p.
Africa	185,000,000 h.p.
Oceania	20,000,000 h.p.

The developed power of the world up to 1921 was as follows:—

North America	12,000,000 h.p. or 14. 9%	of available potential power
South America	500,000 h.p. or 0.79%	of " " "
Europe	9,000,000 h.p. or 19. 7%	" " "
Asia	1,250,000 h.p. or 1.64%	" " "
Africa	200,000 h.p. or 0.006%	" " "
Oceania	300,000 h.p. or 0.87%	" " "

Now the 12 million horse power developed in the United States is divided as follows:—

Atlantic states	3,000,000 h.p. or 31.6%	of available potential power
New England	1,500,000 h.p. or 77.2%	" " "
Central states	2,750,000 h.p. or 36.7%	" " "
Western states	2,750,000 h.p. or 6.5%	" " "

The balance between this and the twelve millions horse power represents the power developed in Canada. We have subdivided this power as follows:—

The eastern provinces have developed 1,200,000 h.p. or 13.1%
The central provinces have developed 1,300,000 h.p. or 10.3%
The western provinces have developed 500,000 h.p. or 9.0%

It is readily seen that the most prosperous countries of the world are the ones having the larger amount of power developed namely: North America and Europe. The good climatic conditions have also played a large part in this development.

An interesting point of the statistics is shown by the percentage of power developed in the New England states, which has reached as high as 77.2 per cent, and as we naturally develop the cheaper water power first, it is reasonable to assume that the remaining 22.8 per cent could be developed at a higher cost per horse power, perhaps, but under these conditions this power could not compete favourably with plants of which the development cost would have been much lower. We may reasonably assume, also, that the New England states have almost reached the limits of their power developments.

Canada has little coal compared to other territories. If we had no water power could we develop our industry by importing coal, and operating our plants by steam driven equipment? Would not our entire manufacturing life depend on the supply of coal? Would we not be at the mercy of coal dealers? We have little coal, this is true, but we have what is called "The White Coal", and this alone will save our industrial life. Is it good policy to surrender this protection? No, the duty of Canada is to develop progressively water power because this power is at the base of industrial development and the manufacturers are looking for places where this power can be obtained, not only manufacturers from the United States, but also our own and the ones from the Old Country. It is immaterial where the manufacturers are coming from; the moment they settle here attracted by the vast resources of the land, the working men they will employ will be "Canadians" and our population will grow because there will be employment for many. The farmers will have to feed larger cities and there will be a need of more of them; but remember the farmers will, first, need a market for their products and this market can only be increased by the development of the cities, which means the development of industry.

After studying statistics it is admitted that one horse power will keep one man busy, whether in the factory, in the office or on the road, in other words one horse power a year will provide work for one man for that year.

With power exported from Canada, the United States can give work to their working men and on the above mentioned base for 100,000 horse power exported 100,000 men will find their living out of it, while to deliver this 100,000 h.p. only a few men will be busy on this side of the border. — 100,000 men receiving an average salary of $1,200. per year and taking the following proportions of the cost of the articles manufactured at labour 30 per cent, material 30 per cent, administration and overhead 30 per cent, profits 10 per cent, the labour will receive $12,000,000. To purchase the raw material another $12,000,000. will be spent. The salaries of the officials and overhead expenses will be represented by another $12,000,000. and the profits will be $4,000,000. The power bill paid to us in this case would be $2,500,000. Have we a fair return in this deal?

Why should we export our power and have the neighbours build up their industry with it? Why not sell our power here. These manufacturers can just as well come here in Canada and build up their plant. They do not care whether they collect their profits here or in United States, or in other countries, their profits are profits. But if these plants are located in Canada our one man per horse power will be a Canadian man who will spend and invest his earning in the country.

The $4,000,000. profits and the $12,000,000. of overhead salaries officials, etc., may go to the United States, less, however, the $2,500,000. for power purchased. But the $12,000,000. paid to the labour and the $12,000,000. for raw material have a good chance to stay here, and this only because we have power for sale as well as raw material.

It would be too long to enter into the possibilities of developing electric railroads, but I will remind you that Italy, a country having no coal whatsoever, has developed a magnificent system of electric railroad which is built up in the north part of the country, and has contributed in making this part of Italy highly industrial and mostly prosperous.

The question of power exported does not come to the attention of the Canadian citizen for the reason that it passes unnoticed, it is an invisible and silent process of draining our resources.

What did bring a change in the legislation regarding the export of pulp wood? It is only after having seen for years the river choked with logs driven slowly from north to south; the large trains loaded with pulp wood pouring into the United States, that the people of this country realized what harm was done to our forest, and how little Canada benefits from this trade, and thanks to our government this drainage of our resources was halted and by the new law the buyers of this wood are forced to manufacture in this country. Three Rivers owes its expansion to this law and other cities are following.

The power cannot be seen flowing along the wires and bringing prosperity to our neighbour at our expense. We are not impressed by the sight of a high tension transmission line and nothing tells us which way the power flows, but nevertheless along these small copper wires the blood of our country is transfused to our neighbour, we are weakening our sole means of expansion to strengthen our giant friend across the line, because the natural means and resources of his country are no more sufficient for his appetite.

This power of ours is the best weapon we own to fight for and protect our industrial life, but like all weapons it will defend you when properly used, but in this struggle for existence and prosperity if you let the opponent put his hand on it this weapon will be turned against you.

One of the arguments I have heard in favour of exportation of power is that "The surplus power only will be exported".

Let us not fool ourselves.—In this country, where 150,000,000 people could live in plenty and where 9,000,000 people are located, can we call the power that our present population cannot use a "surplus power"? Canada will not consist of the present population but of the millions which are coming gradually. What are we keeping for them? Is not the so-called "surplus power" of to-day, the requirement of the future? Shall we not keep for the future generations and future population this weapon so that they can fight and have a fair chance to win in the struggle?

When our country will be populated to such an extent that there will be no more room for immigrants and when this entire population will have work and will live peacefully, then if we have an excess of power at that time I will allow you to call it a "surplus".

Let us be cool-headed, we live in plenty, let us develop our power progressively to meet our requirements. Why should we be so anxious to make quick money? This craze for immediate wealth has been disastrous and how many of our institutions have miserably failed on account of poor investment, bad judgment, lack of foresight, all this because everyone wanted to make large profits in a short time.

Are we not living in the best part of the world? This country is a paradise, there are plenty of opportunities, plenty of everything. Everybody lives here in freedom, protected by the fairest laws of the world. There is room for every man who wants to be a loyal Canadian. Do we realize that?

Is it a reason because we have plenty of power, of wood, of minerals, that we should waste them? There is now a law for the protection of forests; there is a commission called: "La Commission des Eaux Courantes", which does splendid and valuable work in finding storages for our water power in order that they may exist at their maximum strength during the whole year. Will there not be someone who will protest against selling of this so-called "surplus power"? after we have worked so much in ensuring its existence; someone who will protest against the selling of this power at least in places or countries where it can do no good to Canada?

The situation is too serious to let the unscrupulous men bargain the future of millions of people to satisfy their sole lust for gold. Can we not see the difference between what belongs to us and what belongs to the others? Canada will not end with this generation, are we thinking of our children, our grandchildren and of the ones that are coming? If Canada one day is the home of millions of people can we honestly say that our imperishable resources belong to us alone? Where is their part? Are we going to leave them a free country or a mortgaged piece of land of which the best part was sacrificed and wasted by their selfish forefathers? No, it is time now to realize where this policy will lead us and it is time to speak.

Hands off our national resources, they belong to Canada and to Canadians. If they have been preserved for us by our ancestors, these ancestors were trusting us to do the same for the future generation, and if the man of to-day is worthy of the man of yesterday, the man of to-morrow will be a free, strong and prosperous Canadian.

To conclude these few remarks I will quote you a few words of a speech delivered in Geneva, in 1896, at the exhibition in the Pavilion of National Resources, by the ex-president of the Swiss Confederation, Adrien Lachenal, during the political campaign for the adoption of the Law of Subsidies for the development of water power above 50 h.p. In Mr. Lachenal's conception of idea, the question of exportation of power out of his country does not seem to be even a possibility. The following is a quotation translated from the French:—

> "Our water powers are permanent national resources. Our forests may be destroyed, our mines may be exhausted, our agriculture may suffer calamities, but our water powers are an integral part of our national unit, and as they cannot be destroyed, sold nor taken away from us, they are the only reliable source of our prosperity."

Herbert E. Pawson, M.E.I.C.

General Manager, Ottawa-Montreal Power Company, Limited.

The export of power from Canada to the United States is a subject which of late has been receiving a more than usual amount of publicity in the press of both countries, and is calculated to disturb the peace of mind of all who have the best interests of the Dominion of Canada at heart; and I have no hesitation in saying that from any point of view Canada has a lot to lose and very little to gain in permitting the wholesale export of its richest asset.

Upon further consideration it would appear that the question is one of expediency, and resolves itself into a study of cause and effect.

Water, because it is not wasting and with well established consistency runs true to the form laid down by "running on forever", can be considered the greatest asset of any country so placed topographically as to have an abundance of water power within its confines, and for this reason those advocating the export of power claim as their strongest argument that it would be advisable in the best interests of the country to "cash in" on these resources as quickly as possible and take advantage of the various foreign markets for the service, until the Dominion of Canada would be in a position to absorb and fully utilize this electrical power for itself.

It is argued by the exponents on behalf of the exportation of power that during every hour of every day in which the unharnessed water of our various rivers is allowed to run unrestrictedly by, an economic waste is taking place, and which in itself is absolutely true. If no further consideration were necessary it would appear that the immediate development of all these resources would be the proper thing to effect, if possible. There are, however, further considerations which upon investigation require us to halt and take thought before committing ourselves to any unrestricted policy, and the first point to settle in our minds is the ability of the Dominion of Canada to absorb the products of their own resources and the length of time which will elapse before it is in a position to do so.

For the purpose of this discussion it would seem proper to neglect the other provinces and consider the situation only in so far as it affects the provinces of Ontario and Quebec, for the reason that with the exception of a very small amount of power likely to be shipped over the border from British Columbia, these two provinces being most adjacent to the manufacturing areas of the New England states, would be the two principally affected. These two provinces are within relatively easy transmitting distance of the industrial areas of New York and the New England states, and from which the demand for Canadian power is heard most insistently.

From the report prepared by J. B. Challies, M.E.I.C., published in the World Power Conference Number of *The Engineering Journal* under date of July 1924, it appears that the Dominion of Canada has available slightly in excess of 18,000,000 h.p., of primary power, of which a little less than 3¼ million horse power has already been developed. Of this amount 12,000,000 h.p., is available in the provinces of Ontario and Quebec, and of which approximately 2½ million horse power has been developed.

It is most commonly stated by those in an excellent position to know that the power requirements of a community double every seven years, which statement is in all probability based on the assumption or fact that the power requirements of such industrial communities increase at the rate of approximately 10 per cent per annum. To be conservative, however, let us assume that our power requirements would be doubled every ten years. Then, based upon the previous figures, which undoubtedly are accurate, the power resources of Ontario and Quebec would be completely developed by 1946, or twenty-one years from date.

Referring to plate No. 4a of Mr. Challies' report, a curve is given showing the rate of the development of water power since the year 1900, which would show that the resources of the Dominion of Canada on a straight line basis would be developed by 1970. Treating the provinces of Ontario and Quebec alone, however, in the same manner and allowing for development on the same straight line rate of increase, it would be shown that the power resources of Ontario and Quebec would be developed by 1950, or in other words, twenty-five years from date, and in these figures it must be borne in mind that the entire resources of the two provinces have been included, many of which are at a distance from the established centres of civilization, which would rightly restrict their inclusion in the classification of available powers, and that, therefore, this figure of 12,000,000 potential horse power would be very considerably decreased and in all probability there would not be more than 8,000,000 h.p., situated in such a position geographically as to be available for development.

With this in view, therefore, it would appear that we are capable of developing our own resources within a very reasonable space of time, and at all events as quickly, in all probability, as the money would be forthcoming from our own resources by which to do the same, and for reasons, to be explained later, we should hesitate in the acceptance of neighbouring foreign capital by which to carry out these developments.

Let us now consider the other side of the equation under the heading of effect. The advocatee on behalf of exportation of power, I think, are all more or less agreed that even they would not consider exportation under any arrangement other than by yearly contracts, which in itself would, to my mind, constitute an admission that the situation might be fraught with danger, but even granting this, it is very questionable whether power thus sold, no matter what the terms of the contract, could be recovered for our own use when required.

The sale of power in any section, foreign or otherwise, means the establishment of vested interests at the point of delivery, as is evidenced by the development which has taken place during the past ten years in territories served by the Shawinigan and Southern Canada Power Companies respectively.

Whole communities have been built up and the effect is seen, not only in the industries which operate by the use of the power, but amongst the artisans who work in these industries and the communities which are built up to house and care for these workmen, with all the contingent trade following which of necessity must accompany them and which are dependent to a greater or lesser extent upon such power, not only for their ability to earn, but in connection with the comforts of life, and would be capable of voicing long and loud protest if such supply of power were to be interfered with.

Pause a while, and stop to consider what would happen in the province of Quebec if the Shawinigan Power Company and the Southern Canada Power Company for some reason had to suddenly discontinue doing business. To withhold such power would at once destroy this entire communal fabric, which directly and indirectly might represent billions of investment and would disrupt the economic life of countless thousands of people, and any attempt to withdraw this power, by which the situation had been created in the first instance, would be attended with most serious complications.

Carry out this thought a little further and apply it to the case of power supplied to a foreign country and the situation becomes at once of grave international complication. Many prominent speakers in the last few months have admitted that there would be only one condition which would make the withdrawal of power possible, and that condition would be war.

A certain amount of precedent has already been established in this connection, and the following resolution passed by the Ontario Branch of the Canadian Manufacturers' Association at their annual meeting in 1921, would appear to be pertinent:—

> WHEREAS during the past winter a large number of the members of this association have suffered very considerable loss as a result of the failure of the Hydro-Electric Power Commission of Ontario to supply the amount of power contracted for (a single member having lost in ten weeks 36,000 work hours).
>
> AND WHEREAS such loss involves a most serious decrease in production at a time when the greatest possible production is imperatively needed.
>
> AND WHEREAS even if the special difficulties encountered in the past few months were overcome before another winter, there would still, unless adequate steps are taken, be a serious shortage owing to the fact that many of the industries at present served will require an increased supply and many other industries will be certain to need hydro power.
>
> THEREFORE, be it resolved by this Ontario Division of the Canadian Manufacturers' Association in annual meeting assembled:—
>
> 1. That the above consideration be brought to the attention of the Hydro-Electric Power Commission and that the commission be asked to leave no stone unturned to meet the pressing need, which so many industries feel, of a larger and surer supply of power.
> 2. That before new radial railway enterprises calling for the use of large quantities of power be entered upon all existing contracts for power be fulfilled.
> 3. And that the Power Committee of the Ontario Division be authorized and empowered to appeal to the Royal Commission to investigate and report on the production distribution and adequate supply of power in all parts of Ontario, so that the industries of the Province may not be further impeded.

At the same time as this resolution was passed, in excess of one billion kilowatt hours annually was being exported to the United States by Canadian power companies with plants situated in the vicinity of Niagara, viz. the Ontario Power Company, the Toronto Power Company and the Canadian Niagara Power Company, the two former of which are operated and controlled by the Hydro-Electric Power Company of Ontario, and that the principal increases in the exportation of power for the previous year were to be found in the case of these three plants. It would thus appear as if the withdrawal of exported power in this particular instance had not been accomplished with any great degree of success, in spite of the situation as evidenced by the resolution previously mentioned.

It will be argued by some that the difficulty in recovering this Niagara power was due to the fact that by the Treaty of Washington of 1909 the Dominion of Canada was allowed an aggregate daily diversion of 16,000 cubic feet per second of the waters of Niagara in excess of that allowed to the United States and that such excess diversion of water has been allowed in consideration of a certain amount of power being delivered to points in the United States. It is pointed out, however, that a close examination of this treaty reveals no such consideration, and it would be a very dangerous precedent for any such interpretation to be read into this treaty.

In so far as is known, this is the only case on record in the Dominion of Canada where any attempt has been made to withdraw power once sold to the United States.

The best illustration, however, of the danger to be incurred in the exportation of power is to be found from a study of what has happened during recent years in Switzerland. This situation has been very ably set forth by Mr. Paul Lewinson in an article published in *The Nation* and as re-published in the *Montreal Daily Star* under date of August 22nd, 1924, the more detailed study of which I would seriously recommend to all present.

In this article Mr. Lewinson commenced by stating that it does not pay small or powerless nations to be rich, and then goes on to point out wherein this little country, which had previously enjoyed a position of immunity and independence second to none in Europe, had jeopardized its position internationally by its over-anxiety to develop its natural water power resources, with which, owing to its topographical features, it had been more than abundantly blessed.

This country was probably the first in the world to realize the benefits of and take advantage of its water power resources by their development for the purpose of producing electrical power, and in its anxiety to "cash in" on these resources was lead into a programme of development privately and publicly much in advance of its own immediate requirements, and was, therefore, compelled in order to meet the capital charges incurred, to seek a market for its surplus power outside the confines of its own borders. The offer, of what was then considered exceptionally low rates, succeeded in interesting German, French and Italian industrial enterprises in the utilizing of such power, and to-day the Swiss people are themselves paying for their electrical energy for their domestic use, prices much in excess of that being paid for the energy exported to France and Germany, and definite cases are on record of where Swiss manufacturers have been compelled to remove their plants across the border to these other countries in order to get the advantage of this cheaper power.

A worse feature, however, than this is also to be seen. The large vested foreign interests, who relied upon this power exported from Switzerland for their being, were quick to realize the danger in which their adjacent industrial communities would be placed in the event of Switzerland attempting to recover any of this power for its own use, and with this in mind quickly acquired the controlling interest in these power developments, and to-day Switzerland finds itself in the position of having its principal power resources owned and controlled by German, French and Italian capital, under which conditions it is obvious to all that the incentive to withdraw any power previously exported to foreign countries has been absolutely lost. These countries being large and powerful are moreover in a position to dictate to Switzerland any conditions which they might wish to impose.

The benefits, therefore, derived by Switzerland from their early development of electrical power have been absolutely lost to them, and the enormous revenues collected to-day by reason of these developments are all going into the pockets of their foreign owners, and the Swiss people are in the unhappy position of having parted with their assets and having to pay very high rates for their own requirements.

Conclusion

The advantages to be derived by the development of our water powers alone, without taking into consideration the application of the same in our own country, are very, very slight, as is shown by figures recently published by the United States government as the outcome of a special study of investments made and employment furnished due to the development and application of water power. The respective results were summarized as follows:—

Per Thousand Developed Horse Power

Total investment	$1,861,000	
Total number of employees	385	
	Development	Application
Investment	$250,000	$1,616,000
Percentage of total	13.4	86.6
Employees	8.6	376.4
Percentage of total	2.2	97.8

It is obvious, therefore, that under a policy of exportation of electrical energy, the Dominion of Canada will secure only the investment and employment due to the development of our water powers and will lose all those due to the application of that power. If we are satisfied with 13.4 of the investment, 2.2 of the employment ultimately resulting from such development and utilization, nothing more remains to be said.

The situation in the exportation of power is practically anomalous with that resulting by the exportation of pulpwood, with two exceptions: viz.—

1. The effects of the exportation of power would be more far reaching.
2. The exportation of pulpwood embraces the sale of a commodity which is reproducable, whereas the exportation of power is the leasing of a service in perpetuity which is not reproducable.

In conclusion I would add that in my opinion the situation likens itself to that of the head of a large family who, with approaching old age, loses his nerve and cashes in on all his assets with the intention of buying himself a life annuity without reference or consideration of any description for the family which he is going to leave behind him, and we all know what we would think, even though unspoken, of any man amongst us who adopted such a policy.

Abstracts of Papers read before the Branches

The Progress of the Admiral Beatty Hotel

R. H. Macdonald,

St. John Branch, January 15th, 1925.

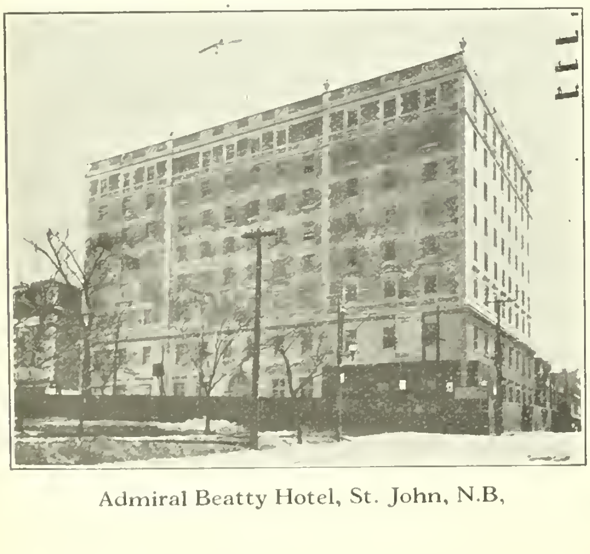
The citizens of St. John have set a splendid example in the financial burden they have assumed in making possible the construction of this hotel. It is going to meet a need by accommodating tourist and auto pleasure seekers during the summer months, and during the winter season will become a stop-over place for trans-Atlantic travellers using this Canadian seaport. It will in all seasons accommodate commercial and business men who concentrate on St. John in connection with their various business enterprises.

Its operation as one of a chain of hotels under United Hotels management will add another link to the chain of hotels under this management extending from St. John on the Atlantic to Seattle on the Pacific. Such connection will be of material value in the business secured and passed on from place to place in the form of conventions, tourist parties, and the regular patronage arising from those familiar with the high quality of service always prevailing in the chain type of hotel management. The interchange of trained hotel workers between the different hotels of this system, and the economies possible through collective buying of all supplies may be mentioned as some of the advantages of this type of hotel management.

In designing a hotel, as in the case of any other class of business building, the architect has always to combine beauty of design with utility of purpose and to create something which must pay dividends to the investor. This has a material effect upon the cost of the structure and ultimately determines whether it will be built of steel frame or some system of reinforced concrete. It will also determine whether of marble, stone or brick exterior, also the extent of lavishness of interior finish. One must strike a medium between erecting a type of building which has cost so much that it cannot pay dividends, and one in which for short-sighted reasons of economy, essential features have been curtailed so that in the end the hotel does not draw the maximum trade and is out-classed by another erected at a later date.

It is impossible to say that Italian Renaissance, Gothic, Francis Ist, Louis XVI, or any other period of architecture is best adapted for any particular type of hotel. Climate, local conditions, historic associations, type of construction and financial considerations are all determining factors. The fenestration of a building is usually so arranged as to give the best light and most air to the rooms to be taken care of. At times it is necessary to subordinate or sacrifice what the designer considers his individual taste in order to provide adequately for the commercial uses and requirements of the building, for hotels are erected primarily to take money and at the same time supply the most exacting needs of the public. There is no reason why in spite of such restrictions a hotel should not be an architectural adornment to any city; in recent years some of the best examples of architecture erected have been in this field of building enterprise.

The hotel must be a place where the traveller can obtain shelter and rest; where if he be a merchant or salesman he can display his wares and transact his business with comfort. It should be the centre of the social activities of the town, both for the residents of the city and out-of-town guests. It should handle the peak load of a large convention without disturbing other guests. Its service, morale and the appointments of its public lobbies and dining-rooms should be such as will neither offend nor repel the woman guest, nor yet over-awe the modest traveller.



Admiral Beatty Hotel, St. John, N.B,

The beginning of a hotel planning problem is a study of the lot of land chosen. Such things as relative worth and importance of surrounding streets; proximity to parks or other open spaces; regular automobile thoroughfares; street car lines; accessibility to ocean and railroad terminals; proximity to shopping, theatre and residential districts, have to be considered. The above considerations determine the locations of entrances, especially the main entrance, which is the key to the main floor plan.

In the case of the Admiral Beatty hotel the location is ideal, being in the centre of many of the above-mentioned features, and is also on one of the highest points of the city, affording a good view of the city, Bay of Fundy and surrounding landscape. The building is located at the northwest corner of King square, having a frontage on King square of 148 feet, and extends along Charlotte street for 98 feet. Being built on the corner in the form of an "L" no courts were necessary and every room is an outside room. The power house is built in the rear of the main building. Expansion is provided by the hotel company owning the adjacent lot on Charlotte street.

When the existing buildings had been razed there remained ledge rock over the site at an elevation generally some feet higher than street level. It was necessary for reasons of economy to build on the ground rather than into it and no rock was removed below level of sidewalk except for pipe tunnels. Fortunately at some former period the rock had been removed for vats or tanks for a tannery over the rear of the property; it was here that excavation would have been necessary for ice making plant, boiler and pump rooms. Thus over the area where a basement was necessary for the mechanical equipment one was available almost ready made.

In general the parts of a hotel building may be grouped under five distinct sub-divisions:—

1. The *typical floors*, comprising guest bedrooms and parlors.
2. The *sample floor room*, comprising display of samples and the accommodation of merchants displaying them.
3. The *public floors*, comprising the public lobbies, dining rooms and other rooms devoted to the general use of the public.
4. The *function room*, comprising banquet rooms, private dining rooms and ball room (if any).
5. The *service parts*, comprising the kitchen, laundry, mechanical departments and all the innumerable units necessary to supply the service to the other four parts, and to provide accommodations for service for the employees.

The essential element in the plan of every hotel is that of the typical guest room floor, as the sale of rooms is the greatest source of revenue. The rooms must be so arranged that the best type of sitting room, bedroom, bathroom, etc., will be secured; where the commercial traveller is to be properly accommodated a number of the bedrooms are so laid out with disappearing beds that they can be used by day for business purposes when required for display of goods. It is desirable that certain rooms be made communicating, so they can be rented by the suite or as separate rooms.

In planning bedrooms, the size for single or double rooms has to be determined, bearing in mind, and actually laying out, the exact size and disposition of furniture in rooms, which is also essential for the proper location of lighting plugs and telephone outlets.

Another matter of importance is the proper size or width of rooms, such as fixing one dimension in multiples of 27 inches to correspond with the manufactured width of carpet. An average of one bathroom for two rooms communicating should be provided; the bathrooms on the different floors should be plumbed over each other, and with suitable pipe spaces between them accessible on each floor for repairs to piping.

The lobby is the heart of the public room space and is usually so placed that it has as full a view as possible of the working areas of the main floor, and the various other public rooms are carefully studied to effect a convenient arrangement with it. The desk should be visible from the hotel entrance, with the passenger elevators near desk to give quick access to the guests' rooms. The arrival and departure of guests must be absolutely under the control and observation of the hotel office, the approaches to elevators, stairways, toilets, etc.; also to a lesser extent a view of the main lobby must be under office control for the comfort and security of the guest.

Immediately surrounding the main office are placed the information wickets, house and public telephones, parcel and coat check rooms, telegraph operator, news and cigar stand, hall porter's desk, and in the office itself the key racks, mail rack, safety deposit boxes, cashier's desk, air tubes, time stamps and master clock, and immediately adjacen t the manager's office. Other features to be provided on the main floor in the case of the Admiral Beatty hotel, are the group consisting of barber shop, shoe shine and public toilets, although at times these are placed in the basement.

One objectionable arrangement in hotel planning is the placing of the main kitchen, and other service features relating thereto, below the dining room floor. The more direct the movements from these spaces to the dining rooms the better the service should be. The proportionate sizes of the main dining room, the cafeteria, private dining rooms or ball room are usually determined by a study of local conditions and the prospect of convention and transient tourist business. In addition to the main dining room there is a cafeteria located on the main floor of the Admiral Beatty hotel and reached by a side entrance off Charlotte street, so that town patrons may use it without entering the main part of the hotel.

On the second function floor the banquet room, which will also be used for dancing, bridge, and similar entertainments, is immediately above the dining room. There will also be three private dining rooms on this floor, so that they can be used in units of one, two, or three, depending on the accommodation desired.

The laundry has been placed in the boiler room extension above the kitchen, with not only windows but also skylights and roof vents. The placing of the laundry is generally a problem in hotel planning as it usually takes considerable space, and if not adjacent to outside light and air, requires considerable provision in the way of mechanical ventilation. The mechanical equipment generally is an important part of a hotel plan, and is essentially an engineering problem. This equipment comprises plumbing, heating, ventilation, electric lighting, power plant, including boilers and steam pumps, refrigeration and ice-making plant, electric clocks and time stamps; passenger, freight and service elevators, telephone system, covering the local and long distance service to both public booths on the main floor and from the guests' rooms, telegraph service, generally connected with two or more systems.

The completed structure will contain in addition to the 184 guest rooms, a residential or regal suite has been provided on the second floor. On this floor provision has also been made for a club with lounge, reading room, etc.

Every provision has been made for the security and protection of the guests and to this end each room will have its own key, which will not open any other door. There will be a master key for each floor, which will open the room doors, but the master key for one floor will not open the doors on another floor. There will be also a grand master key, which will open any room in the building. Another feature which makes for the security of the patrons' belongings is that on leaving the room he may lock the clothes closet door with his room key, and the maid will not be able to open it with her master key.

The street elevations of the two lower floors are faced with Benedict cast cut-stone. The constituents are Atlas white cement and white Tuckahoe marble in screened and properly graded mixtures to secure the result in texture and density required. There is no sand or stone aggregate, nothing more in addition than mineral coloring mediums to match with granite, stone or marble. After being cast and sufficiently matured it is cut, moulded, dressed, polished or otherwise finished just as real stone or marble, and when finished is in every respect equal to the best natural stone. It has been used with success in such buildings as the C.P.R. office building and Ambassador hotel, New York, the Canada Cement building, Mount Royal hotel, Medical Arts building and Keefer building, Montreal. The stone is manufactured in Canada at Montreal.

Above the stone-work the walls are faced with Gartcraig Scotch firebrick, with stone work of the same material as the lower storeys. The rear walls are faced with Citadel brick, while all the face-brick is backed up with 8-inch Interlocking tile, manufactured at Avonport, Nova Scotia.

The main building has a frontage on the north to King square of 148 feet, and on the west to Charlotte street of 98 feet, and extends back 53 feet from the street line; the three-storey power plant wing, 70 by 70 feet, is placed in the southeast at the rear. The main building is an eight-storey, reinforced concrete structure; the floor slabs and roof being of the joist and beam type built with a removable metal form joist system. The floor joists are 5 inches wide throughout and vary from 6 to 14 inches in depth, the average being 9 inches. The slabs are reinforced, and two inches thick, except in the power plant wing, where they are three inches for heavier loading. The columns on the lower floor average 24 by 24 inches in size, and on account of the desirability of keeping the column size to a minimum, a mix of one part cement to one part sand and two parts gravel, and one part cement to 1½ parts sand and three parts gravel was employed. For the upper floors the mix was 1:2:4 throughout for columns, slabs and beams, the column size being reduced to 12 by 12 inches on the top floor. The gravel for concrete was obtained from the beach of the St. John Dry Dock and Shipbuilding Company at Courtenay Bay, and was of excellent grade and quality, as field and laboratory tests during construction showed.

The contract for this work was signed at noon, July 28th, 1924, and on the same day rock drills were at work for the foundation excavations. The first batch of concrete for the frame was poured on September 20th, and the roof slab was completed on November 29th, a total of 61 days, or slightly less than 7⅔ days per floor. This is a remarkable demonstration of speed through skilled and intelligent organization on the part of the contractors, and the quality of the work resulting is equal to the best we have seen or have had executed on any of our buildings.

The general contractors were E. G. M. Cape and Company, of Montreal, with J. B. Stirling, A.M.E.I.C., acting as superintendent. A number of sub-contracts were awarded, that for excavation being carried out by Cameron and Phin, of which N. K. Cameron, A.M.E.I.C., is a member.

Hydro-Electric Power Possibilities Along the Route of the Pacific Greast Eastern Railway.

Ernest A. Cleveland, M.E.I.C.,

Comptroller of Water Rights, Province of British Columbia.

Read at the Annual General Meeting, B.C. Division, Canadian Institute of Mining & Metallurgy in joint session with the Victoria Branch, The Engineering Institute of Canada, Feb. 19th, 1925.

A glance at the map discloses the fact that the Pacific Great Eastern Railway either traverses or crosses some of the most important rivers of the province. The Squamish with its branches the Stawamus, Mamquam and Cheakamus: the Green, Lillooet, Birkenhead, Fraser and Quesnel rivers. Each of these and some of their tributary streams having their sources and upper reaches in the higher altitudes in regions of abundant snowfall, is capable in greater or less degree of furnishing water under suitable heads for the economic production of power.

Beginning at the present terminus at Squamish the railway company has the only hydro-electric development within its territory along the whole list of streams mentioned. A 225-horse power installation at the edge of the East Branch of the Squamish river, using water from Stawamus river, a branch of the former, under a head of 418 feet, is a modest beginning. Two or three additional sites, where the water may be used under somewhat similar heads, may be found on this little stream. Next above it along the route of the railway is the Mamquam, a long tributary of the Squamish from the eastern slopes. It has a drainage area of something like 130 square miles with widely varying discharges of from less than 50 to about 14,000 cubic feet per second. The preliminary investigations so far have disclosed no suitable storage sites so the Mamquam may be regarded as a small continuous power stream — probably less than 1,000 h.p.

The Squamish river, which lies to the west of the railway and diverges from it at about the 8-mile post, though carrying large volumes of water has a very gradual slope in a mile-wide valley and has so far as known no suitable power sites within 30 miles of its mouth. Canôns above this point may provide suitable sites so far as the physical elements are concerned but are so remote from present or likely future transportation that the river may not for our present purposes be classed as a power stream.

The Cheakamus, however, which is the main branch of the Squamish, with its summit elevation of about 2,100 feet above sea level whence the waters of Green river, Soo river, Fitzimmons and other creeks, all tributary to the Green river may be diverted to it; and with its own branches, the Brandywine and Stoney creeks, furnishes an interesting array of power possibilities. Preliminary surveys in these important watersheds indicate the existence of a large and suitably placed storage site on the Soo river whence water may be stored and discharged into the Green river for development at the foot of Nairn falls or be diverted into the chain of lakes, — Green, Alpha, Nita and Alta, — along the Cheakamus summit of the railway, for use on lower reaches of the Cheakamus. Storage of water in Cheakamus lake at elevation 2,750 would also form part of the regulation of the river. It is believed that further studies will show the possibility of utilziing all these waters at a site on the Cheakamus within a distance of 7 miles below Alta lake.

A partial survey to determine the feasibility of diverting the Cheakamus into its western tributary the Brandywine and thence discharging the water back to the Cheakamus valley under a head of about 350 feet has been made.

Preliminary surveys have shown the probability of a sufficient discharge from Garibaldi lake through the Barrier under which its outlet lies, to Stoney creek, an easterly tributary of the Cheakamus, to create a satisfactory development in the valley of the Cheakamus some 3 miles away and about 2,100 feet lower in elevation. Storage in Daisy lake would provide for further regulation of the Cheakamus itself and its development under a head of 700 to 800 feet at a power site below the Cheakamus canôn. Still other proposals are the diversion of the Cheakamus by tunnel at some one of several points into the valley of the Squamish river for development there.

It is to be noted that the data on which these possible developments are based are all of a preliminary nature. Drainage areas have not been ascertained nor the records of stream flow in some cases maintained for a sufficient length of time to determine the run-offs with any great degree of certainty, nor have any investigations been made into sub-surface conditions at the dam sites proposed. Moreover it may appear physically possible to develop power at certain sites which on more complete data may prove to be economically unsound. It seems unwise therefore, as it is unnecessary for the purposes of this discussion, to give individual estimates of developable power at the many possible power sites or combinations of sites on this river. The more recent and major part of these preliminary investigations were made under the direction of J. G. G. Kerry who has given his opinion that the Cheakamus river will justify the installation of machinery to give a peak load output of about 1,000,000 horse power.

Lillooet river is crossed at Pemberton Meadows. Any likely development of this river would be made in the stretch between Lillooet lake and Harrison lake and may hardly be said to be tributary to the railway.

As the railway descends from the Birkenhead — Anderson lake summit through the valleys of Anderson and Seton lakes to the Fraser river there is no suggestion in the stretch of country visible from the railway that a magnificent power development is possible on the shores of Seton lake. Hidden behind Mission mountain to the north of the lake is the valley of the Bridge river, distant at its nearest point less than 3 miles, and about 1,200 feet higher in altitude. This valley, like that of the Lillooet river above Pemberton Meadows, is remarkable for its easy and gradual slope. Hedged about on either side with high and rugged mountains the river winds slowly from side to side of the valley until within about 25 miles of its mouth at the Fraser river a few miles above the village of Lillooet.

The drainage area of the river is unknown. Its run-off varies from 360 c.f.s. to 26,000 c.f.s. The investigations of the Bridge River Power Company show that regulation of the stream flow can be accomplished by construction of a storage dam at Lajoie falls some 63 miles from the river mouth, thereby creating a reservoir 19 miles in length with a maximum width of about a mile.

A diversion dam across the river below the point of its nearest approach to the Seton valley would serve to divert the river through a tunnel about 13,000 feet in length to be driven through Mission mountain whence it would be carried by penstocks about 2,700 feet long to the power site near the Pacific Great Eastern Railway station of Shalalth on Seton lake, developing power under a head of approximately 1,200 feet.

Maximum regulation of the river may be obtained by the erection of a large storage dam at or below the site suggested for the diversion dam, thus creating a reservoir some 30 miles in length and reaching almost to the Lajoie falls. The total economic storage is probably around 1¾ million acre-feet, which would serve to regulate the river flow to about 3,500 cubic feet per second, producing approximately 350,000 horse power.

Extensive surveys have been made looking to this development and sub-surface investigations have been carried out at possible dam sites and at the station site. Examination has also shown that there exists no unusual physical obstacle to the construction of a transmission line some 137 miles in length from the power station to the city of Vancouver following in general the route of the railway.

The crossing of the Fraser river at Lillooet reminds one that the power possibilities in the stretch of 120 miles from Chimney creek to Lytton have had no investigation. The river in that distance falls some 800 feet and is broken by many rapids and canôns. However, Fraser river power may not be counted upon until extensive investigations into the question of storage on a wholesale scale for the purposes of river regulation have shown its practicability.

Chilcotin river, a westerly tributary of the Fraser, has large lake areas at the headwaters of several of its branches but due to its remoteness from present centres of population and industry has so far had no hydro-metric investigation.

The Murtle river, lying in the Thompson river drainage basin but only 60 miles east of the railway at Lac La Hache station, has a catchment area of about 400 to 450 square miles and a discharge varying from about 200 to 7,000 cubic feet per second. Murtle lake will provide storage for about 180,000 acre-feet and furnish a regulated flow of about 700 cubic feet per second. A development at Murtle falls, under a head of 500 feet, would produce about 29,000 horse power or at Clearwater river, under 780-foot head, about 45,000 horse power.

At the Little canôn of Quesnel river, 20 miles from its mouth, a dam about 40 feet in height would permit of a low head development of about 9,000 horse power. Regulated river flow provided by storage in Quesnel lake would greatly increase the power possibilities but the elevation to which the latter may be raised without undue property damage may limit the economic development. From present information it would appear that power development on the Quesnel river immediately below Quesnel lake is not attractive.

The Cottonwood and Fort George canôns on the Fraser between Quesnel and Prince George are regarded as being capable of power production but little is known at present of their actual possibilities.

The Willow river near Prince George is estimated as capable of producing 5,000 horse power, while investigations of the Nechako river recently carried on have shown that its power possibilities are considerable though somewhat limited by the presence of the Grand Trunk Pacific Railway along its banks.

In addition to the larger sources of power to which reference has been made there are numerous smaller streams in the territory under discussion, from which relatively small but appreciable amounts of power may be developed.

It will be observed that much data is yet required to make anything like a complete inventory of the hydro-electric possibilities of the Pacific Great Eastern Territory. Enough, however, is definitely recorded as a result of surveys and investigations to date to show the great extent of the power resources of the country traversed and of their remarkable distribution along the whole length of the railway,

Surveying in British Columbia Since Early Settlement

G. G. Aitken,
Victoria Branch, March 11th, 1925.

The earliest surveys referred to were those of Capt. Vancouver who, when sent by the British government to attend the apology of the Spaniards at Nootka, for the arrest of Capt. John Meares, made the first reputable survey of the coast of British Columbia from Juan de Fuca strait to Queen Charlotte islands. Reference was made to the journey made by Alexander Mackenzie from Athabasca to the Pacific coast.

The next phase referred to was that following the discovery of gold on the Fraser river in 1858, when the company of Royal Engineers, under Col. R. C. Moody, was sent by the British government for the threefold purpose of assisting to maintain law and order, to build roads and trails, and to carry out the survey requirements of the colony.

This phase was followed by that of the construction of the Canadian Pacific Railway, when the necessity for finding the best route for this line caused surveys to be made of the main passes through the Rockies, and alternative routes to the coast. The survey of the main line of the Canadian Pacific Railway was the first standard survey connection with the prairie land survey system of the Dominion government and the British Columbia coast surveyors.

The system of surveying used in the prairie provinces of Canada, and western United States, — that of ranges and townships to define farm and timber lands, — was considered unsuitable for the type of physiography of British Columbia. The surveys in the province were not laid out in any regular pattern, but simply followed the choice pieces of land as they were selected and pre-empted.

A brief description of the type of land, timber, mining, and topographical surveys was given, also the difficulties in controlling the survey boundaries of land and timber areas to avoid confliction of boundaries in collections of surveys; and the benefit which had taken place with the introduction of the "Standard Base Map System" in the Survey Branch some three years ago.

It was then explained, in connection with the publication of the new "Commercial and Visitors' Map" of south western British Columbia, which is in course of printing, that one of the features of this publication was the display, on a portion of the back of the map, of comparative geographical tables giving authentic figures showing comparative progress with, as far as possible, the four states Washington, Idaho, Oregon, and Montana. These tables cover the phases of development of our natural resources.

This study has been based upon, "The history of the development of the natural resources of an older country, having types of population, climate, area, physiography, geographical advantage, and natural resources similar and comparable to those of a younger country".

Comparison was first demonstrated by slides showing the physiographical relief of southeastern British Columbia, and of Washington and Oregon. The area and physiography of British Columbia were shown to be practically the same as those four states; with the climate in British Columbia lay some slight advantage.

Slides of the comparative tables were then shown covering population, climate, mining, grazing, railways, agriculture, labour, forestry, fur bearing animals, education and finance.

Analysis was made of the table of population, showing that where the population of British Columbia was slightly over half a million to-day, it is the same population as was in the four northwestern states about 1885, whereas their present population is given as over three millions. In other words, it has taken them 40 years to attract and assimilate a population of two million five hundred thousand. The question then is, whether, with the emigration situation as it is now, and the transportation and communication advantages which are now possible, it will take British Columbia a longer or shorter period to equal the population increase as carried out in the states of Washington, Idaho, Oregon, and Montana, between 1885 and 1925.

Further, comparisons were made of seven countries of Europe (Great Britain, Ireland, Belgium, Holland, Switzerland, Denmark, and Sweden) with a combined area less than British Columbia and yet with a population of roughly seventy-five million. It could be said that climatic and physiographic conditions to which the people of these countries are accustomed, are reflected in British Columbia.

The percentage of population classed as "city and urban" and that classed as "rural", were shown to be practically the same in ratio as the "city and urban" and "rural" population of the four northwestern states.

Further, analysis was made of the comparative tables covering climate and grazing. The comparative tables shown on the screen open up a very interesting study. These are to be printed, together with other special information, on the back of the new map of southwestern British Columbia. No doubt they will suggest interesting comparative geographical study with regard to the development of the province.

Steam Accumulators and Pulverized Coal

A. J. T. Taylor, M.E.I.C.,
Calgary Branch, March 6th, 1925.

The steam accumulator is practically a new idea and is of interest to every branch of engineering, according to Mr. Taylor. He related how it had reached its present stage of design some six years ago in Europe, but it was only one and a half years ago that the first accumulator was installed in the English speaking world. The Ruth accumulator, he explained, was entirely automatic. There were many of them installed in Sweden, some photographs of which were projected on the screen. The data he gave proved conclusively the economy resulting in any steam plant after the installation of accumulators. Such an equipment has an extraordinary smoothing out effect in the curves illustrating the varied requirements of certain manufacturing plants. The great advantage appears to be the ease with which steam can be directed from a steam switchboard at several different pressures to various points in the plant, and all from the same set of boilers, but regulated through the accumulator. This means that stoking is simplified, as there is no rise and fall from peak to bottom loads to take care of, the accumulator handling such differences.

Pulverized coal, he stated, was also in its infancy. This idea originated in England, and although it has been tried out for about five years it is only very recently that it has proved a complete success. The installation costs are high, but running costs are considerably lower than ordinary stoking methods. The main advantages are: (a) makes station independent of the quality of coal; (b) large pulverized coal plants cost less in reality; (c) efficiency is higher.

Some interesting slides showed a practically ideal boiler installation, namely that of the Ford Company at Walkerville, Ont., where, he explained, the men wear white duck suits, and the whole appearance is more like the inside of a battle ship than a coal burning boiler-room. He mentioned the 26,470 square feet of heating surface in connection with the Ladd boilers at the Ford plant in Detroit, which until quite recently were the largest boilers in the world. One slide showed eight Ford cars inside the firing space of one of these boilers. Actually the largest boilers in the world to-day are those at the Cleveland Electric Illuminating Company's works. He claimed a maximum of cleanliness and economy by the use of pulverized coal.

Hydro-Electric Development

A. B. Sanborne,
Calgary Branch, February 23rd, 1925.

Referring to the history of the properties in which he is interested, Mr. Sanborne stated that it was in 1900 a certain miller from the States arrived near Fernie, B.C. He was prospecting for placer mines. Later he incorporated a company and in 1914 peddled the proposals to a man interested in hydro-electric power. Following a very favourable report, which led apparently to more definite and serious investigations, the British Columbia and Alberta Power Company was formed. Then followed the question of location of dam and design of works in general. A pipe line 8,500 feet long and seven feet in diameter was erected and two 3,600-h.p. units installed. Original development extended 85 miles east to Bellevue and 20 miles west to Cranbrook and after four years reached the mining town of Kimberly. Expansion necessitated further development up at Elk River falls and a dam at the narrowest point of the river. A twelve-foot pipe line 1,200feet long and a tunnel 2,040 feet long with a similar cross-sectional area and concrete throughout were constructed. A surge shaft 32 feet in diameter, 80 feet high and concreted was constructed near the end of the tunnel. Two vertical turbines 7,500 h.p., and 600 kv.a., each at 6,600 volts were installed. So much for the gradual increase in capacity of the plant. At the present time 22,200 water horse power is harnessed and the line extended 225 miles.

The rapid growth and expansion of this plant is in keeping with most hydro-electric plants in Canada. The speaker stated that with but possibly one exception there has never been a loss experienced on the first mortgage bonds of hydro-electric concerns. He contended that the hydrometric problems required more original design than the electric problems in connection with this work.

The main features to be investigated in connection with the installation of any plant of the kind he suggested were consideration of the river run-off and all data relating thereto; size of the plant and probable market cost and profit; design and general investigation; cost of materials and determination of safety factor. In connection with the design for flood control he advocated an allowance in volume of 50 per cent greater than the greatest flood. In designing the headrace he pointed out the advisability of keeping the velocity as low as possible, and the importance of keeping any change in size or direction as gradual as possible.

In referring to surge control he contended that this was most effectively handled by means of surge tanks when possible, and these should be as close to the power house as can be arranged. However, at the Kootenay plant the surge control was at the top of the hill with a head of 190 feet and some distance from the plant on account of topographical peculiarities. With reference to the power house, he emphasized the importance of design of tailraces and foundation and explained that the draft tube must be completely sealed, also that any changes in the size of the penstock should be gradual on account of the enormous increase of velocity that takes place.

EMPLOYMENT BUREAU

Situations Vacant

Chemical Engineer

Chemical engineer or chemist, recent graduate required by a large electrical manufacturing concern for work on factory methods and manufacturing problems. Please state in first instance, education, full qualifications, references, salary required, age, and when available to box No. 133-V.

Engineering Draughtsman

Wanted for large papermill in Province Quebec, engineering draftsman with thoroughly practical experience in design, operation and maintenance of modern newsprint mills; good opportunity for man with ability. Apply box No. 134-V.

Situations Wanted

Contractor's Engineer

Contractor's engineer desires position with progressive firm of contractors engaged in general contracting work and public works in B.C. Take full charge as estimator or manager. Thoroughly qualified and experienced. Good salary required, for first class man. Apply box No. 176-W.

Civil Engineers

University graduate 1922, experienced draughting, municipal and topographical surveying, highway and construction, desires work. with any concern with future prospects; willing to go anywhere and begin at the bottom; at present in B.C.; Canadian; married; age 28 Apply box No. 177-W.

Graduate in civil engineering with three years' experience, requires permanent position. Apply box No. 178-W.

Civil engineer, University graduate, A.M.E.I.C., five years experience, structural steel design and estimating, Canadian, single, age 31, desires position anywhere in Canada, the East preferred. Available May 1st. Apply box No. 179-W.

A technical graduate with wide experience in combustion engineering steam power plant design and operation, and the design of heating systems, is open for engagement. Apply box No. 180-W.

Members' Exchange

Surveyor's and Draftsman's Instruments

The following miscellaneous equipment is for sale. Further information may be secured from the headquarters of *The Institute.*

1 set English drawing instruments in wooden box—in fairly good condition—one or two parts missing.

1½ drawing instruments, (incomplete).

1 Field sketching companion assorted drawing instruments in cardboard case.

1 Map measurer.

1 Part set of scales in poor condition.

2 Military pattern clinometers.

1 Service pattern Mark VII compasses.

BRANCH NEWS

Border Cities Branch

F. Jas. Bridges, A.M.E.I.C., Secretary-Treasurer.

What appeared to be a reunion of graduates of the University of Toronto, School of Practical, Science took place Friday evening March 13th, at the Prince Edward Hotel, Windsor, when the Border Cities Branch held its regular monthly dinner meeting. The attendance was one of the largest that has turned out for the last year or so.

Prof. Peter Gillespie, M.E.I.C., of the University of Toronto, was the drawing card and all who attended were amply repaid by the most interesting illustrated talk that Prof. Gillespie gave on "Engineering Achievements in Canada". When the professor rose to his feet he was greeted by the college yells of the university.

Engineering Achievements

In opening his remarks, the speaker commented on the fact that this year marked the centenary of many events relative to engineering features which include the birth of John Smeaton who built the famous Eddystone lighthouse, the founding of the original association of engineers in Canada, the building of the Darlington, Stockton Ry. in England which was the forerunner of many other railroads in Great Britain and also in America. Just one hundred years ago marked the first survey of the Welland canal by Merritt. Pictures were shown of the original surveyors of the now famous Canadian Pacific who started out in 1870 on the first location survey. Many features of engineering interest were also shown concerning this road, with particular reference as to how the heavy grades through Rocky mountains were overcome. Pictures were also shown of some of the largest bridges in Canada including the old and new Jubilee bridge at Montreal, the C.P.R. bridge at Lachine, the Quebec bridge, the concrete arch bridge at Peterborough. At this point was also shown the Peterborough double hydraulic lift locks which were designed by the late president of *The Institute*, Walter J. Francis. There followed then views of the Red river bridge near Selkirk, the St. Andrews lock and dam, the methods used in constructing the foundations for the warehouses at Vancouver and also pictures of the warehouses at Halifax. Some of Canada's large hydro-electric power developments were shown and described. These included the Chippawa developments, the Shawinigan Water and Power Company's plant, plants in British Columbia and Winnipeg River power stations. Many irrigation schemes were shown, including the C.P.R. irrigation scheme at Albert, the Brook's two mile aqueduct, the small flume at Oliver and the large aqueduct which now supplies Winnipeg with soft water, thereby saving millions of dollars.

Professor Gillespie concluded his talk by referring to the pictures of several of the pioneer engineers of Canada and giving short sketches of their lives. At the conclusion of his talk the speaker was given a most hearty vote of thanks.

The branch was very pleased to have with them Lt.-Col. H. J. Lamb, M.E.I.C., superintending engineer of the Department of Public Works of Canada in Ontario, and also vice-president of The Association of Professional Engineers of the Province of Ontario. Upon being asked by the chairman to address the meeting, he brought up the question of the proposed amendment to the Professional Engineer's Act of 1922. He forcefully pointed out the nature of the proposed amendment and the advantages to be gained thereby, and asked the branch to support it. After quite a lengthy discussion of the whole subject, on motion of J. J. Newman, M.E.I.C., and W. J. Fletcher, A.M.E.I.C., the Border Cities Branch endorsed the application of the Professional Engineers for an amendment to the Engineers Act of 1922 as explained by Colonel Lamb, and that collectively and individually pledge their support of the committee.

Calgary Branch

G. P. F. Boese, A.M.E.I.C., Secretary-Treasurer.
W. St. J. Miller, A.M.E.I.C., Branch News Editor.

Hydro-Electric Development*

A. B. Sanborne, manager of the East Kootenay Power Company, Ltd., gave a very interesting address before this branch on February 23rd. A good number of the members were present, as were also Mayor George Webster and Commissioner A. Graves and heads of other city departments interested in the subject of water power. The subject of "Hydro-Electric Development" was dealt with by Mr. Sanborne in such a manner as to convince his hearers that he had his subject well in hand.

The discussion that followed was quite as enjoyable as the address itself as the speaker answered the many questions so ably. Referring to the question of competition between coal and steam power plants and hydro-electric plants, Mr. Sanborne cited cases in Pennsylvania where steam power from coal was successfully competing for distribution to the mines. There was no doubt in his mind that water power was much cheaper in practically every case than coal-steam plants, and especially so in southern Alberta.

F. R. Robertson, A.M.E.I.C., emphasized the difficulties of hydro-electric power companies in contending with lightning, wind, storms, also the trouble with ice, especially the frazil ice in the fall. On the Bow river the warm Chinook wind followed by severely cold weather was the worst condition. At the Calgary Power Company's plant at Seebe, sheet ice had been attacked, with some success, by air compressors, the pipe being laid under water and exhausted. In this connection Mr. Sanborne told of his experiences when ice had formed on the inside of pipe lines even with the water in movement.

Further discussion included the possibility of large power projects in sparsely settled areas becoming paying propositions. Commissioner Graves stated his opinion that a hydro-electric proposition was preferable due to the probability of strikes in coal mines.

R. A. Brown, superintendent of the street railway, gave some interesting facts concerning hydro-electric power in Canada stating that 92 per cent of the total power produced was by this means, 6 per cent from steam, and the balance from gas and other means. He traced the history from the first hydro-electric plant in the British Empire of 500 k.w. to a plant of 500,000 located in Ontario, Canada. He gave the Chinese credit for originating this method of producing power some 3,000 years ago, and it was not until 1881 that a successful plant was installed on this continent. He declared that the discussion arising out of the splendid address of Mr. Sanborne has been an education in itself.

Mayor Webster stated that he was a trifle hazy as to what took place in 1881, and had completely forgotten what the Chinamen did 3,000 years ago, but he did know that the steam plant in Calgary was operating as efficiently as possible considering the conditions. He concluded, however, that there was no doubt that hydro-power was much cheaper and we had an opportunity of cheap power with proper storage development in the mountains. What we need in Calgary was the absolute assurance of continuous service without the inconvenience of coal strikes. He believed that storage at Spray lakes would control flood conditions for all time, and saw no reason why we should not have all the power required from this particular hydro development, instead of having to depend to such a large extent on steam power.

Steam Accumulators and Pulverized Coal*

Steam accumulators and pulverized coal were two subjects on which the branch was enlightened on March 6th. A. J. T. Taylor, M.E.I.C., managing director, Vickers and Combustion Engineering Corporation, was the speaker, and we are indebted to him for one of the most interesting and enjoyable addresses yet delivered to the branch. Mr. Taylor is a past master in the art of delivering an address, and it has been conceded on all sides that he treated his subject in such a manner as to be readily understood by all.

M. H. French, A.M.E.I.C., moved a vote of thanks to the speaker, which was seconded by the chairman, R. S. Trowsdale, A.M.E.I.C., both of whom eulogized Mr. Taylor on his ability as a speaker, and on the manner in which he had presented his subject to the members. An active discussion took place, and it was with regret that the meeting terminated on account of the lateness of the hour.

Edmonton Branch

W. R. Mount, A.M.E.I.C., Secretary-Treasurer.

At the regular monthly meeting held on February 26th, in the McDonald hotel, the members were addressed by C. A. Davidson, commissioner of highways for the province of Alberta.

The speaker explained at the outset how the staff of the Highways Branch had grown in 1924 from meagre proportions within a very short time, in an endeavour to put through a large and scattered mileage of main highway construction, with a view to earning some of the grant from the Dominion government, which was available for road construction.

A number of the 1924 contracts had been let for stretches of from 15 to 20 miles, averaging approximately 3,000 cubic yards of excavation per mile, and not a little of this work had to be undertaken a head of completion of working plans. The speaker spoke of some of the difficulties encountered when dealing with a large number of contractors some of whom were unable to produce evidence of satisfactory financial backing. The local farmer, too, appeared in some instances, to consider it his right to have some connection with the actual work.

In the absence of Kells Hall, A.M.E.I.C., R. J. Gibb, M.E.I.C., was the chairman for the evening, and an interesting discussion brought out several points raised by Mr. Davidson's address. The merits of force account and contract work were discussed and Mr. Davidson was able to show how gravel surfacing could be done more cheaply by departmental forces than by contract.

C. A. Robb, M.E.I.C., moved and Mr. Brown seconded, a vote of thanks to Mr. Davidson, which was heartily approved.

*Abstracts of these papers appear on another page of this issue.

Hamilton Branch

H. B. Stuart, A.M.E.I.C., Secretary-Treasurer.

Presentation of Branch Charter

The "Charter Dinner" of the Hamilton Branch was held in the Royal Connaught hotel, Hamilton, on Wednesday evening, March 11th, 1925, with J. J. MacKay, M.E.I.C., branch chairman, presiding.

J. W. Tyrrell, M.E.I.C., immediate past chairman, said grace, and during dinner each member arose, gave his name and in most cases a too scanty autobiography.

After the time-honoured toast to "The King", the chairman outlined the purpose of the gathering and introduced Vice-President J. B. Challies, M.E.I.C., who reviewed briefly the constitution and organization of the E.I.C., touched upon the problems facing it at present and, with the able support of O. O. Lefebvre, M.E.I.C., presented the charter to the branch. A much appreciated personal touch was added when photographic copies of the charter were presented by Mr. Lefebvre to the immediate past chairman, the chairman, and the secretary of the Hamilton Branch.

Hugh A. Lumsden, M.E.I.C., county engineer of Wentworth, presented the E.I.C. Student's Prize to Harold M. Thompson, S.E.I.C., for the latter's paper on "Mechanical Equipment used in Road Construction and Maintenance".

Everyone regretted exceedingly that Mr. Lefebvre had to leave early in order to take a train. His visit was all too short and the members of the Hamilton Branch hope to see him again and often.

Mr. Challies spoke on his "Impressions on the World Water Power Conference at Wembley". He stated that, as more than one evening would be required to tell of the discussions on the civil engineering aspect alone, he would attempt to point out only the high lights. A few of the points upon which he threw light were: — Old world and new world attitudes of mind, even among engineers; Lord Derby, "the uncrowned king of Lancashire"; the language difficulty; aesthetic treatment of power plants in Italy at a cost less than an architect's fee here; effect of exportation of power on Swiss industry; the meticulousness of continental hydraulic calculations and observations; splendid and finished entertaining. To sum up he provided sufficient matter over which any engineer might ponder for many an evening.

The vote of thanks was moved by R. K. Palmer, M.E.I.C., and carried unanimously.

Messrs. Johnston and Downie, the chairman and secretary respectively of the Niagara Peninsula Branch brought the greetings of their branch and initiated plans for a joint summer meeting of the two branches together with a tour of inspection of the Welland ship canal.

Following the secretary's intimations of future meetings, the chairman threw the meeting open for general discussion as to how branch affairs might be managed so as to approach more closely the ideals as set forth on the front cover of *The Journal*. Many points were brought out and particular encouragement was given to the younger members who will undoubtedly benefit by this training.

Kingston Branch

G. J. Smith, A.M.E.I.C., Secretary-Treasurer.

Electricity in the Paper Industry

A regular meeting of the Kingston Branch had been arranged for Thursday evening, February 26th, in Carruthers Hall, Queen's University, but due to unforeseen circumstances it was found necessary to postpone it until the evening of March 3rd. The subject of the evening was "Electricity in the Paper Industry", and was dealt with by Professor J. W. Bain, A.M.E.I.C., assistant professor of electrical engineering at Queen's. The chairman of the branch, Major L. F. Grant, A.M.E.I.C., occupied the chair.

Professor Bain had extensive experience in paper mill work and methods, and his handling of the power end of the subject was very thorough and most interesting to the members of the branch present. Some twenty lantern slides were shown illustrating the details of some of the more complicated machines, and an instructive discussion followed the address, particularly as to the question of electricity vs. coal for steam production, and the speed regulation of the machines, necessitated by the stretch or shrinkage of the paper stock in passing through.

A hearty vote of thanks was tendered to the speaker in closing.

On the evening of March 5th, the Kingston Branch of *The Institute* united with the Engineering Society of Queen's University to hear an address by T. Linsey Crossley, A.M.E.I.C., on "Pulp and Paper".

Pulp and Paper

Mr. Crossley, who is chairman of the Pulp and Paper Association of Canada and assistant editor of the *Pulp and Paper Magazine*, is exceedingly well versed in the subject, and his lecture which took place in Ontario Hall, Queen's University, proved most interesting and instructive to his large audience of Queen's and R.M.C. students, members of *The Institute* and citizens of Kingston. The address had an added interest due to its dealing with the general aspect of a subject, one phase of which, had been explained to the branch a few days previously in the application of electricity to the pulp and paper industry.

F. S. Lee, S.E.I.C., president of the Engineering Society of Queen's, acted as chairman of the meeting and at the close a vote of thanks was moved by Major L. F. Grant, A.M.E.I.C., chairman of the Kingston Branch of *The Institute*.

A motion picture of several reels, entitled "Canadian Sulphite Pulp" was shown followed later by a number of slides and diagrams of water powers and different machines used in the process of pulp and paper making, the speaker explaining the pictures as they were shown.

Mr. Crossley emphasized the importance of the pulp and paper industry in its future possibilities for the engineer, first in the process of the manufacture itself where the field is almost unlimited. The length of experience of the practical mill man is absolutely no criterion of the length of time in which a technically trained man could arrive at the same state of efficiency; that is, the educational advance is bound to be much more rapid than the non-educational advance, other things being equal. From a structural standpoint, he pointed out its great importance since, in the next few years, many millions of dollars are to be spent in the construction of new mills and in the enlargement of the present ones.

Lethbridge Branch

N. H. Bradley, A.M.E.I.C., Secretary-Treasurer.

Annual Meeting

BANG !

That one word sums up the spirited way in which the Lethbridge Branch carried through the last meeting of the season. Everything went with a bang from the moment when the sixty odd members and Branch Affiliates sat down to the flower-decked dinner tables, to the conclusion when the crowd broke out in one spontaneous round of applause for the speaker of the evening, Major A. L. Cuffe, squadron leader of the High River Forest Patrol Service.

The greatest of good fellowship prevailed throughout. The community singing made the rafters ring. The Sons of England quartette, enthused by the great reception accorded them, gave four selections and when the members still clamored for more, two of their number sang solos. The branch orchestra which has entertained throughout the season was on duty again and all through the dinner rendered everything in their repertoire from classic to jazz.

It was a "peppy time", and when John Dow, the genial, hard-working chairman rose to deliver the speech that was to terminate his term of office, the applause told him of his popularity. "John's speech complimented everybody except himself," to quote "Bob" Livingstone, M.E.I.C., the newly elected chairman. To Gavin Houston, M.E.I.C., Mr. Dow gave credit for the splendid programme of papers read during the season. To read the list below will give something of an idea of how well Mr. Houston carried out his task:

- Major Geo. A. Walkem, M.E.I.C., "*The Engineer as a Public Man*".
- Col. H. C. Boyden of Chicago, "*Concrete*".
- James Davidson of Calgary, "*A trip to the North Pole*"; (Mr. Davidson was himself a member of the second Peary expedition).
- D. P. Carlyle, "*Dairying*".
- Dean R. W. Boyle, M.E.I.C., "*The Social Scientific Century*".
- W. B. Trotter, A.M.E.I.C., "*Central Heating*".
- Mr. De Hart, "*The Mining Industry of Canada*".
- H. P. Keith, A.M.E.I.C., "*Main Highway Construction*".
- W. D. Armstrong, "*Manufacture of Cement*".
- Major A. L. Cuffe, "*The Use of the Aeroplane in Forest Patrol*".

The musical end of Lethbridge meetings is always an outstanding feature and Sam Porter, M.E.I.C., was entitled to every particle of praise given him by the retiring chairman. "Mr. Porter failed in only one particular," said Mr. Dow, "and that was in the complete break-down of the famous quartette". Be it said, for the benefit of those who have never heard the particular quartette referred to that it was composed of certain members who pretend to be engineers first and singers only by accident. Their parodies of famous songs were wonders as compositions go, and when they refused finally to continue the pastime, genuine regret was expressed.

It was with regret also that the branch received the resignation of George Brown, A.M.E.I.C., as secretary. Mr. Brown however, continues with the branch as a member of the new executive.

The officers for 1925 and 1926 were elected as follows:

Chairman	Robert Livingstone, M.E.I.C.
Secretary-Treasurer	N. H. Bradley, A.M.E.I.C.
Executive	G. S. Brown, A.M.E.I.C., G. N. Houston, M.E.I.C. M. Freeman, A.M.E.I.C.
Auditors	C. J. Broderick, W. G. Aldous.

The secretary's report showed a steadily increasing membership and considerable cash on hand.

The Use of Areoplanes in Forest Patrol

Major A. L. Cuffe, squadron leader of the High River Aerial Forest Patrol, gave a talk on the work of air patrols that was intensely interesting. Illustrated as it was by over one hundred slides, it gave his audience a realistic description of what Canada owes to its air force in the routine work of peaceful pursuits. As the efficiency of these patrols increase with experience and better equipment, the destruction of our timbered areas by fire will rapidly diminish.

The Major was accorded a vote of thanks for his splendid address. Thus closed for the Lethbridge Branch a season replete with entertainment and instruction.

Moncton Branch

M. J. Murphy, A.M.E.I.C., Secretary-Treasurer.

Ancient Architecture

"Ancient Architecture" was the subject of an illustrated lecture delivered by Dr. Delano of Mount Allison University before the branch on the occasion of the regular monthly supper-meeting held at the Barker House on February 18th.

As explained by Dr. Delano, the city of the Ancients was created primarily as a social center, not as the result of industrial needs. Furthermore, it was a religious institution and, according to custom, always built on the top of a hill. The houses were of masonry construction, and notwithstanding the lack of modern handling machinery, remarkable feats of building were performed. The speaker cited an instance of a wall built of stones, fourteen feet long and seven feet wide. These stones were transported many miles on specially constructed wheels, and were placed in position entirely by human hands without the aid of lifting machinery. No mortar was used, and so well were the stones fitted that it would be difficult to locate the joints. Thousands of years have passed and this wall still withstands the test of time.

Special reference was made to the ancient amphitheatres. Although roofless, they were in many respects more comfortable than our modern theatres, particularly in the matter of seating arrangements. In conclusion, Dr. Delano gave a brief description of the streets of the ancient cities. These were little more than lanes, none exceeding fourteen feet in width. They were used almost exclusively by pedestrians.

A vote of thanks was extended Dr. Delano for his interesting and instructive address. Previous to the lecture, two very pleasing solos were rendered by Mr. A. Lorne McKendrick.

Electrolytic Corrosion

The Moncton Branch held a supper-meeting at the Barker House, on the evening of March 12th. C. S. G. Rogers, A.M.E.I.C., acted in the capacity of chairman.

During the evening, an interesting address was read by C. L. Roach, B.Sc. Jr.E.I.C., (N.S. Tech.), acting plant engineer, New Brunswick Telephone Company, St. John, his subject being "Electrolytic Corrosion". Mr. Roach's paper was followed by a general discussion on corrosion — its causes and effects.

A hearty vote of thanks, moved by H. Jardine, M.E.I.C., and seconded by G. E. Smith, A.M.E.I.C., was tendered the speaker of the evening by the chairman.

Montreal Branch

C. K. McLeod, A.M.E.I.C., Secretary-Treasurer.
Stanley A. Neilson, A.M.E.I.C., Branch News Editor.

Maintenance-of-Way.

G. L. Moore, chief engineer, maintenance-of-way, Lehigh Valley Railway was the speaker of the evening on February 19th, 1925, on which occasion he read a paper on the work carried on by his department. The paper was illustrated by lantern slides and two reels of moving pictures in which the very modern equipment as used by the Lehigh Valley Railway was shown in operation.

F. L. C. Bond, M.E.I.C., occupied the chair, and following a discussion by a number of the Canadian railroad engineers present, a vote of thanks was moved by J. L. Busfield, M.E.I.C.

The Export of Power

On Thursday, February 26th, 1925, the Montreal Branch devoted the entire evening to the discussion of a subject which is of great general interest at the present time, namely the "Export of Power". The chair was occupied by J. L. Busfield, M.E.I.C., chairman of the branch, who opened the meeting with the following remarks:—

> "It has always been my policy that we should not only discuss in our meetings purely engineering and technical problems, but also show that we are good citizens of our community by discussing from time to time such matters of public interest as are related to engineering in its various branches. There is undoubtedly some difference of opinion as to what constitutes a fit subject to be openly discussed in this hall, but to my mind there is no question but that practically all engineering involves economics in some form or other, and furthermore, that engineers have the broad vision and knowledge necessary for an intelligent discussion of many of the economic problems which arise from time to time as affecting the community at large. The subject of "Export of Power" is one of these problems.
>
> "There has been some criticism regarding the holding of this meeting this evening on the ground that it is not an engineering subject but purely political. Personally I think it is possible to discuss the subject purely from the viewpoint of engineering economics and I have every confidence that the various speakers of this evening will bear this in mind.
>
> "I am going to admit that after this reference to politics was made to me, I gave the matter some thought and began to wonder just what is this bugbear called politics. In order to get enlightenment I looked up the word in the Universal Dictionary and the definition there given satisfied me more than ever that it was entirely appropriate that we should have this discussion this evening and moreover that politics are apparently well within the sphere of engineering activity. The definition to which I refer reads as follows:—
>
> *Politics* — The science which treats of the distribution of power in a country. Domestic politics investigates the distribution of power among the several classes or individuals belonging to a particular country."

The principal speakers of the evening, reports of whose speeches appear elsewhere in this issue, included F. W. Cowie, M.E.I.C.; C. J. Desbaillets, M.E.I.C.; F. B. Brown, M.E.I.C.; H. E. Pawson, M.E.I.C.; and Royal LeSage, A.M.E.I.C. A large number of those present took part in the general discussion from which the following extracts are taken:—

HENRY HOLGATE, M.E.I.C. The question involves two elements, first, sentiment; secondly, economics. The conservation of natural resources does not mean, tying them up. It means, using them to the best possible advantage. It seems impossible to imagine that Canada can consume all available power within a reasonable time. Therefore, I agree with Mr. Brown that with possible restrictions and contracts properly drawn up for a long term we could satisfactorily and profitably export our surplus. We must on the other hand consider to what extent the export of power would hinder or delay development of industry here. This whole question is very serious and deserves much more study as an economic question than has been given it so far. I am in favour of export of power with proper restrictions and a good revenue to the government.

J. M. ROBERTSON, M.E.I.C., said he was definitely against the export of power. There are a very large number of angles from which to look at the question, but there are two or three underlying principles which are most important. There is a lot of power available. We would export it, and if we could get it back, then go ahead. But it has been admitted by speakers that we cannot get it back, then are we going to export for a small price? If we are not going to grow up to it or if we can get it back, then alright, go ahead and export. If we are going to grow up, if we cannot get it back, if we are looking out for the benefit of our grandchildren, then hang on to our power, by all means.

L. D. W. MAGIE, M.E.I.C., of Peterborough, Ont. We want to and ought to develop all our power. If we can export and then get it back later when we need it, then go to it.

J. H. HUNTER, M.E.I.C. I have been listening all night to power engineers. I want to speak as a user. The United States is surrounded by a fence. They like to come here, pick up our resources, take them home, manufacture them, use what they want and sell what they don't want to the rest of the world. We have never got anything back from them yet. If you exported power, do you honestly think we could get it back? No you don't. If we export power, they will use it as a scourge. "I am emphatically against the export of power."

J. A. JAMIESON, M.E.I.C., said he was in favour of exporting power under regulation of contracts.

J. C. KEMP, A.M.E.I.C. What percentage of available power is within transmission range of the border?

F. B. BROWN, M.E.I.C., said he thought about 5,000,000 h.p.

R. O. SWEEZEY, M.E.I.C., estimated it at about three and one-half million from Niagara, three and one-half million from St. Lawrence, one million from the St. Maurice, and one million from the Ottawa Valley.

E. A. FORWARD, M.E.I.C., said he would draw attention that we had then available for export about seven million, right in the heart of where the manufacturing in this country would naturally be.

Invisible Radiations.

Dr. L. E. Pariseau gave the members of the Montreal Branch a treat on March 5th, when he entertained them for over three hours by taking them on a trip from one end of the spectrum to the other. His lecture was well illustrated by demonstrations with apparatus which had been set up on the platform. Infra-red, ultra-violet, X, gamma and several other kinds of rays were described and illustrated, the evening finishing up with a demonstration of the X-ray machine and of the radioactive properties of radium.

Improvements in the Design and Appearance of Highway Bridges.

A paper on the above subject was read to the branch on March 12th, by C. J. Desbaillets, M.E.I.C. It was profusely illustrated with lantern slides which very forcibly brought out the points stressed by the speaker.

Steam Storage and Steam Accumulators

G. E. Lofgren of the Ruths Steam Accumulator Company, Stockholm, favoured the Montreal Branch on March 19th with a most interesting paper on the subject of steam storage and steam accumulators.

Ottawa Branch

F. C. C. Lynch, A.M.E.I.C., Secretary-Treasurer.

The need for the development of secondary education along technical lines was impressed upon members of the Ottawa Branch, at luncheon at the Chateau Laurier, March 3rd, by Prof. L. W. Gill, M.E.I.C., F.Am.I.E.E., principal of Hamilton Technical School, and formerly of Queen's University. The immediate need of all education was to train man to earn a living, for unless he could do this he was a weakness to the community. The technical school gave the 70 per cent of all children, who never progressed beyond the public school, a new interest in knowledge.

The luncheon was largely attended, and A. F. Macallum, M.E.I.C., chairman of the Ottawa Branch, presided. Those at the head table were Major-General J. H. MacBrien, Controller Tully, Dr. James W. Robertson, G. J. Desbarats, M.E.I.C., Gerald Brown, C. A. Bowman, A.M.E.I.C., A. W. Crawford, Jr.E.I.C., W. W. Nichol and Ewan Mason, Hamilton.

In defining the end of popular education, Prof. Gill liked the definition of Dr. James W. Robertson, that "Education was a preparation of body, mind and spirit for some useful occupation". He believed that the old Greek and Roman idea of finding work for all was the best, as it did not bring forth a class which believed that the community owed them a living.

Prof. Gill believed that education should inculcate into boy and man the instinct of appreciation of the fact that his welfare is bound up in the community. The teaching of civics was a step in the right direction, but that subject did not awaken a man's or boy's consciousness of his responsibilities. The universities were largely vocational training institutions, and Prof. Gill believed that the technical education should have some end in view. It should give a good general education, a grounding in good English and an insight into history. The technical student should be taught the why and the wherefore of the trade he or she has in view. The technically trained man becomes a more skilled mechanic than if he had not received special training.

The expense of technical education often brought up the question of its value and usefulness. Such education must cost more than ordinary high school training. Prof. Gill pointed out that of 100 boys commencing public school less than one finished the university, and only 30 commenced high school. The remaining 70 per cent could hardly be driven to high school, or if they attended they would not study. They had lost interest in book work or had insufficient vision to see its application to the ordinary forms of work.

As man was naturally a creative creature, he loved to plan and build, and the technical school gave 70 per cent who had lost interest in books an opportunity to express their individuality and interest was reawakened. The student soon realized the practical value of mathematics, for instance, and he got a new interest in the classroom. It was a work well worth spending money on.

The technical school performed another great service. It took care of the boy or girl during an impressionable age, when, if the proper spirit of citizenship was not obtained, there remained good soil for the talk of the agitator. Culture was not great learning, but was refinement of character, and in the technical school there was only one way of doing a thing, the right way, and gradually a habit was formed that was the highest kind of culture.

He believed that the only real way character could be trained in the school was with the aid of the character and personality of the teacher. Secondary school teachers were in the class of nation builders.

Ventilating Electric Motors

An instructive entertainment was provided for the guests and members of the Ottawa Branch in the Victoria Memorial Museum, on February 19th, when two excellent reels of film, lent to the branch by the Wagner Electric Corporation of St. Louis, Missouri, were screened, showing by means of motion pictures and mechanographs new principles in ventilating electric motors and the importance of proper ventilation. They also depicted the gradual development of the means of producing power from the primitive methods employed by the ancient Egyptians to the latest type of the modern induction motor.

The motion pictures were preceded by a short talk by John Murphy, M.E.I.C., F.A.I.E.E., in which he explained the application of the principles involved in the ventilation of electric motors. Mr. Murphy referred to the discovery of the magnetic field by Farraday about 100 years ago, and as the result of his experiments then the principles of the electric generator and electric motor of to-day were evolved. The electric motor was discovered by Gramme, in 1878, quite by accident, and the first one was utilized in regular service in Ottawa in the Russell House in 1890. Up until 1891 direct current motors were used exclusively.

From 1889 alternating current was used in this district for lighting, but it only came into use for driving motors, after the Hull and Ottawa fire in 1900, when alternating current generators suitable for both light and power were installed, and some of them are still in use. They are very rugged and will run for a year without stopping.

Mr. Murphy also compared the work accomplished by man power and motor power, and showed that the same amount of work could be accomplished by electric power for one cent which would require an expenditure of $20 for man power, wages being at the rate of 50 cents per hour. Each one-horse-power motor would replace 30 men.

Mr. Murphy also showed a few slides, which served to illustrate the development which motors and generators have undergone in recent years.

Peterborough Branch

P. Manning, A.M.E.I.C., Secretary.

W. E. Ross, A.M.E.I.C., Branch News Editor.

On the evening of February 26th, W. R. Goddard, president of the Canadian Porcelain Company of Hamilton addressed the members on the subject of "Electrical Porcelains".

Electrical Porcelains

Mr. Goddard, in his opening remarks, pointed out to his audience that the making of porcelain insulators is merely a branch of the potters' art, that the art is over four thousand years old and that no remarkable progress or fundamental changes have been made in the last thousand years, insofar as the actual methods of making porcelain are conceived. He pointed out that all true porcelain consists of clay, flint and feldspar and briefly described the methods of mixing, glazing and firing.

In respect to porcelain insulators, the speaker stated that their use for high voltage work dates practically from 1900, and had led to an almost infinite number of designs and sizes, some of which are fairly complicated, but he stated that it was his opinion that the period of radicalism could safely be said to be past and that the design of line insulators has settled into pretty well defined channels, although a steady improvement in the quality of porcelain and refinements in design could be looked for.

Mr. Goddard then described in detail the special features of line insulators for the higher voltages, the methods of making joints between the porcelain parts, and the mechanical and electrical testing both during and after assembly, and also described some typical failures in insulators and their causes.

The address was illustrated throughout with lantern slides, in addition to which Mr. Goddard showed samples of raw material, various parts of insulators and some completed samples.

The chair was occupied by E. R. Shirley, M.E.I.C., chairman of the branch, and at the close of the meeting the thanks of the members were conveyed to Mr. Goddard by B. L. Barns, A.M.E.I.C.

Modern Pulp and Paper Making Equipment

Another regular meeting was held on the evening of March 12th, under the chairmanship of B. Ottewell, A.M.E.I.C., at which A. D. Ross, pulp and paper engineer of the Canadian General Electric Company, Toronto, was the speaker. Mr. Ross stressed the importance of the paper industry, pointing out that it led all other industries in Canada in consumption of power, and gave a few figures to illustrate his point, stating that there are 104 mills with a total investment of $400,000,000 and employing 26,000 men; the total output of newsprint from these mills being estimated as 5,000 tons per day.

The speaker gave a brief description of paper making methods and the materials used from the earliest Chinese bamboo fibre paper to the most up-to-date methods of the present time, illustrating the modern methods by lantern slides and particularly referring to the electrical equipment in use at the plant of the St. Maurice Lumber Company at Three Rivers, Que., which plant, Mr. Ross informed his audience, is completely electrified, and has a connected load of 34,000 horse power.

For this occasion, and by the courtesy of the General Electric Company, Schenectady, a special two reel film was available entitled "The World of Paper". This film proved to be both entertaining and interesting, as it traced the history of paper from the ancient Egyptian papyrus down to the most up-to-date methods, incidentally showing the parallel development of printing.

Mr. Ross was called upon to answer many questions from the members, after which a hearty vote of thanks was tendered him on the motion of R. B. Rogers, M.E.I.C.

Niagara Peninsula Branch

R. Hogg, Jr.E.I.C., Branch News Editor.

At a meeting of the branch, held in the Chamber of Commerce rooms in St. Catharines, on March 19th, an interim report was presented by the committee formed to bring to the attention of the Council of *The Institute* the injustice of a recent ruling on the Superannuation Act. This ruling bars from participation under the act the engineering staff of the Welland ship canal. The committee consisted originally of E. G. Cameron, A.M.E.I.C., and F. S. Lazier, M.E.I.C. Mr. Lazier was unable to attend the annual meeting in Montreal, whereupon F. E. Sterns, A.M.E.I.C., was prevailed on to act in his place. Mr. Cameron gave a detailed report to the meeting of what progress had been made so far, which included the information that a committee of the Council have taken the matter in hand. Mr. Cameron was not elated over the results so far attained. His report brought out a great deal of discussion in the meeting. The members from the ship canal, who form a large proportion of the branch membership, are quite worked up over the question and resent very much what they consider unfair discrimination on the part of the government.

St. Catharines' New Filtration Plant

When this discussion had subsided, the meeting was addressed by Alex. Milne, A.M.E.I.C., superintendent of the St. Catharines waterworks. The city of St. Catharines has just broken ground for a large modern filtration plant, to be built on the site of the present chlorination plant at Decew falls, at a cost, including pipe-lines, of about $360,000. The town of Merritton, the village of Port Dalhousie and the suburbs of the city itself will share in the costs and benefits of the development. It has not yet been decided whether Thorold will also come into the scheme.

In his address, Mr. Milne gave a short outline of the water-works history of the city, following with a description of the plant-to-be. The address, illustrated by blue-print sketches and plans, was of a very interesting and instructive nature, and the speaker at the conclusion of his paper, was called upon to answer numerous questions, which he did in a very able manner.

L. B. McCurdy, A.M.E.I.C., of Nova Scotia, attended the meeting in company with Mr. Milne and was introduced to and welcomed by the members. Mr. McCurdy has come to this district to take charge of the building of the new water-works, in the capacity of resident-engineer.

Sault Ste. Marie Branch

A. H. Russell, Jr.E.I.C., Secretary-Treasurer.

The regular monthly meeting of the Sault Ste. Marie Branch was held on Friday, February 27th, 1925, following a dinner at the Y.W.C.A. Wm. Seymour, M.E.I.C., chairman, called the meeting to order and introduced the speaker, E. A. Davis, assistant superintendent of the coke plant, Algoma Steel Corporation, who gave a paper on "Safety First as practised at the Coke Plant of the Algoma Steel Corporation". By the aid of charts and lantern slides he fully outlined the system that has been adopted at the coke plant and which has proven very successful. The number of accidents have decreased and the efficiency of the men have increased, thus it takes less men to do the work.

A practical demonstration of the Prone method of resuscitation was given by two of the committee. A lively discussion followed by all present and Mr. Merrifield, chairman of the safety first organization of the transportation department, said that in his department since safety first was started, accidents have been reduced by 90 per cent, and there has only been one man killed in the last two years.

A hearty vote of thanks was tendered Mr. Davis for his splendid paper.

A resolution was adopted authorizing the chairman to appoint a committee to meet similar committees from other organizations to discuss the forming of a "Safety League" in the city of Sault Ste. Marie.

St. John Branch

W. J. Johnston, A.M.E.I.C., Secretary-Treasurer.

Again the citizens of St. John showed their interest in the meetings of the St. John Branch of *The Engineering Institute of Canada* when many attended a branch meeting on January 15th, 1925, and learned of "The Progress of the Admiral Beatty Hotel" as told by R. H. Macdonald, vice-president, Ross and Macdonald Inc., architects, Montreal. The address was of timely interest as all the citizens are interested in St. John's new eight-storey hotel now under construction, and considerable local capital is invested in the undertaking. It will contain one hundred and eighty-four guest rooms, and will prove a distinct addition to hotel accommodation in St. John. It is expected to open the hotel in June next. The address by Mr. Macdonald treated of a number of problems met by the architect in hotel planning with particular reference to the plan of the Admiral Beatty hotel.

As is often the case at a meeting, the discussion engaged in, when those present were invited to ask questions regarding the lecture, brought out several points in addition to those treated in the paper. It was noticeable that many of the questions asked were not by branch members, but from the general public, showing their interest in this project. In reply to a question why the windows looked so small, the speaker replied they might appear small from the size of the building, but they were in reality four by five feet, and were chosen this size to prevent undue heat radiation. Other questions asked and satisfactorily answered included whether the face wall would tarnish in the salt air of St. John; if the size of the ball-room would accommodate a big dance, and whether the skill of the contractors or the mild weather during the past autumn would account for the rapid progress in pouring concrete.

G. G. Hare, M.E.I.C., chairman of the branch, presided at the meeting. A vote of thanks was extended to Mr. Macdonald, on motion of J. N. Flood, A.M.E.I.C., and W. R. Pearce, M.E.I.C. There was a good attendance of branch members, including some from out-of-town, who were in the city attending the annual meeting of the Association of Professional Engineers of New Brunswick.

Quebec Branch

Louis Beaudry, S.E.I.C., Secretary-Treasurer.

A regular luncheon-meeting of the Quebec Branch was held at the Chateau Frontenac, on Monday, February 23rd, 1925, at which the members and a few friends had the pleasure of hearing J. H. Fortier, general-manager of the P. T. Légaré Company Limited, and general vice-president of the Manufacturers' Association of Canada.

Mr. Fortier, who is a prominent figure in the financial circle of our city, said that the engineers were not unknown to him, having been in contact with some of them more than once in his life, and that he greatly appreciated the honour of addressing us.

The speaker referred to the present situation of our city. He called upon the civil engineers to lend their support in the movement to improvements and only through their co-operation could the requirements be met. Now was the time to have the necessary improvements made, especially in view of the facts that our port was being enlarged and the number of tourists visiting our city was increasing rapidly. Conditions would grow worse as time goes on.

The speaker was extended a vote of thanks by Arthur Amos, A.M.E.I.C., and our chairman, A. R. Décary, M.E.I.C., also added his thanks for the interesting address made by Mr. Fortier.

Some Duties Common to Both the Engineer and the Lawyer

On Monday, March 9th, Louis S. St-Laurent, K.C., was the speaker at a luncheon-meeting held at the Chateau Frontenac.

Mr. St-Laurent made an impressive appeal for the elimination of waste, which was an essential part of economic government and should be seriously considered not only by those in charge of the destinies of the nation but also by the citizens. Mr. St-Laurent dealt particularly with the common duties of the engineer and the lawyer, but his remarks applied to every citizen of the nation. "Economy must be the watchword if Canada is to proceed to its proper destiny," he said.

Launched on his subject, Mr. St-Laurent said that as a people we had come to a pass where all waste must be avoided. Nature was so bountiful that it did not allow for a certain amount of waste, but it had its factor of safety just as definite as that provided by the most minute calculations of the engineers, and in the past decade we had been running so close to the limit of that factor of safety that there must now be a slowing down and a period of recuperation. So much had been wasted that it was now necessary to replenish depleted stocks.

At the present time, the speaker continued, this was only a duty common to the engineer and the lawyer and common to the responsible people who go to make up the community. He thought that the lawyers could help cut out a lot of unnecessary expense by keeping people out of litigation which involved the time and energy of men, and the expenditure of money which could be employed in more useful channels. Separately individual efforts might not appear to amount to very much, but if these efforts were repeated often enough throughout the country, in the aggregate, it would soon represent a very large saving.

In closing his address, Mr. St-Laurent said Canada had reached a pass where the nation was running deeper and deeper into debt though from year to year the people had to dig deeper into their pockets to pay the taxes which must inevitably be the accompaniment of public debt. Therefore it behooved them to see that waste was avoided in all the social and economic activities of the people.

Mr. St-Laurent was introduced to the gathering by our chairman, A. R. Décary, M.E.I.C., and at the conclusion of his address, he was accorded a hearty vote of thanks which was moved by S. L. deCarteret, A.M.E.I.C.

Victoria Branch

E. P. Girdwood, M.E.I.C., Secretary-Treasurer.

The Victoria Branch held a successful meeting on Wednesday, February 11th, at Victoria College. A. L. Carruthers, M.E.I.C., provincial bridge engineer, gave an interesting lecture upon different types of bridges and modes of construction.

Mr. Carruthers described how in the early days the Indians were able to build bridges on the principle of suspension and cantilever type. The illustrations showed different types such as through truss, deck girder and pratt, arch bridges of various designs, suspension bridges, cable and cantilever, direct lift and swing bridges under construction, and in the completed state. Some of the most notable were bridges over the following rivers — Fraser river, Thompson river, Buckley river, Columbia and many other bridges over minor rivers. The bridges, white washed in the dry belt, were an outstanding feature, showing to great advantage and assisting in preservation. The lecture was fully illustrated with lantern slides.

Through the courtesy of the C.P.R. officials, forty members of the Victoria Branch made a private visit of inspection to the "S.S. Kathleen" on Saturday, February 14th.

The Princess is the realization of long years of expectation. The vessel will be on the triangular run, Victoria–Vancouver–Seattle, British Columbia Coast Service.

The Princess Kathleen is the first coastwise steamer to have the metal Mike and Gyro compass installed to replace the usual quartermaster, and there is no doubt that the new compass will prove of great value to the captain in charge, when on the triangle run, for in foggy weather the Princess Kathleen will be able to keep a better course than if steered by hand.

The builders are John Brown and Company, Clydebank, Scotland, and the engines are 12,000-horse power Brown Curtis turbines, and the speed 22.5 knots per hour.

The Victoria Branch had an interesting meeting on Thursday, February 19th, at which the principal subject under discussion dealt with questions connected with our forest resources. The speakers on this occasion were E. C. Manning, whose address was entitled "Depletion of our Timber Resources and the Practice of Forestry", Thos. H. Wilkinson, who spoke on "Forest Protection", and J. H. Blake, A.M.E.I.C., whose address was entitled "Some Economics in Steam Plants".

OTHER SOCIETIES NEWS

Canadian Institute of Mining and Metallurgy, British Columbia Division, Annual Meeting February 18th, 19th and 20th.

The British Columbia Division of the Canadian Institute of Mining and Metallurgy held its annual general meeting in the Hotel Vancouver on February 18th, 19th and 20th of this year.

The occasion marked a distinct step forward in the relationships of the various engineering bodies in British Columbia, and one which may well be emphasized as an example of the kind of co-operation which every Canadian believes is an imperative necessity to the future of our Dominion.

The Canadian Institute of Mining and Metallurgy is the protagonist of the mining industry in Canada, standing for the improvement of mining conditions and the betterment of mining and metallurgical methods. But although this primary function is the reason for its existence, its aims are of much broader scope; and like its sister organizations in the engineering fraternity, the C.I.M.M. is using its energy and resources in the service of our national life.

The British Columbia Division of this Institute, recognizing that the pressing problems of to-day are fraught with considerations of broader aspect than those of merely technical significance, decided to make of its annual meeting an opportunity to attack problems as citizens rather than as engineers, and, subordinating their own particular interests to those of the community at large, the members of the executive invited the co-operation of every available authority in matters of industrial importance.

In the line-up of this convention of men actuated by a constructive purpose were representatives of *The Engineering Institute of Canada*, the Association of Professional Engineers of B.C., the University of British Columbia, the Geological Survey, the Vancouver Board of Trade, the Canadian Manufacturers' Association, the Timber Industries Council, the Provincial Government departments of lands and mines, the Chamber of Mines and the Legislature and Government of British Columbia. Three hundred and seventy people signed the register of attendance.

The principal features of this meeting were valuable symposia of information upon the "Problems of the Pacific Great Eastern Railway", and upon "Economic and Industrial Conditions in British Columbia", and how they may be improved. One whole day was devoted to each of these discussions.

The Problem of the Pacific Great Eastern Railway

The problem of the Pacific Great Eastern Railway was attacked with a thoroughness that brought a high tribute of commendation from Hon. Dr. Sutherland, provincial minister of public works. It was no one-sided argument, opportunity being given to exponents of diverse and opposing views to state their case.

Mr. T. Kilpatrick, manager of the railway, described its history and the purpose for which it was originally intended, its present position and his views as to its future prospects. Mr. Kilpatrick referred to the extent and value of the natural resources of the territory served. The railway is in operation over 370 miles and 45 miles have yet to be constructed between Quesnel and Prince George. It is an unfinished job, and it is due to that cause alone, said the manager, that the operating losses for the past two fiscal years have been $230,786 and $242,207. Mr. Kilpatrick made an appeal for the farmers and settlers along the railway who were struggling on in anticipation of the road's completion.

Suggestions Relative to Completing the Railway

Major W. G. Swan, M.E.I.C., chairman of the Vancouver Branch of *The Engineering Institute of Canada*, presented his views on the problem in relation to the future of the railway. He upheld Mr. Kilpatrick's contention that the non-completion of the railway was the greatest drawback to its future as a paying investment, and emphasized the futility of expecting a line which begins nowhere and ends nowhere, to ever pay. After dwelling briefly on some of the physical features of the country served by the railway as at present constructed, he proceeded to outline his views on the most practical way to complete the line and provide it with the much desired terminus located in prosperous centres. The following were Major Swan's suggestions:—

1. Extend the present line to Prince George, making that thriving town the northern terminus.
2. Build from Clinton to Ashcroft, thereby establishing the much needed southern connection with the port of Vancouver, via the C.N.R. or C.P.R.
3. Dismantle the present Clinton-Lillooet section, using the rails and other salvagable material to build the proposed Clinton-Ashcroft line. Such action would be the more advisable because large expenditures will be required in the immediate future to renew the numerous costly timber structures in this section, if

operation of the railway is to continue. This money could be used to much greater advantage in the construction of the Clinton-Ashcroft line.

4. Lease the section from Lillooet to Squamish to logging interests, protecting settlers along the line with requirement in lease for reasonable freight and passenger service.

5. Abandon the proposal to complete the railway from Squamish to Vancouver because construction presents difficulties which would make the cost financially inpracticable.

Major Swan pointed out that in event of future development of the country requiring a change of policy in respect of the Lillooet-Squamish-Vancouver route, the leasing of the present Lillooet-Squamish section would insure the upkeep of the line in the meantime.

He advised the operation or lease of the completed line from Ashcroft to Prince George at the earliest possible moment, as the only means, in his opinion, of building up a traffic which would put the railway on a paying basis and relieve the taxpayers of British Columbia of their present burden in this enterprise. He strongly objected to the proposal to extend the line into the Peace River district, because such an extension would be of no practical value so far as the P.G.E. problem would be affected, the logical outlet being Prince Rupert rather than Vancouver. This line, if constructed, would provide a feeder to the Grand Trunk Pacific, not the Pacific Great Eastern.

Power Resources

The chief engineer of the Water Rights Branch, Provincial Department of Lands, E. A. Cleveland, M.E.I.C., described the water power possibilities within the territory traversed by the railway. He cited figures which were the result of most careful investigation and systematic recording, which showed that in the numerous rivers and lake systems of the country tributary to the P.G.E., there are very large possibilities for development of hydro-electric power, notably in the Cheakamus and Bridge rivers. The text of Mr. Cleveland's specially prepared paper will be found on another page of this issue of *The Journal.*

Timber Resources

Pacific Great Eastern timber resources were dealt with by P. Z. Caverhill, chief provincial forester. He divided the territory into three areas: the coastal, covering four to four and a half billion feet of Douglas fir, cedar, hemlock and balsam; the Lillooet plateau, chiefly characterized by lodge pole pine, suitable for ties and pulp production, the estimated stand of which is approximately 15,000,000 feet B. M.; and the Quesnel basin, in which the total stand of spruce, balsam, pine, Douglas fir, cedar and hemlock, is estimated at approximately 18,000,000,000 feet B. M. In regard to this section Mr. Caverhill estimated that the annual increment might be roughly assumed as being equivalent to 200,000 feet B. M.

An interesting wall map of the Peace River district was exhibited by Noel Humphrys, representing the Vancouver Board of Trade. Mr. Humphrys spoke most hopefully of the vast possibilities in this northern country. His representations have already appeared in extenso in *The Vancouver Daily Province.*

Geology and Topographical Features

Dr. Victor Dolmage of the geological survey, dealt with geological and topographical features of P.G.E. territory and many of the more important mineral occurrences. The burden of Dr. Dolmage's remarks was that from the point of view of mineral wealth, very little was known of the territory as a whole, but that good grounds existed for believing that more general exploration and intensive study of the geological conditions might reveal resources out of all proportion to those which had been discovered so far.

The secretary of the division, H. Mortimer Lamb, asked Hon. Dr. Sutherland, who was present, if the provincial government would accept from the Institute a summary of the information gathered, with recommendations in regard to a future policy. The minister replied in the affirmative.

As a result of this conversation a resolution was passed that a committee be formed, in conjunction with such representatives of other organizations as might be deemed advisable, to frame and submit proposals to the government in relation to means for affording a better understanding of the natural resources of the territory served by the P.G.E., and especially in regard to the development of the mineral resources, upon which so much depends.

Economic and Industrial Situation in B.C.

The economic and industrial situation in B.C., and how it could be improved, was discussed at length during the third day of the convention. The manufacturing, agricultural, timber and mining industries were summarized first of all and the particular problems in relation to each were set out by high authorities.

Dean Clement, faculty of agriculture of the University of British Columbia, spoke in detail of the several branches of agriculture. His main argument was that while rural development is greatly to be desired, it is quite possible to over-emphasize its importance. Rural development depends upon other industries and unless they progress in proportion, it might very well happen that low prices will be the only result.

The opportunity for British Columbia lay in the improvement and efficiency of methods; in the production of higher-grade agricultural products rather than in great extensions, said Dean Clement. It would be better that money spent on schemes of immigration should be spent on the development of markets. Efficient management is the need of to-day. The interests of the farmer are more concerned with the establishment of refineries for his products than with great developments in new fields. Conservation rather than exploitation should be the watchward of British Columbia.

A discussion was launched upon the different aspects of the industrial situation. The subject of economics was introduced by A. McC. Creery, M.L.A., who stressed the value of a high level of thought in the consideration of the subject under discussion.

George Kidd, president of the B.C. Electric Railway, stated that despite the uneasiness evinced in many quarters and complaints that were voiced in places, it appeared to him that the country as a whole was treading the normal path of progress.

Joint Luncheons

One of the special features of the convention was the series of luncheons held in the Hotel Vancouver in the interim between morning and afternoon sessions. The luncheon on Friday, February 20th, was under the joint auspices of the Vancouver Branch, *The Engineering Institute of Canada,* and the Association of Professional Engineers of B.C. The arrangements were ably conducted by E. A. Wheatley, A.M.E.I.C., registrar of the Association, the luncheon being presided over by Major W. G. Swan, M.E.I.C., chairman of the Vancouver Branch, E.I.C. A very representative number of members from these two organizations in addition to many members of the C.I.M.M. were present.

The luncheon was addressed by Patrick Philip, M.E.I.C., president of the Association of Professional Engineers of B.C., and chief engineer of the Department of Public Works of British Columbia, who gave a most interesting and instructive outline of the "History of Highway Building in British Columbia". Before proceeding with his address, he made some well chosen remarks on the pleasure that everyone evinced in the fact that members of all three engineering bodies were united in one luncheon gathering, and complimented the B.C. Division of the C.I.M.M. on the success of the convention as a whole, at the same time prophesying benefits of far-reaching importance to the welfare of the province which would arise through the free and earnest discussions held on vital public problems during the course of the proceedings.

The final event on the programme of the annual general meeting was a very well attended dinner on the evening of February 20th, in the Hotel Vancouver, the guest of honour being W. Fleet Robertson, provincial mineralogist, whose approaching retirement from the post which he has so ably held for many years, has been announced.

Gift to the Library

The following technical books have been presented to the Institute library by Mr. A. Mossman, and are gratefully acknowledged. These volumes are from the library of Mr. Mossman's son the late Harold Alexander Mossman.

The Theory and Practice of Surveying by J. B. Johnson — N.Y., Wiley, 1910.

Structural Details or Elements of Design in Heavy Framing — N.Y., Wiley, 1910.

Mechanics of Engineering by I. P. Church — N.Y., Wiley, 1908.

Sewer Construction by H. N. Ogden — N.Y., Wiley, 1908.

Tables for the Computation of Railway and other Earthwork by C. L. Crandall — N.Y., Wiley, 1907.

Laboratory Manual: Direct and Alternating Current by C. E. Clewell — N.Y., Wiley, 1913.

Principles of Reinforced Concrete Construction by Turneaure & Maurer — N.Y., Wiley, 1913.

Contracts in Engineering by J. I. Tucker — N.Y., McGraw-Hill, 1910.

River Discharge by J. C. Hoyt — N.Y., Wiley, 1912.

Mechanics of Internal Work by I. P. Church — N.Y., Wiley, 1910.

Railroad Construction by C. L. Crandall and F. A. Barnes — N.Y., McGraw-Hill, 1913.

Field Book for Railroad Surveying by Crandall and Barnes — N.Y., Wiley, 1910.

Sewer Design by H. N. Ogden, N.Y., Wiley, 1911.

American Civil Engineers Pocketbook by M. Merriman — N.Y., Wiley, 1912.

Elements of Descriptive Geometry by O. E. Randall — Boston, Ginn & Co., 1905.

Shades and Shadows of Perspective by O. E. Randall — Boston, Ginn & Co., 1902.

Ordinary Foundations by C. E. Fowler — N.Y., Wiley, 1911.

Text Book on Roads and Pavements by F. P. Spalding — N.Y., Wiley, 1912.

Public Water Supplies by Turneaure & Russell — N.Y., Wiley1913.

Roofs and Bridges by Merriman and Jacoby—N.Y., Wiley, 1911, 3v.

Engineering Index

This Index is prepared by the American Society of Mechanical Engineers.

In this department will be published from month to month the titles of current engineering papers with the authors and source and a brief extract of the more important. It is designed to give the members of The Institute a survey of all important articles relating to every branch of engineering profession.

PHOTOSTATIC PRINTS

Photostatic copies of the articles listed in this section, or others on engineering subjects, may be obtained from the Engineering Societies Library.

Price of each print (up to 11 by 14 in. size) 25 cents, plus postage. Where possible, two pages, up to 7 by 9 in. size, will be photographed on one print. Larger magazines require a print per page. Bills will be mailed with the prints.

The Library is also prepared to translate articles, to compile lists of references on engineering subjects and render assistance in similar ways. Charges are made, sufficient to cover the cost of this work. Correspondence is invited. Information concerning the charge for any specific service will be given those interested. In asking for information please be definite, so that the investigator may understand clearly what is desired.

The Engineering Societies Library is under the management of the United Engineering Society, which administers it as a public reference library of engineering. It is maintained jointly by the American Society of Civil Engineers; the American Institute of Mining and Metallurgical Engineers; the American Society of Mechanical Engineers and the American Institute of Electrical Engineers. It contains 150,000 volumes on engineering and allied subjects, and receives currently most of the important periodicals in its field.

Orders and correspondence should be addressed to

Harrison W. Craver, Director

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AERODYNAMICS

Vortices as Bearing Power. Forces Carrying Airplanes and Their Relation to Distant Hydrodynamic Action (Sur les forces qui portent les aéroplanes et leur relation avec les actions hydrodynamiques à distance), V. Bjerknes. Journal de Physique et le Radium, vol. 5, no. 12, Dec. 1924, pp. 353-367, 5 figs. Discusses formation of vortices below wings to explain bearing power and shows analogy by experiment, also serving as bases for theories of Lanchester and Prandtl.

AIR COMPRESSORS

Electrically Driven. An Automatic Air-Compressing Plant. Engineer, vol. 139, no. 3606, Feb. 6, 1925, p. 170, 3 figs. New electrically driven air-compressing plant installed in crypt of House of Commons, London; two sets of compressors are used, each comprising standard Hamworthy single-cylinder unit with cylinder bore of 10 in. and piston stroke 7½ in.

Rotary. Tests of a Rotary Compressor of 500 Hp. (Essais effectués sur un compresseur rotatif de 500 ch.), C. Ostertag. Bul. Technique de la Suisse Romande, vol. 51, no. 2, Jan. 17, 1925, pp. 14-16, 3 figs. Details of three acceptance tests of 500-hp. compressor built by Swiss company for locomotive and machine construction, showing same efficiency as piston compressors.

Turbo. The Development of the Turbo-Compressor, Carrard. Brown Boveri Rev., vol. 12, no. 1, Jan. 1925, pp. 3-8, 4 figs. Account of improvements effected in design of centrifugal or turbo-compressors since their first appearance on market; shows that various methods of cooling are all equally effective theoretically, but that use of intercoolers is becoming more and more general in modern practice; means available for improving efficiency of these machines; solution consists in combining high speed with large number of impellers; advantages of regulating turbo-compressors by movable diffuser vanes.

Turbo-Compressor at Wimblebury Colliery. Colliery Guardian, vol. 129, no. 3341, Jan. 9, 1925, pp. 87-88, 7 figs. Describes air-compressing plant recently installed; normal running speed is 5000 r.p.m., turbine being standard B.T.H. 4-stage mixed-pressure machine fitted with speed governor, intermediate and low-pressure steam gages and usual accessories.

AIR PUMPS

Steam-Jet. The Steam-Jet Condensing Type Vacuum Pump, J. H. Smith. Elec. Jl., vol. 22, no. 1, Jan. 1925, pp. 17-23, 11 figs. Describes design of condensing-type air ejector, purpose of which is to remove motive steam used in first stage after having completed initial compression of air, thus relieving second stage of this extra duty during completion of compression cycle, and thereby making use of lower ratio of compression; ejector performance; effect of cooling-water temperature; installation and operation.

AIRPLANE ENGINES

Design. Aircraft Engine Design, E. E. Wilson, Nat. Advisory Committee for Aeronautics — Tech. Notes, no. 211, Jan. 1925, 20 pp. 24 figs. on supp. plates. Developments to date, possibilities of future, and underlying fundamental principles.

AIRPLANE PROPELLERS

Designing. Simplified Propeller Design for Low-Powered Airplanes, F. E. Weick. Nat. Advisory Committee for Aeronautics — Tech. Notes, no. 212, Jan. 1925, 10 pp., 7 figs., on supp. plates. Furnishes simple system for designing of propeller and making of drawing; empirical design method is used, based on tests of model propellers in wind tunnel and full-scale tests of propellers in flight.

AIRPLANES

Design. Ninth International Aeronautical Exposition, Paris, Dec. 5-21, 1924 (La IXe Exposition Internationale de l'Aéronautique), Martinot-Lagarde. Technique Moderne, vol. 17, no. 1, Jan. 1, 1925, pp. 18-20. Review of evolution of airplanes, and development of metallic construction.

Metal. Metal Airplanes, W. B. Stout. Soc. Automotive Engrs.—Jl., vol. 16, no. 2, Feb. 1925, pp. 209-214, 8 figs. Type chosen by Stout Metal Airplane Co., Detroit, is all-metal internally trussed Liberty-engined monoplane, carrying maximum load at cruising speed of 100 m.p.h. or better.

Wing Calculations. Recent Progress in the Science of Aeronautics, Jos. S. Ames. Franklin Inst.—Jl., vol. 199, no. 1, Jan. 1925, pp. 83-90. Points out, that as consequence of theoretical work of Prandtl, Betz and Munk, science of aeronautics has at its disposal certain formulas which enable one to calculate principal properties of airplane wing of given profile and dimensions and also of any combination of wings; these formulas also make it possible to discuss effect of modifications in wings, as, for instance, of changing the ailerons.

AIRSHIPS

Gas Regeneration in. Process for Regenerating Gas in Dirigibles to Avoid Deflating (Procédé de régénération du gaz des dirigeables évitant leur dégonflement), R. Biquard and A. Chenu. Académie des Sciences—Comptes Rendus, vol. 179, no. 26, Dec. 29, 1924, pp. 1593-1596, 2 figs. Describes a method of regeneration by simple circulation of gas, purifying apparatus being of type used for hydrogen extraction or absorption by charcoal.

Speed Indicators. Acoustic Speed Indicators for Airships (Indicateur acoustique de vitesse relative pour aéronef), A. de Gramont de Guiche). Académie des Sciences—Comptes Rendus, vol. 179, no. 26, Dec. 29, 1924, pp. 1591-1593, 1 fig. Describes device consisting of a very light screw driving a small alternator, and a telephone receiver giving sound produced at each turn of screw.

ALCOHOL

Industrial, Manufacture of. Manufacture of Industrial Alcohol, C. D. Ryder. Indus. Australian and Min. Standard, vol. 72, nos. 1878 and 1879, Dec. 4 and 11, 1924, pp. 805 and 855-856, Raw materials and processes.

ALLOY STEELS

Air-Hardening. Air-Hardening Steels, Jos. K. Wood. Am. Mach., vol. 62, no. 7, Feb. 12, 1925, pp. 265-268, 4 figs. Microscopic constituents of iron and steel; their behavior under heat treatment; consideration of air-hardening steels obtained by adding certain alloying metals to ordinary carbon steels, showing why such alloy steels harden in air.

ALLOYS

Aluminum. *See Aluminum Alloys.*

Bronzes. *See Bronzes.*

Eutectic Patterns. Eutectic Patterns in Metallic Alloys, C. H. Green. Am. Inst. Min. & Met. Engrs.—Trans., vol. 1421-E., Feb. 1925, 15 pp., 27 figs. After careful consideration of literature on eutectics, especially of two most important recent papers by F. L. Brady and A. Portevin, it appears that there is no disagreement in results; suggests classification.

Monel Metal. *See Monel Metal.*

Nickel. *See Nickel Alloys.*

Structural Composition, Determination of. Determination of Structural Composition of Alloys by a Metallographic Planimeter, E. P. Polushkin. Min. & Metallurgy, vol. 6, no. 218, Feb. 1925, p. 94. Accuracy of planimetric method; conditions of work. (Abstract.)

ALUMINUM

Etching. Etching Aluminum and Its Alloys for Macroscopic and Microscopic Examination, F. B. Flick. Am. Inst. Min. & Met. Engrs.—Trans., no. 1418-E. Feb. 1925. 12 pp., 9 figs. Describes reagent which has given satisfactory results as grain-size etch generally applicable to aluminum and aluminum alloys; consists of combination of hydrofluoric-hydrochloric acid solutions.

Progress, 1923. Aluminum and Aluminum Alloys, R. J. Anderson. Brass Wld., vol. 21, no. 1, Jan. 1925, pp. 13-17. Summary of technical progress in 1923, including technology, uses and applications, aluminum paint, die casting, metallography, bauxite, aluminous abrasives, aluminous refractories, etc.

ALUMINUM ALLOYS

Aluminum-Magnesium-Cadmium. Solidification of Ternary Alloys Aluminum, Magnesium, Cadmium (Sur la solidification des alliages ternaires aluminium, magnésium, cadmium), J. Valentin and G. Chaudron. Académie des Sciences—Comptes Rendus, vol. 180, no. 1, Jan. 5, 1925, pp. 61-63, 1 fig. Discusses thermic analysis of ternary alloy, using Le Chatelier thermocouple with Rengade recorder.

Casting and Heat Treatment. Casting and Heat Treatment of Some Aluminum Copper-magnesium Alloys. Am. Inst. Min. & Met. Engrs.—Trans., no. 1404-E, Jan. 1925, 8 pp. Discussion of paper 5. S. Daniels, A. J. Lyon, and J. B. Johnson; also of paper on Heat Treatment of Alpha-Beta Brass, by O. W. Ellis and D. A. Schemnitz; Coatings Formed on Corroded Metals and Alloys, Geo. M. Enox and Rob. J. Anderson; and Hardness of Heat-treated Aluminum Bronze, Geo. F. Comstock.

Duralumin. *See Duralumin.*

High-Strength. New Developments in High-strength Aluminum Alloys, R. S. Archer and Z. Jeffries. Am. Inst. Min. & Met. Engrs.—Trans., no. 1415-E, Feb. 1925, 18 pp., 2 figs. Describes two new alloys of "strong-alloy" class having improved fabricating qualities; also methods of producing alloys of duralumin type with greater strength and hardness than previously obtained.

AMMONIA COMPRESSORS

Oil-Engined. Types of Modern Power-Plant Oil Engines. Oil Engine Power, vol. 3, no. 1, Jan. 1925, pp. 27-30, 5 figs. Combination unit of Ingersoll-Rand oil engine and ammonia compressor eliminates crank and main bearings on ammonia end; considerable friction is avoided by this arrangement and oil-engine economy is further accentuated; detailed description of oil-engine part of unit.

Plans for. Education and Training for the Industries. Mech. Eng., vol. 47, no. 2, Feb. 1925, pp. 94-102. Three papers, slightly abridged, and extracts from discussion as follows: Industry's Interest in Industrial Training, M. W. Alexander; The Need for District Organization of Modern Apprenticeship, H. A. Frommelt; Training for Industry and the Public Program of Vocational Education, F. Cushman.

AUTOMOBILE ENGINES

VIBRATION-MEASURING-DEVICES. New Instruments Measure Vibrations of Various Engine Parts, C. E. Summers. Automotive Industries, vol. 52, no. 4, Jan. 22, 1925, pp. 135-137, 6 figs. Devices developed by Gen. Motors Research Laboratories give permanent records of both linear vibrations due to unbalanced forces, and torsional vibration of crankshaft. (Abstract.) Paper presented before Soc. Automotive Engrs.

AVIATION

THUNDERSTORMS, DANGER FROM. Thunderstorms and Aviation, G. C. Simpson. Roy. Aeronautical Soc.—Jl., vol. 29, no. 169, Jan. 1925, pp. 24-41 and (discussion) 41-46, 13 figs. Consideration of heat thunderstorms which occur on warm days in summer; thunderstorms caused by warm and cold currents being brought together; characteristics of thunderstorms which are of interest to aviators; account of actual experiences of aircraft in thunderstorms; dangers to airship.

UNITED STATES GOVERNMENT EXPENDITURES. Expenditures of Government with Aircraft Industry. Aviation, vol. 18, no. 4, Jan. 26, 1925, pp. 98-104. Wartime and post-war aviation costs; distribution of contracts; funds reverted to Treasury; conclusions.

B

BALANCING

ROTATIVE. Rotative Balancing, R. Soderberg. Machy, (N. Y.), vol. 31, no. 6, Feb. 1925, pp. 439-444, 13 figs. Simple explanation of theory of balancing, and description of practical balancing methods.

BALANCING MACHINES

SMALL HIGH-SPEED ARMATURES. The Dynamic Balance of Small High-Speed Armatures, Wm. E. Trumpler. Elec. Jl., vol. 22, no. 1, Jan. 1925, pp. 34-41, 10 figs. Describes balancing machine developed for small high-speed armatures; definition of term, dynamic balance.

BEAMS

VARYING CROSS-SECTION. The Apparent Value of Poisson's Ratio for Beams of Varying Cross-Section, H. W. Baker. Lond., Edinburgh, & Dublin Philosophical Mag. & Jl., Sci., vol. 48, no. 288, Dec. 1924, pp. 1080-1084, 2 figs. Describes an optical method of measuring radii of curvature of beam under bending load in which two pieces of plate glass are attached to pillars and spacing of interference bands reflected from their inner surfaces is measured.

BEARINGS

LUBRICATION. Theory of Shaft Bearings (Note sur la Théorie des Paliers porteurs), F. Menier. Association des Ingénieurs Sortis de l'Ecole Polytechnique de Beuxelles—Bul. Technique, vol. 20, no. 2, 1924, pp. 66-74, 5 figs. Discusses Rrynolds and Sommerfeld equations for oil film between plane and cylindric bearing surfaces and makes calculations for oil film if pad completely surrounds shaft, avoiding negative pressures.

MOTOR, GENERAL-PURPOSE. Bearings for Horizontal General-Purpose Motors, H. Maxwell. West. Soc. Engrs.—Jl., vol. 30, no. 1, Jan. 1925, pp. 1-5. Deals with lubrication; standardization of sizes; assembly; enclosure; saving in friction loss; maintenance cost; oil leakage; life of bearings; vibration and noise; cost.

BEARINGS, BALL

DEVELOPMENT. Ball Bearings, L. A. Hillman. West. Soc. Engrs.—Jl., vol. 30, no. 1, Jan. 1925, pp. 6-8. Development during last 25 years; retainers; ball thrust bearings.

MACHINE TOOLS, APPLICATION TO. Ball Bearings Applied to Machine Tools, T. C. Delaval-Crow. Machy, (N. Y.), vol. 31, no. 6, Feb. 1925, pp. 454-459, 12 figs. Discusses three classes of service for which ball bearings are suitable; applying ball bearings to pulverizing mill; ball-bearing bevel-gear drive for boring mill; application to pneumatic grinder; ball-bearing electric motors; etc.

BEARINGS, ROLLER

INDUSTRIAL USES, APPLICATIONS TO. Roller Bearing Applications to Industrial Uses, A. H. Williams. West. Soc. Engrs.—Jl., vol. 30, no. 1, Jan. 1925, pp. 9-11. Determining factors that must be considered in selection of bearing; materials used in bearings and method of manufacturing.

BELT DRIVE

BELT SLIP. Visual Comparison of Belt Slip, V. Sahmel. Iron Age, vol. 115, no. 7, Feb. 12, 1925, pp. 481-482, 2 figs. Convenient method of studying relations between different drives; short-center belt with large contact arc.

BELTING

JOINTS FOR. Endless Joints for Power-Transmission Belting. Power Engr., vol. 20, no. 226, Jan. 1925, pp. 13-14. Practical article on technique of belt cementing.

BLAST-FURNACE GAS

CLEANING. Cleaning Blast-Furnace Gas, A. E. Rowe. Iron & Coal Trades Rev., vol. 110, no. 2969, Jan. 23, 1925, pp. 125-129, 6 figs. Studies problem by three heat-balance diagrams of whole works, one showing consumption of B.t.u. when using dirty gas, and two showing conditions when using clean gas, fixing an average set of conditions, such as exist at many works to-day. Paper read before Cleveland Instn. Engrs.

BLAST FURNACES

OIL FUEL FOR. Oil Fuel for Blast Furnace Work, D. Perietzeano. Iron and Coal Trades Rev., vol. 110, no. 2968, Jan. 16, 1925, p. 100, 1 fig. Results of experiments in use of mazut for blast-furnace work, carried out by Rumanian government with view of ascertaining metallurgical possibilities of making use of country's rich oil-fuel resources, object of which was to find out whether it was practicable to replace in part customary fuels by other and cheaper fuels. From Revue de Métallurgie.

BOILER FEEDWATER

REGULATORS. Automatic Feed Water Regulation.Eng. & Boiler House Rev., vol. 38, no. 8, Feb. 1925, pp. 336, 338 and 341, 2 figs. Aster-Anthony regulator differs from other designs in that actual control is operated hydraulically by means of small by-pass from feedwater delivery which is afterwards returned to hot well.

BOILER FURNACES

DESIGN. Suggestions on Boiler Furnace Design, C. M. Garland Power, vol. 61, no 5, Feb. 3, 1925, pp. 176-178. Desirability of high furnace, temperatures; selecting stoker; losses caused by stratification of gases; less tendency for stratification with underfeed and V-type stokers; radiation and conduction losses.

FIRING. Handling Boiler Furnace Fires. South. Engr., vol. 42, no. 5, Jan. 1925, pp. 95-103, 16 figs. Pointers on firing with stationary, shaking, and dumping grates, and hand and mechanical stokers

FLUE-DUST REMOVAL. Pneumatic Method of Flue Dust Removal. Eng. & Boiler House Rev., vol. 38, no. 7, Jan. 1925, pp. 282-284, 3 figs. Describes recent developments in using vacuum pumps for removing flue dust and soot from flues and tubes of Lancashire and water-tube boilers.

PAPER MILLS. Maintaining Furnaces in the Paper Mill, H. C. Evans. Paper Trade Jl., vol. 80, no. 3, Jan. 15, 1925, pp. 47-50, 9 figs. Improvements in furnace design; results secured after period of investigation; savings effected by improvements.

WATER-COOLED WALLS. Water-Cooled Furnace Walls Prove Successful, H. D. Savage. Power Plant Eng., vol. 29, no. 4, Feb. 15, 1925, pp. 227-229, 2 figs. Need for higher capacities and efficiencies lead to fin-tube wall which eliminates trouble with furnace brickwork.

BOILER OPERATION

ECONOMY IN. Economy in Steam Raising, Chas. F. Wade. Chem. & Industry, vol. 44, no. 3, Jan. 16, 1925; pp. 49-51, 1 fig. Combustion control; recording instruments; test methods; analysis of records; firing methods.

BOILER PLANTS

CONTROL EQUIPMENT. An Efficient London Power Station. Eng. & Boiler House Rev., vol. 38, no. 8, Feb. 1925, pp. 327-328 and 331. Details of boiler-house control equipment at Marshgate Lane generating station of Charing Cross Electricity Supply Co.

MANAGEMENT. 72% Efficiency and Good Will, H. Brunner. Mgt. & Administration, vol. 9, no. 2, Feb. 1925, pp. 125-127, 5 figs. Changes in boiler-room management and results obtained; economy plus employee satisfaction in small power plant.

SMALL, EFFICIENCY OF. The Small Boiler Plant. Eng. & Boiler House Rev., vol. 38, no. 8, Feb. 1925, pp. 324-326, 5 figs. Methods which can be used to improve efficiency.

BOILERS

ELECTRIC. Electrically Heated Steam Boilers for Continuous Current. Eng. & Boiler House Rev., vol. 38, no. 8, Feb. 1925, pp. 312 and 335, 2 figs. Details of boiler suitable for using continuous current.

PERFORMANCE FORECASTING. Forecasting Boiler Performance. South. Engr., vol. 42, no. 5, Jan. 1925, pp. 15-20, 5 figs. How to determine a fair approximation of what a boiler may be made to do.

SELECTION AND TYPES. Selection and Types of Steam Boilers. South. Engr., vol. 42, no. 5, Jan. 1925, pp. 12-15, 5 figs. Requirements of a boiler; safety and size; type of boiler largely determines load.

SETTINGS. Boiler Setting and Baffling. South. Engr., vol. 42, no. 5, Jan. 1925, pp. 87-94, 21 figs. Boilers require a firm support, properly constructed setting and bafflings that are free from gas leaks if best results are to be obtained.

WASTE-HEAT. Alpha Portland Cement Company's Waste-Heat Boiler Installation. Power, vol. 61, no. 4, Jan. 27, 1925, pp. 134-135, 3 figs. Outstanding features which differentiate installation at No. 4 mill at Martins Creek, Pa., from previous waste-heat installations are arrangement of boilers over main collecting flue to conserve space and use of common flue with extra fan.

BOILERS, WATER-TUBE

FINDLAY FIRE-TUBE. On the Findlay Water Fire-Tube Steam Generator, W. S. Findlay. Power Engr., vol 20, no. 226, Jan. 1925, pp 27-29, 3 figs. Résumé of heat-transmission investigations undertaken on this boiler, with special reference to influence of concentric water fire tubes and spiral gas retarders.

BRIDGE DESIGN

INFLUENCE LINES. The Use of Influence Lines, A. C. Hughes. Surveyer & Mun. & County Engr., vol. 67, no. 1720, Jan. 2, 1925, pp. 3-5, 11 figs. Brief description of function of influence lines and their use.

BRIDGES, CONCRETE

ARCH. Old Foundations Used in Replacing Steel by Concrete Span. F. W. Epps. Eng. News-Rec., vol. 94, no. 6, Feb. 5, 1925, pp. 234 235, 2 figs. Masonry on pier and abutment tops cut to 5-ft. depth and capped; concrete arch with floor ties.

CURVED VIADUCT. Mountain Pass Highway Bridge Built on Sharp Curve, H. D. Miller. Eng. News-Rec., vol. 94, no. 7, Feb. 12, 1925, pp. 278-279, 4 figs. Concrete viaduct at foot of steep grades has radius of 175 ft.; roadway superelevated 24 inches.

BRIDGES, HIGHWAY

STEEL-AND-CONCRETE. St. Clair Avenue Bridge, Vale of Avoca, G. Alison and N. G. Stewart. Can. Engr., vol. 48, no. 3, Jan 20, 1925, pp. 141-144, 9 figs. Steel and concrete bridge at Moore Park, Toronto; piers and abutments are concrete with steel arch span.

BRONZES

ADMIRALTY. Admiralty Bronze, C. G. A. Rosen. West. Machy. Wld., vol. 15, no. 12, Dec. 1924, pp. 433-436, 4 figs. Discusses composition and properties, melting and casting.

FOUNDING. Modern Problems and Developments in Engineering Bronze Founding, F. W. Rowe. Foundry Trade Jl., vol. 31, no. 437, Jan. 1, 1925, pp. 3-7, 5 figs. Problems of furnaces and melting practice; correct melting; cause and preventiou of oxide; runners and running and pyrometric control; liquation, segregation and other problems; tin sweat; cause and remedy of tin spots; blowholes; manganese and aluminum bronze; alloys to resist corrosion; possible future developments.

BUCKET ELEVATORS

STANDARDIZATION. Standardization as Applied to Bucket Elevators, M. W. Potts. Indus. Mgt. (N. Y.), vol. 69, no. 2, Feb. 1925, pp. 116-121, 8 figs. Discusses possibilities of standardization in this field; advantages to manufacturer.

TYPES. Notes on Elevators, N. Tate. Mech. World, vol. 77, no. 1986, Jan. 23, 1925, pp. 54-55, 3 figs. Centrifugal discharge, continuous-type, perfect discharge, vertical and inclined elevators; feeding of elevators; speed; minor troubles.

BUILDING CONSTRUCTION

ETHICAL PROBLEM IN DESIGN. The Engineer's Ethical Problem in Structural Design, D. C. Coyle. Eng. News-Rec., vol. 94, no. 6, Feb. 5, 1925, pp. 236-237. Discusses different classes of engineering which arise in practice and tentative statement of principle; ethics of cheap work, ordinary work, and monumental work such as public buildings and other structures far outweight first cost.

WINTER CONDITIONS, UNDER. Building Construction under Winter Conditions, C. D. Harrington. Eng. Jl., vol. 8, no. 2, Feb. 1925, pp. 76-77. Deals with excavation, preparation for foundations, concrete work and masonry.

BUILDINGS

WIND STRESSES IN STEEL MILL. Wind Stresses in Steel Mill Buildings, R. Fleming. Engineering, vol. 119, nos. 3081 and 3083, Jan. 16 and 30, 1925, pp. 65-69 and 123, 6 figs. Author seeks to present sane and workable method of treating wind forces in ordinary mill buildings; deals with wind pressure; Duchemin formula; wall-bearing roof trusses; mill building bents with knee braces.

BUSES

TROLLEY. Conversion of Keighley Corporation Tramways to Trolley Omnibus Traction, C. Jackson. Tramway & Ry. World, vol. 57, no. 3, Jan. 15, 1925, pp. 9-17, 20 figs. Description of converted system; double motor equipments; overhead equipment.

C

CABLES, ELECTRIC

High-Tension. High Tension Cables, L. B. Atkinson. Electrician, vol. 93, no. 2431, Dec. 19, 1924, pp. 694-695. Notes on temperature limits; heat disposal; geometry of cable design. (Abstract). Paper read at World Power Conference.

Testing. Testing High-Tension Impregnated-Paper-Insulated, Lead-Covered Cable, E. S. Lee. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 2, Feb. 1925, pp. 156-164, 12 figs. Measurement made to determine insulation resistance, dielectric strength, dielectric power loss and power factor, capacitance and ability to withstand bending. Bibliography. (Abridged).

CABLEWAYS

Electrical Equipment. Aerial Ropeway Operation, H. E. Hudson. Electrician, vol. 93, no. 2432, Dec. 26, 1924,pp. 718-719, 4 figs. Describes installation erected at new generating station of West Gloucestershire Power Co. at Lydney, England, for removing boiler ashes from power station to waste heat; electrical features; details of switchgear; simplified bucket discharge in mid-air.

Systems. Aerial Rope Transport, T. E. Dodds. Indus. Mgt. (Lond.), (Cassier's Mech. Handling No.), Jan. 1925, pp. 58-66, 18 figs. Mono-cable and bi-cable systems; bi-cable spoil conveyor; aerial ropeways at Montevideo; Roe patent dumping frame; cableways or "Blondin;" gravitating rope inclines. Bibliography.

CALORIMETERS

Reaction Heats at High Temperatures, Measurement of. Calorimetric Apparatus for the Measurement of Reaction Heats at High Temperatures, J. D. Davis. Fuel, vol. 4, no. 1, Jan. 1925, pp. 38-44, 5 figs. Particularly for heat of carbonization of coal.

Manufacture. Railway Wagon Construction. Eng. Production, vol. 8, no. 149, Feb. 1925, pp. 37-42, 16 figs. Methods adopted in Wolverton Works of Lond., Midland & Scot. Ry. Co. for production of their new standardized freight truck.

CARS, REFRIGERATOR

Passenger-Train Service. New Express Refrigerator Car, Great Northern Ry. Ry. Rev., vol. 76, no. 5, Jan. 31, 1925, pp. 229-233, 7 figs. Insulated refrigerator built for passenger-train service, equipped with ice compartments having stationary bulkheads.

Rails. Case-Hardening of Rails (Le durcissement superficiel des rails), E. Marcotte. Génie Civil, vol. 86, no. 2, Jan. 10, 1925, pp. 42-44, 12 figs. Sandberg process; composition and use of sorbitic rails on curves; French hardening plant at Hagondange, and its work.

CAST IRON

Composition, Control of. The Choice and Use of Pig-Iron by Modern Methods, H. J. Young. Foundry Trade Jl., vol. 31, no. 438, Jan. 8, 1925, pp 36-37. Author points out that cast iron can be controlled by composition and by no other means known at present day.

Strength, Factors Influencing. Some of the Factors which Influence the Strength of Cast Iron, A. Campion. Foundry Trade Jl., vol. 31, no. 440, Jan. 22, 1925, pp. 67-70, 5 figs. Influence of existence and distribution of components; strength of cast iron; usefulness of test bars said to be limited; influence of casting temperature. Paper presented to Assn. Technique de Fonderie in behalf of Inst. Brit. Foundrymen.

CASTING

Grate Bars. Casting Firebars, B. Shaw and J. Edgar. Mech. World, vol. 77, no. 1985, Jan. 16, 1925, pp. 40-41, 7 figs. Consideration of methods for producing molds for grate-bar castings, keeping in mind need for their expeditions production.

Deaerator Shells. Producing Deaerator Shells, Jas. J. Zimmerman. Foundry, vol. 52, no. 2, Jan. 15, 1925, pp. 77-79, 6 figs. Explains foundry practice employed in rapid production of shells, such as are used in building component parts of deaerator; methods involve use of slip ring, thus eliminating necessity for sweeps or solid patterns.

CASTINGS

Contraction and Sullage Troubles. Some Methods of Overcoming Contraction and Sullage Troubles. Foundry Trade Jl., vol. 31, no. 438, Jan. 8, 1925, pp. 25-27, 10 figs. Points out that among many causes responsible for production of defective castings is omission to provide runners or ingates of suitable design and size; methods of overcoming troubles, in the case of pulleys, small, medium, cylindrical and heavy castings.

Defects and Causes. Fixing the Responsibility for Foundry Defects, Jos. Leonard. Foundry Trade Jl., vol. 30, no. 435, Dec 18, 1924, pp. 523-524. Gives list of typical defects and possible causes. (Abstract.) Translated from paper read before Assn. Technique de Fonderie.

Testing. Testing Castings, F. C. Edwards. Foundry Trade Jl., vol. 31, no. 437, Jan. 1, 1925, pp 10-14, 9 figs. Importance of testing castings, and various phases thereof; discusses test-bar problem, giving results of tests illustrating interdependence of shape, size, and mixture of test bar; testing of actual casting, with details of interesting example showing how this can be carried out, and great importance and benefits derived therefrom.

CEMENT

Alumina. Fused Alumina Cement, Pure or Mixed [Ciment alumineux fondu pur ou mixte (Sand-cement)], A. Paris. Bul. Technique de la Suisse Romande, vol. 50, no. 25, Dec. 6, 1924, pp. 309-312, 1 fig. Details of application of alumina cement in reconstruction of Magnacun tunnel where a rapid-setting cement was required, and for piling and foundations of Villeneuve gas holder.

CEMENT MANUFACTURE

Problems. Manufacturing Problems of Cement Industry, J. J. Porter. Am. Inst. Min. & Met. Engrs.—Trans., no. 1403-H., Jan. 1925, 8 pp. Relative merits of dry and wet process; effect of variation in chemical composition; factors affecting cost; dust collection and prevention.

CENTRAL STATIONS

Distance Control. Distribution of Load Between Various Centrals of a System (Répartiteur fréquence-métrique de la charge entre les différentes centrales d'un réseau), J. Lyonn. Industrie Electrique, vol. 33, nos. 779 and 780, Dec. 10 and 25, 1924, pp. 493-496 and 527-529, 2 figs. Discusses work of dispatcher in controlling at distance power stations of a system, and Résal's proposal of automatic control based on frequency.

Long Beach, California. Long Beach Steam Station of the Southern California Edison Co., F. S. Clark and M. W. Carty. Power, vol. 61, no. 7, Feb. 17, 1925, pp. 246-254, 6 figs. First modern high-pressure steam plant west of Rocky Mountains; capacity, 70,000 kw.; equipped with combination oil and gas burners; furnace walls under forced-draft ventilation using ventilating air for combustion; central priming system for pumps and condensers; double-wound squirrel-cage motors for auxiliary drive.

Pine Grove, Pa. Low Operating Costs and Fixed Charges at Pine Grove Station (Pa.), G. G. Hollins. Power Plant Eng., vol. 29, no. 4, Feb. 15, 1925, pp. 222-227, 9 figs. Plant is served by cooling pond which may ultimately be enlarged to serve 200,000 kw.; includes summary of mechanical equipment.

Thermal Efficiency. The Thermal Efficiency of Power Stations, R. H. Parsons. Engineering, vol. 119, nos. 3082 and 3084, Jan. 23 and Feb. 6, 1925, pp. 93-94 and 153-154, 2 figs. Basis upon which thermal efficiency should be computed; examination of degree of accuracy upon which essential factors of calculation can themselves be determined

CHAINS

Conveyor, Malleable-Iron. Malleable Iron Conveyor Chains and Their Manufacture, W. H. Atherton. Indus. Mgt. (Lond.) (Cassier's Mech. Handling No.), Jan. 1925, pp. 116-124, 17 figs. Describes types of chains suitable for various handling operations, and links and attachments in common use.

CHIMNEYS

Design and Construction. Chimneys and Stacks. South Engr., vol. 42, no. 5 Jan. 1925, pp. 38-46, 19 figs. Kinds of chimneys, how constructed and erected foundations, smoke flues, calculated and actual performance.

COAL

Gasification of Low-Grade. Gasification of Low Value Fuels, W. Freund. Am. Gas Jl., vol. 122, no. 2, Jan. 10, 1925, pp. 25-26 and 39-40. 1 fig. Methods of converting low-grade fuels into useful gaseous fuel and tar; advantages of process Translated from Chemiker-Zeitung.

Steaming Tests. A British Coal-Steaming Test, W. H. Gordon. Combustion, vol. 12, no. 1, Jan. 1925, pp. 59, and 64. Report of an account of some tests made with steaming of coal from Arley seam in Lancashire.

Water Content. The Normal Water Content of Anthracite and Coke (Der normale Wassergehalt von Steinkohlen und Koks), N. Schoorl. Zeit. für angewandte Chemie, vol. 37, no. 50, Dec. 11, 1924, pp. 983-986, 1 fig. Determination of water content of anthracite, by means of drying in air at 102-105 deg. cent. up to constant weight, gives values somewhat too high, but difference is very slight.

COAL HANDLING

Methods, United States. Coal Handling and Storage in the United States, J. F. Springer. Colliery Eng., vol. 2, no. 11, Jan. 1925, pp. 24-29, 10 figs. Survey of subject, drawing attention to some of the advantages and problems involved.

Power-House. Coal and Ash Handling in the Power House, W. D. Wylde. Indus. Mgt. (Lond.) (Cassier's Mech. Handling No.), Jan. 1925, pp. 30-37, 9 figs. Reviews latest systems of handling raw material and residue, and describes appliances in use Bibliography.

Coal Handling in Power Stations, F. J. Warden-Stevens Electrician, vol. 93, no. 2432, Dec. 26, 1924, pp. 720-722 and 730, 6 figs. Review of equipment for discharging, transfer to and withdrawal from storage, and delivery of coal to boiler houses.

Machine Loading. Machine Loading During Past Year, A. F. Brosky. Coal Age, vol. 27, no. 3, Jan. 15, 1925, pp. 67-70, 8 figs. Over 1 per cent of coal output loaded by machines; equipment is bringing about concentration in mining and better preparation.

COAL MINES

Safety. Safety Movement Stirs Illinois Mining Men, E. W. Davidson. Coal Age, vol. 27, no. 4, Jan. 22, 1925, pp. 146-151, 3 figs. Review of papers read before Illinois Mining Safety Conference, discussing safety from roof falls; face accidents; mine fires and how to fight them; safety in use of locomotives; indirect influences for safety; where use of water destroys mine; putting out fire with rock dust.

COAL MINING

Blasting. Electric Blasting in Coal Mining, J. W. Koster. Modern Min., vol. 2, no. 1, Jan. 1925, pp. 11-13, 7 figs. This method has advantages from standpoints both of safety and efficiency.

COALING STATIONS

River-Wharf. Coaling Staith on the River Tyne at Whitehill Point. Engineering vol. 119. no. 3083, Jan. 30, 1925, p. 134, 2 figs. Reconstruction in steel of existing timber wharf.

COAL STORAGE

Heating of Coal. Heating in the Coal Pile, J. F. Springer. Combustion, vol. 12, no. 1, Jan. 1925, pp. 34-38, 4 figs. Causes of heating and some means used to determine what particular places are becoming heated in order that remedial measures may be taken.

COKE

Botanical Origin. Coal in Relation to Coke, E. C. Jeffrey. Am. Inst. Min. & Met. Engrs. — Trans., no. 1399-I. Jan. 1925, 10 ppl. 12 figs. Results of author's investigations, showing that coke bears interesting relation in origin, to charcoal it has so completely replaced.

COKE OVENS

Reversing Regenerative. Reversing Regenerative Ovens in Europe, C. H. Tupholme. Can. Chem. & Metallurgy, vol. 9, no. 1, Jan. 1925, pp. 13-15, 4 figs. Recent developments in ovens of this type and description of operation, tests and installation.

COMBUSTION

Control. Automatic Combustion Control, S. C. Martin. Power Plant Eng., vol. 29, no. 3, Feb. 1, 1925, pp. 182-183, 1 fig. Theoretical considerations governing application to pulverized fuel installations.

Pulsations, Influence on. The Influence of Pulsations on Combustion, J. Deschamps. Engineer, vol. 139, no. 3606, Feb. 6, 1925, pp. 152-153, 2 figs. Author seeks to exhibit phenomena of combustion and advantages that are obtained by setting up pulsations and vibrations in gaseous flames.

CONCRETE

Moisture in Sands, Effect of. Moisture in Sands Affects Proportions in Concrete Mixtures, R. R. Litehiser. Ry Eng. & Maintenance, vol. 21, no. 1, Jan. 1925, pp. 17-18, 3 figs. Experiment shows effect of different quantities of water on volume of sand; moisture causes sand to bulk.

CONCRETE CONSTRUCTION

Plants for. Proper Plant for Concrete Work Contractors' & Engrs.' Monthly, vol. 9, no. 5, Nov. 1924, pp 49-54, 3 figs. Report of Committee C-I of Am. Concrete Inst. Discusses principles on which plant design depends, particular types of concrete plants applicable to a certain set of given conditions; and use to which each particular device may be put so that it will work out to best advantage.

Pre-Cast for Railway Work. A Variety of Pre-Cast Concrete Units are Used on Railroads, J. S. Huntoon. Ry. Eng. & Maintenance, vol. 21. no. 2. Feb. 1925, pp. 48-49, 8 figs. Special applications found of particular advantage in overhead bridges, girder spans and trestles.

CONCRETING

Cold-Weather. Pouring Concrete in Zero Weather, C. N. Shanly. Eng. Jl., vol. 8, no. 2, Feb. 1925, pp. 78-80, 4 figs. Details of construction of large hydro-electric plant in Northern Quebec under severe winter conditions.

CONDENSERS, ELECTRIC

Pressure Regulation, for. Synchronous Condensers Used as Pressure Regulators, F. Grieb. Brown Boveri Rev., vol. 12, no. 1, Jan. 1925, pp. 9-13, 5 figs. Calculation of pressure drop; various methods of pressure regulation; properties of synchronous condenser; regulation by means of synchronous condensers.

Static. Static Condensers for the Higher Distribution Voltages. R. A. Lane. Elec. Jl., vol. 22, no. 2, Feb. 1925, pp. 68-71, 7 figs. Problems to be considered in design of 5,000-volt units.

CONDENSERS, STEAM

Types, Comparison of. The Comparative Efficiency of Condensers, D. G. McNair. Power Engr., vol. 20, no. 226, Jan. 1925, pp 21-23. Comparison of types from standpoint of economy; ejector, multiple-jet and surface condensers.

CONNECTING RODS

Machining. The Con-Rod Line at Waukesha, Wm Thiel and H. O. Schultz. Am. Mach., vol. 62, no. 8, Feb. 19, 1925, pp. 301-304, 12 figs. Application of standard machines with special fixtures to production of connecting rods; fixtures and jigs for limited production; details of good single-blade reamer.

CONTRACTING

Cost-Plus Contracts. Principles of Cost Plus Contracts. Contracts Rec., vol. 39, no 3, Jan. 21, 1925, pp. 54-57. What Committee on Methods of Associated General Contractors of America regards as proper service constructor should render and owner receive.

CONVERTERS

Synchronous Frequency. Scherbius Controlled Induction Synchronous Frequency Converter, R. E. Greene. Power, vol. 61, no. 7, Feb. 17, 1925, pp. 258-260, 5 figs. Frequency-changer sets designed so that they will operate with maximum variation of 9 per cent in frequency of two systems they tie together.

CONVEYORS

Belt. Longest Belt Conveyor in the World. Chem. & Met. Eng., vol. 32, no. 4, Jan. 26, 1925, p. 159, 2 figs. Details of belt-conveyor system 4½ miles in length installed and operated by H. C. Frick Coke Co.

Pneumatic. Recent Developments in Pneumatic Conveying, E. G. Philips. Indus. Mgt. (Lond.) (Cassier's Mech. Handling No.), Jan. 1925 pp. 67-73, 11 figs. Describes suction and blowing systems of pneumatic conveying, and various uses to which they are best suited. Bibliography.

Rotary Pipe. Development of the Rotary Pipe Conveyor, E. W. Davis. Eng. & Min. Jl.-Press, vol. 119, no. 4, Jan. 24, 1925, pp. 157-159, 6 figs. Describes developments of pipe launder or conveyor which has been patented and is being manufactured by Dorr Company under name of Dorrco rotary pipe conveyor, an accessory to ore-dressing plants that is applicable under many conditions.

COPPER ALLOYS

Corrosion in Sea Water. Corrosion of Copper Alloys in Sea Water, W. H. Bassett and C. H Davis. Am. Inst. Min. & Met. Engrs.—Trans., no. 1394-E, Jan. 1925, 30 pp., 11 figs. A 10-year sea-water corrosion test of tubes of several copper alloys shows that many alloys withstood attack by solution, pitting, and dezinkification; 1-year salt-spray test of sheet-metal specimens of same composition showed same results.

COST ACCOUNTING

Analysis of Interest. The Use of Interest in Figuring Production Cost, J. P. Jordan. Mgt. & Administration, vol. 9, no. 2, Feb. 1925, pp. 145-148. Analysis of various kinds of interest, their effect on business, and their treatment as indicated by necessities in each case.

Fundamentals. The Fundamentals of Engineering Costs, A. Stewart. World Power, vol. 2, no. 11, Nov. 1924, pp. 261-266, 2 figs.; and vol. 3, no. 13, Jan. 1925, pp. 13-17. Nov.: Purpose of cost accounts; terminology; elements of cost; overhead cost. Jan. 1925; Allocation of items of overhead cost; general overhead cost; cost of marketing; installing a costing system.

Small Plants. Correct Costs at Little Expense, G. G. Thompson. Mgt. & Administration, vol. 9, nos. 1 and 2, Jan. and Feb. 1925, pp. 67-70 and 169-172, 10 figs. Jan.: Cost accounting for shop work; examples of shop order cards. Feb.: Factory and foundry accounting.

Systems. A Cost System That Helps the Production Executive, O. C. F. Lippert. Factory, vol. 34, no. 2, Feb. 1925, pp. 278-280, 348, 350 and 352, 4 figs. Method employed by Strietmann Biscuit Co.; advantage of system is that, instead of merely furnishing record of past costs, it is direct help to production executives and to higher executives interested in both production and sales.

CRANES

Jib, Travelling. Level Luffing Roof Cranes at Bristol Rocks. Engineering, vol. 119, no. 3083, Jan. 30, 1925, pp. 130-131, 2 figs. Details of 2-ton electric cranes installed by Bristol Docks Committee on shed roofs at Canon's Marsh, Bristol, embodying new and interesting design of level luffing gear; description of gear together with mathematical principles of motion.

Types and Design. Cranes C. M. Toplis. Indus. Mgt. (Lond.) (Cassier's Mech. Handling No.), Jan. 1925, pp. 38-43, 6 figs. Examples of modern practice with analysis of controversial points in design. Bibliography.

CRANKPINS

Replacing. Replacing Crank Pins Equipped with Eccentric Arms, R. B. Robinson. Ry. Mech. Engr., vol. 99, no. 2, Feb. 1925, pp. 117-118, 1 fig. How to eliminate possibility of errors and reduce cost of application.

CUPOLAS

Designing. Designing a 4-Ton Cupola, J. H. List. Foundry Trade Jl., vol. 31, no. 440, Jan. 22, 1925, pp. 71-72, 2 figs. Points to consider in designing a cupola, taking a 4-ton-per hour cupola as example.

CUTTING METALS

Electric Arc Process. Cutting Cast-Iron and Copper Alloys by the Electric Arc Process, A. G. Bissell. Machy. (N. Y.), vol. 31, no. 6, Feb. 1925, pp. 445-446, 4 figs. By using electric arc, sufficient heat may be concentrated at point to melt, oxidize or volatize metal involved and make a cut; in case of cast iron, action is mostly melting and molten metal must be run out of cut, but in case of copper alloys, action is melting, oxidation, and volatilization.

Flow and Rupture during Cutting. Cutting Tools Research, W. Rosenhain and A. C. Sturney. Engineering, vol 119, nos. 3083 and 3084, Jan. 30 and Feb. 6, 1925, pp. 151-152 and 178-179, 20 figs. Report on flow and rupture of metals during cutting (Abridged.) Paper presented before Instn. Mech. Engrs.

D

DAMS

Bassano, Canada. The Bassano Dam and Irrigation Works. Engineering, vol. 119, no. 3081, Jan. 16, 1925, pp. 63-65, 6 figs. Details of construction of dam across Bow River, 83 mi. east of Calgary, by Can. Pac. Ry. Co.; low-water surface of river is raised about 40 ft. by dam which is composite structure, most notable portion being concrete spillway, 720 ft. in length; most important of canal structures is Brooks aqueduct, 10,000 ft. long with capacity of 900 sec.-ft.

Fishways for Lifting Salmon. An Experiment in Lifting Salmon Over High Dams, J. N. Cobb. Jl. Electricity, vol. 54, no. 2, Jan. 15, 1925, pp. 50-53, 4 figs. Experiments developed following facts: that if fish can be induced to enter fishway of type describes, they can be lifted almost any height desired; they can be lifted without water and it is decided advantage not to lift water, since out of water fish's struggles were extremely limited; in majority of cases this method can be employed in getting fish over high dams, provided experienced biologist is consulted before work on dam is started.

DIE CASTING

Gas, Use in. Die Casting with Gas, H. Behrman. Gas Age-Rec., vol. 55, no. 3, Jan. 17, 1925, pp. 75-76, 3 figs. Use of gas at Soss Mfg. Co. in Brooklyn; how machines operate.

Methods. Die casting, A. H. Mundey. Metal Industry (Lond.), vol. 26, no. 4, Jan. 23, 1925, pp. 81-82 and 96, 7 figs. Early development; casting temperature; molds; secrets of successful die castings; alloys for pressure die casting.

DIES

Sub-Press. Modified Type of Sub-Press Die, H. M. Groff. Machy. (N.Y.), vol. 31, no. 6, Feb. 1925, pp. 425-426, 3 figs. Describes type of die employed to shave triangular pin hole in balance hub and roller which is used in high-grade watch movements.

DIESEL ENGINES

Applications in America. Diesel Engine Applications Increase in America, R. C. Demary. Power Plant Eng., vol 29, no. 3, Feb. 1, 1925, pp. 191-192, 2 figs. Locomotive, marine and large stationary plants prove practicable; use of fuel oil distilled from coal may lead to greater economy.

Combined with Steam Plant. Operating Diesel Engine in Combination with a Steam Plant, J. W. Crow. Power, vol. 61, no. 4, Jan. 27, 1925, p. 131. Operating results with Diesel-engine installation operated in conjunction with existing steam engines; engine is of vertical 2-stroke-cycle type.

Operation. Operation of Diesel Engines, R. Hildebrand. Power, vol 61, nos. 5 and 7, Feb. 3 and 17, 1925, pp. 174-176, 3 figs., and 255-257, 3 figs. Feb 3: Keeping engine-cooling system in proper condition. Feb. 17: How to choose suitable lubricating oil and when to apply it.

DRILLING MACHINES

Drill-Socket Manufacture. Better-service Drill Sockets. Machy. (Lond.), vol. 25, no. 643, Jan. 22, 1925, pp. 517-521, 12 figs. Manufacturing methods employed by Wm. Asquith, Halifax; work-progress system; operations on sockets.

Radial. 7-ft. Radial Drilling and Tapping Machine. Machy. (Lond.), vol. 25, no. 642, Jan. 15, 1925, pp. 503-504, 1 fig. Details of machine put on market by Geo. Swift & Sons, Halifax; results of tests.

DROP FORGING

Flush-Pin Locating Method. The Application of the Flush Pin to Jig and Mixture Design, W. E. Butler. Machy. (Lond.), vol. 25, no. 644, Jan. 29, 1925, pp. 557-559, 5 figs. Method specially adapted for drop forgings.

DRYDOCKS

Floating. The Southampton Floating Dock, E. H. Salmon. Engineering, vol. 119, no. 3082, Jan. 23, 1925, pp. 101-102. Construction, hull details, machinery, control and fittings. (Abstract.) Paper read before Instn. Civ. Engrs.

Subsidiary Works. Southampton Floating Dock: Subsidiary Works, F. E. Wentworth-Shields. Engineering, vol. 119, no. 3082, Jan. 23, 1925, p. 102. Describes various incidental works which were required in connection with installation of new 60,000-ton floating dock. (Abstract.) Paper read before Instn. Civ. Engrs.

DRYING

Wood Refuse. The Drying of Wood Refuse and Its Importance to Industry. A. J. T. Taylor and O. Nordstrom. Paper Trade Jl., vol. 80, no. 1, Jan. 1, 1925, pp. 49-60, 14 figs. Discusses desirable effects of drying moist fuels before burning them; describes construction, operation and tests of actual waste wood-drying plant, operating on system devised by O. Nordstrom of Sweden.

DURALUMIN

Castings. Tempering of Duralumin Castings (Trempe des moulages de duralumin), L. Guillet. Revue de Métallurgie, vol. 21, no. 12, Dec. 1924, pp. 734-741, 11 figs. Results of experiments showing effect of pouring, velocity of cooling, dimensions, time of heating after tempering, and temperature of tempering on castings.

DYNAMOMETERS

Aircraft-Engine. Electric Dynamometers in Engine Development, H. M. Martin. Aviation, vol. 18, no. 4, Jan. 26, 1925, pp. 105-106, 3 figs. How dynamometer works; modern installations.

E

ELECTRICAL INDUSTRY

Developments in 1924. Some Developments in the Electrical Industry During 1924, J. Liston. Gen. Elec. Rev., vol. 28, no. 1, Jan. 1925, pp. 4-58, 103 figs. Review of prominent developments in electrical industry during 1924.

ELECTRICAL MACHINERY

Commutators, Heating of. The Heating of Commutators, P. Huggins. Elec. Rev., vol. 95, no. 2457, Dec. 26, 1924, pp. 967-968, 3 figs. Results of investigation to establish reliable means by which heating of general run of commutators could be quickly and accurately predetermined; sources and calculation of losses occurring at commutators; temperature rise in relation to watt loss.

Dynamo Machines, Thermal Time Constants. The Thermal Time Constants of Dynamo-Electric Machines, A. E. Kennelly. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 2, Feb. 1925, pp. 142-149, 12 figs. Discusses nature, applicability and advantages of thermal time constants of dynamo machines, from engineering standpoint.

Protection. A Survey of Automatic Alternating-Current Protective Apparatus, B. Nuttall. Instn. Elec. Engrs.—Jl., vol. 63, no. 357, Jan. 1925, pp. 147-148, 3 figs. Essential characteristics for ideal protective system; protection of independent feeders; protection of interconnections, ring mains and component pieces of apparatus of generation, transmission and distribution system. (Abstract.)

ELECTRICAL MEASUREMENTS

BRIDGES, HIGH-TENSION. A High-Tension Bridge for Measurement of Dielectric Losses in Cables, R. W. Atkinson. Elec. Jl., vol. 22, no. 2, Feb. 1925, pp. 58-66, 7 figs. Evolution of high-tension bridge; describes bridge method which is adaptation of Wien bridge to measurements at high voltages and of a.c. galvanometer as detector for such bridge measurements.

ELECTRIC CIRCUITS

CONDUCTORLESS. Conductorless Electric Circuits, F. B Vogdes. Gen. Elec. Rev., vol. 28, no. 1, Jan. 1925, pp. 63-66, 3 figs. Demonstrates that familiar electrical conditions of a circuit can exist when conductors are composed of nothing more tangible than space. Study of electromagnetic waves; explanation of fact that a "wireless" antenna radiates a very considerable percentage of all power put into it, while a transmission line radiates practically none.

ELECTRIC CONDUCTORS

ECONOMIC BALANCE. The Economic Balance in Electrical Transmission, Phil. C. Jones. Elec. Jl., vol. 22, no. 1, Jan. 1925. pp. 9-12, 1 fig. Shows derivation of law and its absolute validity when constants entering into it are properly evaluated, indicates certain corollaries concerning voltage drop and heat generated in conductor, and determines within rather broad limits values of constants to be used.

ELECTRIC FURNACES

HEAT-TREATING. Heat Treating Steel Electrically, E. F. Collins. Forging—Stamping—Heat Treating, vol. 11, no. 2, Feb. 1925, pp. 41-45, 2 figs. Points out that use of electric heat does not call for new methods of application; practically all uncertainties connected with proper application of heat are removed.

HIGH-FREQUENCY MELTING. High Frequency Melting, D. Willcox. Foundry, vol. 53, no. 3, Feb. 1, 1925, pp. 120-121, 3 figs. Describes induction furnace developed to meet special problems.

MELTING. Development of Electric Furnaces for Melting and Refining, L. J. Barton. Fuels & Furnaces, vol. 3, no. 1, Jan. 1925, pp. 54-56. Reviews recent development and outlines desirable features in furnace of to-morrow. Personnel an important factor in successful operation.

METALS REFINING. Refining Metals Electrically, L. J. Barton. Foundry, vol. 52, nos. 1, 2, 3 and 4, Jan. 1, 15, Feb. 1 and 15, 1925, pp. 9-13, 3 figs.; 70-72, 2 figs.; 103-107, 1 fig.; and 150-154 and 160, 6 figs. Jan. 1: Effect of acid lining on slag reactions. Jan. 15: How manganese steel was discovered; advantages of electric melting. Feb. 1: How manganese steel differs in its melting phenomena; using return scrap. Feb. 15: Manganese and silicon reactions; how heat treatment helps.

RENNERFELDT. The Electric Furnace Rennerfeldt. Blast Furnace & Stee Plant, vol. 13, no. 2, Feb. 1925, pp. 70-72. 3 figs. New disposition of electrodes adds distinct operating advantages. Translated from German.

ELECTRIC GENERATORS, A.C.

SELF-INDUCTION COEFFICIENTS. Coefficients of Self-Induction of Alternators (Sur certains coefficients de self-induction des alternateurs), A. Blondel. Académie des Sciences — Comptes Rendus, vol. 179, no. 26, Dec. 29, 1924, pp. 1569-1572. Methods for determining total apparent self-induction and apparent reactance of same windings in short circuit.

65,000-KVA. Design of 65,000-Kva. Generator, R. B. Williamson. Elec. World, vol. 85, no. 6, Feb. 7, 1925, pp. 289-293, 10 figs. Requirements imposed by desire to economize space and highest efficiency consistent with reliability were chief considerations in design of Niagara Falls unit; results of overspeed and performance tests.

ELECTRIC LOCOMOTIVES

ARTICULATED. British-Built Electric Locomotives for Montreal. Ry. Gaz., vol. 42, no. 1, Jan. 2, 1925, pp. 12-13, 2 figs. Designed with special view to increased traffic movements, and are capable of dealing with trains up to 3,600 (short) tons; box-cab, double-truck, articulated type equipped with four 430-h.p. motors.

HIGH-SPEED. Electric Locomotives, J. T. Wallis. Int. Ry. Congress Assn.—Bul., vol. 7, no. 1, Jan. 1925, pp. 179-202, 15 figs. Deals with high-speed electric locomotives for passenger service, hauling trains at 45 m.p.h. or higher. American railways operating this type locomotives; description of development of principal features of designs; equalization and tracking; transverse resistance on leading trucks; articulation; brake arrangements. Bibliography.

ELECTRIC MOTORS

RATING. Methods Used in Rating Motors. Power Plant Eng., vol. 29, no. 4, Feb. 15, 1925, pp. 247-248. General-purpose motors rated in three ways; type of insulation used determines maximum temperature which is permissible.

ELECTRIC MOTORS, A.C.

INDUCTION. Another New Self-Excited Synchronous Induction Motor, Val. A. Fynn. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 2, Feb. 1925, pp. 164-170, 9 figs. Describes second form of such motor, first form having been described by author in previous paper; it is shown that this second form is not only capable of duplicating performance of first form but of bettering it.

Theory of the Induction Motor (Théorie systématique du moteur d'induction), A. della Riccia. Revue Générale de l'Électricité, vol. 16, no. 24, Dec. 13, 1924, pp. 933-937. Gives complete elementary theory of a synchronous motor with equations to find necessary coefficients.

ROTATING-FIELD THEORY. The Rotating Magnetic Field Theory of A.C. Motors, K. L. Hansen. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 2, Feb. 1925, pp. 170-178, 14 figs. It is shown that theory can be readily applied to commutator machines also, and that it undoubtedly furnishes simplest and most direct means for mathematical deductions in more complicated problems where three or more circuits are inductively related and moving with respect to one another.

STARTING. Effect of Full Voltage Starting, J. L. Rylander. Am Inst. Elec. Engrs.—Jl., vol. 44, no. 2, Feb. 1925, pp. 115-121, 14 figs. Discusses effect on windings when starting squirrel-cage induction motors with full voltage.

SYNCHRONOUS Field Current Adjustment of Synchronous Motors, Q. Graham. Power, vol. 61, no. 6, Feb. 10, 1925, pp. 209-211, 5 figs. Tells what effects of changing field current will be upon load current, power factor, efficiency and pull-out torque of synchronous motor.

UNBALANCED VOLTAGES, EFFECT OF. Effect of Unbalanced Voltages on the Operation of Induction Motors, O. C. Schoenfeld. Elec. Jl., vol. 22, no. 1, Jan. 1925, pp. 20-33, 6 figs. Method for determining actual effect of unbalanced voltages on motor performance; features necessary in motor design to meet these conditions.

ELECTRIC MOTORS, D.C.

DESIGN. Theory for the Rational Construction of Electric Machines (Essai d'une théorie sur la construction rationnelle des machines électriques), S. Rauth. Revue Générale de l'Électricité, vol. 17, no. 1, Jan. 3, 1925, pp. 25-28, 1 fig. Discusses weight and quality of materials used, heating of motors, ventilation, etc.

ELECTRIC TRANSMISSION LINES

IRON WIRE FOR. Electric Transmission Lines of Iron Wire (Lignes électriques en fils de fer), M. Bunet. Société Française des Électriciens—Bul., vol. 4, no. 38, Aug.-Oct. 1924, pp. 849-864, 5 figs. Discusses use of iron wire for transmission and how to make calculations; effect of iron lines in eliminating parasitic waves and Kelvin effect; comparison with copper wire.

ELECTRIC WELDING

BOILERS. Electric Welding Tests Made by the Swiss Society of Steam Boiler Users (Essais de soudures à l'électricité. effectués par l'Association Suisse de Propriétaires de Chaudières à Vapeur), L. Cauchois. Associations Françaises de Propriétaires d'Appareils à Vapeur—Bul., vol. 5, no. 18, Oct. 1924, pp. 225-238, 6 figs. Particulars of tests carried out and precautionary measures recommended regarding electrodes, current, joints profiles, etc.

ELECTRIC WELDING, RESISTANCE

TROUBLES AND REMEDIES. Electric Resistance Welding, F. M. Cushing. West Machy. Wld., vol. 15, no. 1, Jan. 1925, pp. 9-10, 1 fig. Common troubles and their remedies.

ELECTRIC WIRING

OXIDATION, EFFECT OF. The Effect of Oxidation on the High-Frequency Resistance of Aerial Wires: with a Note on Measuring the Resistance of Thick Wires, L. B. Turner. Instn. Elec. Engrs.—Jl., vol. 63. no. 337, Jan. 1925, pp. 149-153, 5 figs. Measurements made on thick solid and stranded wires to ascertain effect on their high-frequency resistance of oxide film formed by weathering; it is found that weathering produces no sensible effect, under either dry or wet conditions; methods of measuring high-frequency resistance are compared in respect to their suitability for determining resistance of stout straight conductors.

ELECTROLYSIS

CABLES, ELIMINATION IN. Eliminating Electrolysis of Cables, H. H. Appleton. Ry. Signaling, vol. 18. no. 2, Feb. 1925, pp. 66-69, 7 figs. Problem solved by determining sheath current with milli-voltmeter.

ELECTROLYTES

STORAGE-BATTERY. Storage Battery Electrolytes, G. W. Vinal and G. N. Schramm. Am. Inst Elec Engrs.—Jl., vol. 44, no. 2, Feb. 1925, pp. 128-132, 1 fig. Experiments in progress at Bureau of Standards to determine quantitatively effect produced by wide variety of impurities on rate of sulphation of storage battery plates; various impurities are classified according as they effect negative plates, positive plates or both; points out that it is important that some generally recognized specifications for storage-battery electrolytes be established.

ELEVATORS

ROPE-DRIVE METHODS. Methods of Rope Drive on Electric Elevator Machines, Chas. A. Armstrong. Power, vol. 61, no 5, Feb. 3, 1925, pp. 171-173, 11 figs. Common methods of roping up drum and traction elevators and their advantages and disadvantages.

EMPLOYEES' REPRESENTATION

EFFECTS OF. Labor's Growing Share in Management—Is It Effective? Factory, vol. 34, no. 1, Jan. 1925, pp. 29-32, 4 figs. Contains contributions by P. W. Litchfield and F. H. Montgomery on beneficial effects of industrial representation.

PLANS. Lynn Plan of Shop Representation, S. S. Ringer. Mgt. & Administration, vol. 9, no. 2, Feb. 1925, pp. 163-164. Plan of industrial representation which was put into effect by mutual consent of employees and management.

EMPLOYMENT MANAGEMENT

BIBLIOGRAPHY. Readers' Guide to Management Literature, E. V. McCollough. Indus. Mgt. (N.Y.), vol. 69, no. 2, Feb. 1925, pp. 98-107. Bibliography of employment management and allied subjects.

PROBLEMS. Personnel Management Problems Discussed. Iron Age, vol. 115, no. 6, Feb. 5, 1925, pp. 403 and 451-453. Review of papers presented at convention of American Management Association, dealing with employee magazines, factory lunchrooms, education, health supervision and grading of supervisors.

RATIONAL METHODS. Management's Greatest Opportunity, W. G. Caldwell. Indus. Mgt. (N. Y.), vol. 69, no. 2, Feb. 1925, pp. 92-94. Personnel directors tell how common-sense management policies are driving radicals out of ranks of labour; responsibilities of good personnel department.

ENGINEERING

PROGRESS AND PROMISE OF. The Progress and Promise of Engineering, D. S. Kimball. Franklin Inst.—Jl., vol. 199, no. 1, Jan. 1925, pp. 27-36. Author reviews most important changes wrought by modern engineering methods upon industrial life; examples of results that applied science has brought about in industry and other fields to indicate trend of modern development.

ENGINEERS

PUBLIC RELATIONS. The Public Relations of the Engineer, F. A. Thomson. Min. & Metallurgy, vol. 6, no. 218, Feb. 1925, pp. 75-78. Discusses unsatisfactory status of engineer before public and reasons; doubtful value of licensure; suggestions for improving situation.

EVAPORATION

WATER. On the Influence of Thin Surface Films on the Evaporation of Water, G. Hedestrand. Jl. Physical Chem., vol. 28. no. 12, Dec. 1924, pp. 1245-1252, 4 figs. Results of experiments show that a unimolecular layer of oil or fatty acid on water surface changes rate of evaporation by very little, if at all.

EXECUTIVES

REQUIREMENTS IN. Striking a Balance, W. E. Irish. Indus. Mgt. (N. Y.), vol. 69, no. 2, Feb. 1925, pp. 78-82. Appraisal by general manager of his executives.

EXTRUSION OF METALS

DEFECTS. Extruded Metal: A Dip into Pandora's Box, W. Lambert. Foundry Trade Jl., vol. 31, no. 441, Jan. 29, 1925, pp. 87-91, 32 figs. partly on pp. 95-98. Views as to origin of extrusion defect; basic conditions under which structurally homogeneous yellow-metal rod or shapes to any given specification can be produced by extrusion process; improper conditions; dual structure as cause of extrusion defect; prolonged heating and dual structure; causes of coring defect; remedial measures. Bibliography.

F

FANS

MINE. An Experimental Study of Fan Evasées, H. Briggs and J. N. Williamson. Instn. Min. Engrs.—Trans., vol. 68, Pt. 4, Jan., 1925, pp. 323-344, 17 figs. Principles; Peclet's experiments, and other experiments on évasées; effects of re-entry and turbulent flow; efficiency of convergence and divergence; existing évasées; amount of energy available for conversion by évasée chimneys; etc.

RATING. The Rating of Fans, Jul. Frith and F. Buckingham. Colliery Guardian, vol. 129, no. 3341, Jan. 9, 1925, p. 90. Discusses difficulties in deciding what output of a fan really is.

FATIGUE

INDUSTRIAL. Cost of Fatigue in Steel Plants, H. Porter. Blast Furnace & Steel Plant, vol. 13, no. 2, Feb. 1925, pp. 73-75, 1 fig. Recent studies of fatigue among operatives in steel mills and other industries throw considerable light on causes and processes of bodily fatigue and upon losses in dollars and cents which result from failure to apply simplest remedies at hand.

FILTRATION PLANTS

LEVIS, QUEBEC. A New Filtration Plant for Levis, P. Q. Contract Rec., vol. 39, no. 1, Jan. 7, 1925, pp. 2-5, 4 figs. Water-works improvements carried out in 1924 include installation of new intake pipe, filters, pumping system and reservoir: capacity of 3,000,000 gal. per day is provided for.

FIREBRICK

SPALLING THEORY. A General Theory of Spalling, F. H. Norton. Am. Ceramic Soc.—Jl., vol. 8, no. 1, Jan. 1925, pp. 29-39, 5 figs. A theory is proposed whereby certain physical properties of a material are combined in such a way as to give a measure of its resistance to rapid temperature changes.

FLOOD CONTROL

INDUSTRIAL DISTRICTS. Drainage and Flood Protection of an Industrial District. O. H. Horner. Eng. News-Rec., vol. 94, no. 6, Feb. 5, 1925, pp. 238-240, 5 figs. Greater pumping capacity required that for agricultural lands; hydraulic fill levee constructed along Missouri River; large conduit instead of ditch.

FLOW OF WATER

MEASUREMENT. Methods of Measuring Velocity in Hydraulics (Sur quelques procédés de mesure des vitesses en hydraulique), L. Escande and M. Ricaud. Académie des Sciences—Comptes Rendus, vol. 179, no. 26, Dec. 29, 1924, pp. 1590-1591. Describes chronophotographic method of measuring, by using small balls of specific gravity of water, of 2-3 mm. diameter for instance, and compares results obtained with those from Pitot tube.

FLUE-GAS ANALYSIS

HEAT-LOSS CALCULATION. Calculation of Heat Loss in Flue Gas, N. T. Bourke. Power Plant Eng., vol. 29, no. 4, Feb. 15, 1925, pp. 230-231, 1 fig. Proximate analysis of coal and flue-gas analysis from basis of formula for heat lost in dry gases.

INSTRUMENTS FOR. Instruments for Flue-Gas Analysis, C. L. Hubbard. South. Engr., vol. 42, no. 5, Jan. 1925, pp. 81-86, 14 figs. Reasons for flue gas instruments, how to operate them and details regarding various types.

MULTI-POINT SAMPLERS. Multi-Point Samplers for Flue Gas Analysis, C. E. Colborn. Combustion, vol. 12, no. 1, Jan. 1925, pp. 43-44, 1 fig. An interesting method for taking flue-gas samples, particularly with reference to wide boilers.

FORGINGS

STRESSES, INTERNAL. Internal Stresses of Forgings and Annealing After Forging (Les "tensions internes" de forgeage et les recuits après forgeage), A. Portevin. Revue de Métallurgie, vol. 21, no. 12, Dec. 1924, pp. 729-733, 6 figs. Concludes that stresses due to forging at usual temperatures are insignificant, that effect of annealing therefore is rendering steel homogeneous chemically.

FOUNDATIONS

CONCRETE. Novel Construction of Concrete Foundations for Structures, W. G. Kirchoffer. Mun. & County Eng., vol. 67, no. 6, Dec. 1924, pp. 289-291. Briefly describes a method of constructing reservoir walls and foundations for small dams, bridges, chimneys, etc.. in locations where materials to be excavated are water bearing sands and gravel, quick sand or other materials which will not be self-supporting and would require complicated or expensive sheeting and bracing.

FOUNDRIES

DRAFTSMEN, CO-OPERATION OF. Foundry Work and the Draughtsman, A. Sutcliffe. Foundry Trade Jl., vol. 31, no. 440, Jan. 22, 1925, pp. 75-77, 6 figs. Gives number of examples to illustrate that it is essential that draftsman should cooperate with patternmaker and molder and would undoubtedly benefit by associating himself with their national technical organization.

FRENCH AND AMERICAN METHODS. French and American Iron Foundry Methods Compared. Wm. Ruddy. Foundry, vol. 53, no. 3, Feb. 1, 1925, pp. 97-99. Describes foundry conditions, materials and methods in France, and compares these factors in French and American foundries.

PARIS CONGRESS. Fourth Foundry Congress, Paris, Nov. 21-23, 1924 (Le IVe Congrès de Fonderie), S. Brull. Technique Moderne, vol. 17, no. 1, Jan. 1, 1925, pp. 8-11. Summary of proceedings, covering special castings, study of sands, standardization of patterns, cost of production, defects of foundries, etc.

PRODUCTION CONTROL IN. Production Schedule Aids Steel Foundry Sales, B. Ulchake. Foundry, vol. 53, no. 2, Feb. 15, 1925, pp. 49-51, 4 figs. Discusses method of production control adopted by firm with which author is connected; production manager in charge is directly responsible to general manager and has control, not only over production, but also over time study and rate-setting department.

STEEL. Mechanical Aids Handle Sand in Manganese Shop, P. Dwyer. Foundry, vol. 53, no. 4, Feb. 15, 1925, pp. 141-144 and 160, 11 figs. Equipment takes sand from shakeout floor and returns it to molding department in large Chicago steel foundry; laboratory control prevails; general layout of plant and operation details.

FRAMES

WOODEN, JOINTS FOR. Resistance Tests of Some Types of Joints for Wood Frames (Essais de résistance sur quelques types d'assemblage pour charpentes en bois), F. Cretin. Génie Civil, vol. 86, nos. 1 and 2, Jan. 3 and 10, 1925, pp. 9-12 and 35-38, 25 figs. Discusses various types of joints for pieces of wood, including joining by bolts, keys, wedges, etc., and their efficacy.

FUEL ECONOMY

ENGINEERING AND RESEARCH. Outstanding Developments in Fuels Engineering and Research during 1924, H. W. Brooks. Mech. Eng., vol. 47, no. 2, Feb. 1925, pp. 145-147. Report prepared at request of Fuels Division of A.S.M.E.

FUELS

COAL. *See Coal.*

PULVERIZED COAL. *See Pulverized Coal.*

REFUSE CINDERS. Refuse Cinders for Steam Raising. Eng. & Boiler House Rev., vol. 38, no. 8, Feb. 1925, p. 346. Working figures of boiler plant at Eccles sewage disposal works, making use of cinders screened from ordinary house refuse in place of burning total refuse in destructor.

G

GAGES

GAGING METHODS AND. Modern Gaging Methods and Gages, Jos. K. Wood. Am Mach., vol. 62, no. 8, Feb. 19, 1925, pp 305-310, 12 figs. Working, inspection and master gages; interchangeability; types of fits; modern gaging tools; metal contact according to atomic theory.

GALVANIZING

DIP TEST FOR COATED FERROUS ARTICLES. A New Dip Test for Zinc Coated Ferrous Articles, C. J. Wernlund. Metal Industry (N.Y.), vol. 23, no. 1, Jan. 1925, pp. 13-14, 1 fig. New method developed in laboratories of Roessler & Hasslacher Chemical Co.

GAS DISTRIBUTION

HIGH-PRESSURE. Distribution of Gas under High-Pressure, C.E. Harford. Gas World, vol. 82, no. 2112, Jan. 10, 1925, pp. 22-27, 8 figs. Distribution under high-pressure system over area in County of Essex, England, covering 160 sq. mi.; work of laying mains for 45 miles; testing mains; method adopted of supplying from trunk high-pressure main to low-pressure district is by district regulators.

GAS ENGINES

COCKERILL. 7150 B.H.P. Cockerill Gas Engine. Engineer, vol. 139, no. 3606, Feb. 6, 1925, pp. 168-169, 6 figs. partly on p. 166. Blast-furnace gas engine built by Société Anonyme John Cockerill, Belgium, for works of Staveley Coal & Iron Co., Barrow Hill, Chesterfield, Eng.; it is of 4-cylinder twin-tandem type, with overhung cranks, operating on 4-cycle system.

GAS PRODUCERS

THEORY AND PRACTICE. Gas Producer Theory and Practice, A. B. Huyck. Blast Furnace & Steel Plant, vol. 12, no. 12, Dec. 1924, pp. 542-545 and vol. 13, no. 2, Feb. 1925, pp. 90-92. Series of investigations dealing with important phases of producer operation.

GEARS

SPEED-REDUCTION. Reducing Speed by Gear Sets. Iron Trade Rev., vol. 76, no. 5, Jan. 29, 1925, pp. 348-350, 3 figs. For straight-line reduction, plain spur, planetary and non-planetary types of speed reducers are employed; torque and speed are inversely proportional, disregarding frictional losses.

TESTING. The Routine Testing of Gears. Automobile Engr., vol. 15, no. 198, Jan. 1925, pp. 25-26, 3 figs. Details of Wickman gear-measuring machine.

GOLD DEPOSITS

MANITOBA, CANADA. The Central Manitoba Goldfield, J. F. Wright. Can. Min. Jl., vol. 46, no. 4, Jan. 23, 1924, pp. 91-95, 5 figs. Geological notes on East Central Manitoba (Rice Lake) gold area.

GRINDING MACHINES

SPINDLE BEARINGS, FITTING. Fitting Spindle Bearings on the Heim Centerless Grinder. Am. Mach., vol. 62, no. 6, Feb. 5, 1925, pp. 245-247, 6 figs. Preliminary boring operations; housings scraped to alignment; final boring after bearings are fitted; scraping in spindles.

GYPSUM

PRODUCTION. An Outline of Gypsum Production, J. L. McK. Yardley. Rock Products, vol. 28, no. 1, Jan. 10, 1925, pp. 44-50, 11 figs. Description of principal processes employed with costs of both plant construction and operation.

H

HARDNESS

BALL HARDNESS TESTING. Duration of Loading and Ball Hardness, R. Mailänder. Mech. Eng., vol. 47, no. 2, Feb. 1925, pp. 133-134, 1 fig. According to Krupp process, variation of depth of impression as function of duration of loading is determined by measuring, within single, test and without withdrawing pressure, depths of impressions at given time intervals. (Abstract.) Translated from Kruppsch Monatshefte, vol. 5, Oct. 1924, p. 209.

COLD-ROLLED METALS. Scratch and Brinnell Hardness of Severely Cold-rolled Metals, M. F. Fogler and E. J. Quinn. Am. Inst. Min. & Met. Engrs.—Trans., no. 1395-E. Jan. 1925, 6 pp., 2 figs. Attempt to duplicate Rawdon and Murchler's experiments showing reversal of hardness with continued rolling gave negative results, indicating that phenomenon is not general but depends, probably, on local conditions of rolling.

ROCKWELL AND BRINELL SCALES, RELATION BETWEEN. Relation between Rockwell and Brinell Hardness Scales, I. H. Cowdrey. Am. Soc. Steel Treating—Trans., vol. 7, no. 2, Feb. 1925, pp. 244-251, 3 figs. Results of research carried on at Testing Materials Laboratory of Mass. Inst. Technology.

TESTING. Report of the Hardness Testing Work of the A.S.M.E. Am. Soc. Steel Treating—Trans., vol. 7, no 2, Feb. 1925, pp. 251-260. Account of investigation being carried out by J. O. Keller.

HARMONICS

ANALYZER FOR. An Electric Harmonic Analyzer, J. D. Cockcroft, R. T. Coe, J. A Tyacke and M. Walker. Instn. Elec. Engrs.—Jl., vol. 63, no. 337, Jan. 1925, pp. 69-113 and (discussion) 113-119, 29 figs. Deals with experimental harmonic analysis of electromotive force and current wave forms; outline of existing methods and their limitations; modification of dynamometer method which allows much higher degree of accuracy to be attained; final method advocated aims at analyzing wave forms up to at least 23rd harmonic and correct to within 0.1 per cent of fundamental; for convenience, most of mathematics is given in appendices and only results are quoted in paper itself. Bibliography.

HEAT

CONVECTION. Theoretical and Practical Study of Heat Convection (Etude théorique et pratique de la convection calorifique), G. H. Perrin. Revue Générale de l'Electricité, vol. 17, no. 1, Jan. 3, 1925, pp. 3-13, 3 figs. General equations; law of similitude; calculation of coefficients of convection for air, CO_2, H, H_2O, transformer oil, etc.

HEATING, GAS

INDUSTRIAL AND DOMESTIC. Where Can City Gas Be Used for Domestic and Industrial Heating? D. J. Demorest. Chem. & Met. Eng., vol. 32, no. 6, Feb. 9, 1925. pp. 233-236, 4 figs. Economic factors controlling use of coal gas and coal gas-water mixtures in house and factory furnaces.

HEAT TREATING

HEATING ELEMENT. Oehm Heating Unit. Machy. (Lond.), vol. 25, no. 642, Jan. 15, 1925, p. 504 Describes apparatus for production of heat from solid fuel which is said to effect complete combustion of solid fuel to CO_2 gas possessing pressure and velocity without flame and smoke; element is adapted for drying molds and cores on floor, in pits and in drying rooms, for heating ladles, shanks and ingots, and for annealing and heat treatment generally.

HEATING, STEAM

CENTRAL. Advantages of Central and District Heating, F. A. Combe. Power House, vol. 17, no. 23, Dec. 29, 1924, pp. 21-28 and 42, 10 figs. Usually exhaustive investigation shows that such systems result in economies unobtainable in any other way. Gives installation and operating costs of district heating systems of North Battleford, Sask., Winnipeg and Brandon, Man., and of central heating systems of University of Toronto, Dominion Government Buildings, Ottawa, University of Alberta and McGill University, Montreal. Abstract of report made to Dominion Fuel Board.

HIGHWAYS

TRAFFIC. Highway Research Board Report on Highway Traffic Analysis. Mun. & County Eng., vol. 67, no. 6, Dec. 1924, pp. 310-316. Full text of report of Committee No. 4, on Highway Traffic Analysis of Highway Research Board, on a study of increase in motor vehicle registration to determine factors for forecasting future traffic and a saturation point.

HOISTS

ELECTRIC CONTROL. Electric Control of Hoisting and Handling Apparatus (Etude sur la commande des appareils de levage et de manutention par l'électricité), E. Pacoret. Vie Technique et Industrielle, vol. 6, nos. 62 and 63, Nov. and Dec. 1924, pp. 517-520 and 602-605, 12 figs. Types and advantages of electric control; d.c. and a.c. motors; power consumption of motors; distance control; electric braking.

SKIP. Skip Hoists, Geo. F. Zimmer. Electrician, vol. 93, no. 2432, Dec. 26, 1924, pp. 723-725 and vol. 94, no. 2433, Jan. 2, 1925, pp. 4-6, 6 figs. Modern examples from power-station practice; skip hoist for handling locomotive ashes; floating coaling device at London docks.

HUMIDITY

MEASUREMENT. Methods for Measuring Humidity, S. P. Fergusson. Optical Soc. Am.—Jl., vol. 10, no. 1, Jan. 1925, pp. 119-121. Discusses chemical, condensation, psychrometric, and hair-hygrometer methods.

PRINCIPLES. Fundamental Principles of Humidity, W. E. Biggs and W. R. Woolrich. Nat. Engr., vol. 29, no. 1, Jan. 1925, pp. 5-6, 1 fig. Practical discussion on principles of humidity and their application in practice.

HYDRAULIC TURBINES

PROPELLER TYPE. Some Noteworthy Modern Turbine Installations (Quelques Installations remarquables de Turbines modernes), R. Hofmann. Houille Blanche, vol. 23, no. 95-96, Nov.-Dec. 1924, pp. 169-173, 7 figs. Describes propeller turbines at Wynau hydro-electric plant, for a head of 2.4 to 5.2 m., developing 2,700 hp. maximum, 107 r.p.m.

HYDRO-ELECTRIC DEVELOPMENTS

CANADA. Further Notes on O.H.E.P.C.C. Construction. Can. Engr., vol. 48, no. 3, Jan. 20, 1925, pp. 149-152, 6 figs. Taken from report covering engineering operations of Ontario Hydro-Electric Power Commission during fiscal year 1923; additional units at Queenston; extension at Nipigon; development at Dams nos. 8 and 9; Bingham chutes.

NEW SOUTH WALES. Hydro-Electric Power in New South Wales. Indus. Australian & Min. Standard, vol. 72, no. 1878, Dec. 4, 1924, pp. 810-812, 5 figs. Particulars of Nymboida and Jackadgery schemes.

WINTER CONSTRUCTION. Winter Hydro-Electric Plant Construction in Minnesota, Geo. H. Herrold. Eng. News-Rec., vol. 94, no. 6, Feb. 5, 1925, pp. 230-232, 3 figs. Materials brought in by barges in summer and sledges in winter; temperatures fell to 50 deg. below zero; belt conveyors and gravity railway for concrete.

I

INDICATORS

HIGH-SPEED ENGINES. The Dobbie-McInnes "Farnboro" Indicator, A. W. Judge. Automobile Engr., vol. 15, no. 198, Jan. 1925, pp. 9-14, 11 figs. Details of electro-pneumatic apparatus for high-speed engines.

INDUSTRIAL MANAGEMENT

BUDGET CONTROL. Tighter Control through Budgets. Factory, vol. 34, no. 1, Jan. 1925, pp. 33-34, 2 figs. Outline of progress budget has made as revealed in survey made by this journal.

BUDGETING. Industrial Budget Methods. Jos. H. Barber. Mgt. & Administration, vol. 9, nos. 1 and 2 Jan. and Feb. 1925, pp. 15-20 and 129-133, 7 figs. Jan.: Notes on developing a related external cycle; reducing cycles to comparable basis; reading cycle mass movements; comparing cycle averages; value of average demand cycle line; valuation factors. Feb.: Operation and application of sales forecast.

CO-ORDINATION OF EMPLOYER AND EMPLOYEE. The Pay-Roll Dollar in Industry, S. F. Fannon. Modern Min., vol. 2, no. 1, Jan. 1925, pp. 5-8, 2 figs. Vital importance of human element compared with apparent importance of plant equipment.

INVENTORY CONTROL. How to Maintain Proper Inventory Control, H. S. Owen. Indus Mgt. (N. Y.), vol. 69, no. 2, Feb. 1925, pp. 83-85, 1 fig. Simple method for keeping inventory investment at practical minimum.

MANAGEMENT TOOLS. Management's Progress toward New Standards. Factory vol. 34, no. 1, Jan. 1925, pp. 21-26, 2 figs. Gives opinions of leaders in industry on trend in management and management tools that shape it; these tools are defined as; (1) Closer executive control through budgeting, accounting systems which focus attention on crucial points, and pre-determination of costs; (2) reduction of costs by constant attention to details; (3) production planning and control; (4) elimination of waste; increase of manufacturing turnover.

PRODUCTION PLAN. Organization and Production Efficiency, W. S. Findlay. Eng. Production, vol. 8, no. 149, Feb. 1925, pp. 60-61. Describes plan worked out by executive which included installation of costing system, payment by results, organization of stores and works requisitions, plant repairs, rearrangement of shop, and division of labor into groups.

PROGRESS. Twenty Years of Modern Management, D. S. Kimball. Mgt. & Administration, vol. 9, no. 2, Feb. 1925, pp. 113-116. Management of movement; magnitude of Taylor's task; experimental stage of management; literature; personnel relations in industry; humanizing of management.

RATE SETTING, DEPARTMENTAL. Departmental Rate Setting, K. M. Baker. Indus. Mgt. (N. Y.), vol. 69, no. 2, Feb. 1925, pp. 95-97, 3 figs. Departmental rate based upon standard cost figures obtained from standard rates on all operations is said to be most certain method to effect saving to company.

SIMPLIFICATION. Simplification: Achievement and Promise, P. G. Agnew. Factory, vol. 34, no. 1, Jan. 1925, pp. 26-27, 2 figs. Achievements of American Engineering Standards Committee during 1924 told by its secretary.

INDUSTRIAL ORGANIZATION

REORGANIZATION. The "Destructive" Element in Reorganization. Eng. Production, vol. 8, no. 149, Feb. 1925, pp. 43-44. Describes new "cutting-out" policy worked out by a production manager.

INDUSTRIAL PLANTS

OIL VS. STEAM ENGINES FOR. Cost of Power for Industrial Plants, M. G. Farrell. Oil Engine Power, vol. 3, no. 1, Jan. 1925, pp. 38-42, 4 figs. Advantages of oil over steam engine; comparative operating costs; data on steam-plant costs; purchased power, and Diesel-plant costs.

POWER-SERVICE EQUIPMENT. Trends and New Practices in the Use of Mechanical Equipment in the Path of Power Service, G. A. Van Brunt. Indus. Engr., vol. 83, no. 2, Feb. 1925, pp. 55-64 and 111, 29 figs. Describes new developments in leading items of equipment, including ball, roller and sleeve bearings; belting and pulleys; speed reducers; clutches and couplings.

INDUSTRIAL RELATIONS

COLORADO INDUSTRIAL LAW OF CONCILIATION. The Colorado Industrial Law, Wm. I. Reilly. Min. Congress Jl., vol. 11, no. 1, Jan. 1925, pp. 20-22. Functions of Industrial Commission of Colorado created by Colorado law, primary object of which is conciliation; law gives commission jurisdiction over every dispute between employer and employee regarding wages, hours or working conditions, etc.

CO-OPERATION, PROBLEM OF. Human Relations in Industry, E. J. Henning. Min. Congress Jl., vol. 11, no. 1, Jan. 1925, pp. 17-18. In author's opinion, major problem of industrial co-operation is to secure complete harmony between four factors of industry, namely, capital, management, labor and the public.

CO-OPERATION, RAILWAYS. Co-operation—Not an Idle Dream, R. V. Wright. Ry. Age, vol. 78, no. 4, Jan. 24, 1925, pp. 259-265, 2 figs. Concrete and practical results traced on Central of Georgia Railway.

LABOUR INTERVENTION IN MANAGEMENT. A "Voice in the Management", M. E. Nichols. Mech. World, vol. 77, no. 1983, Jan. 2, 1925, p. 7. Author seeks to demonstrate that intervention of labour in connection with managerial matters is not effective; on other hand, management should differentiate between flesh and blood and iron and steel.

LABOUR POLICY. Industrial Relations Plan Stands Time Test, G. L. Lacher. Iron Age, vol. 115, no. 5, Jan. 29, 1925, pp. 325-330. Colorado Fuel & Iron Co.'s program embraces works council, provisions for recreation and education, pensions, medical and surgical treatment and encouragement of practical suggestions from employees.

PROMOTING HARMONY. Promoting Industrial Harmony, R. W. Kelly. Indus. Mgt. (N. Y.), vol. 69, no. 2, Feb. 1925, pp. 89-92. Ten years' progress in industrial and public relations; fields in which best work has been done, and in which most noteworthy permanent advancement has been achieved, are industrial medicine, accident prevention, and industrial training; points out necessity for men especially suited to work.

INSULATORS, ELECTRIC

HIGH-TENSION. High-Tension Insulators (Isolants pour hautes tensions), P. Bunet. Revue Générale de l'Electricité, vol. 16, no 24, Dec. 13, 1924, pp. 939-951, 5 figs. Methods of testing and production of shock waves; disruptive voltage; strength of insulators, etc.

INTERNAL-COMBUSTION ENGINES

See Airplane Engines; Automobile Engines; Diesel Engines; Gas Engines; Oil Engines.

IRON AND STEEL

CHEMISTRY OF. The Chemistry of Iron and Steel, F. T. Sisco. Am. Soc. Steel Treating—Trans., vol. 7, no. 2, Feb. 1925, pp. 197-216. It is shown that nickel, chromium, vanadium and molybdenum are of great benefit as alloying elements in steel; advantages of cobalt, uranium and zirconium are questionable.

IRON CASTINGS

GRAY-IRON. New Method of Making Gray Iron Castings Engineer (Met. Supp.), vol. 129, no. 3605, Jan. 30, 1925, pp. 9-11, 2 figs. Describes practice of Holley Carburetor Co., Detroit, and Holley casting machine.

IRON DEPOSITS

ONTARIO, CANADA. Future of the Ontario Iron Deposits, E. L. Bruce. Can. Min. Jl., vol. 46, no. 3, Jan. 16, 1925, pp. 71-75, 1 fig. Their origin, relation to world supply of iron ore, and potential importance.

L

LIFTING MAGNETS

PRINCIPLE AND USES. Electro Magnets, J. B. Kramer. Indus. Mgt. (Lond.) (Cassier's Mech. Handling No.), Jan. 1925, pp. 74-78, 14 figs. Explains working principle of electromagnet, and purposes for which this form of handling device is employed in works and factories.

LIGHTING

FACTORY. Lighting Facts to Ponder Over, C. E. Weitz. Am. Mach., vol. 62, no. 8, Feb. 19, 1925, pp. 295-300, 10 figs. Points out that immense loss is chargeable to poor illumination; fundamental principles of good lighting; perception, discrimination, sustained vision and what foot-candle meter will show.

INDUSTRIAL. Illumination and Industrial Efficiency, S. DeHart. Indus. Mgt. (N. Y.), vol. 69, no. 2, Feb. 1925, pp. 108-111, 5 figs. Points to necessity of good lighting; effect of lighting on output; causes of glare.

LIME

BURNING. British Practice in Lime Burning, N. V. S. Knibbs. Cement, Mill & Quarry, vol. 26, no. 1, Jan. 5, 1925, 6 pp. between pp 24 and 34. Notes on combustion and calcination; operation of externally-fired, gas-fired, and rotary kilns; lime cooling: fuel economy; temperature measurement and control. Chapter from book entitled "Lime and Magnesia".

LIQUIDS

VAPORIZATION HEATS. Velocity of Sound in Liquids and Its Relation to Heats of Vaporization (Sur la vitesse du son dans les liquides et sur ses relations avec les chaleurs de vaporisation), T. V. Ionescu. Journal de Physique et le Radium, vol. 5, no. 12, Dec. 1924, pp. 377-383, 4 figs. Discusses relation of velocity of sound in liquids and their heat of vaporization and examines various formulas expressing it.

LOCOMOTIVES

COALING STATIONS. Mechanical Handling of Locomotive Coal in England, E. W. Selby. Indus. Mgt. (Lond.) (Cassier's Mech. Handling No.), Jan. 1925, pp. 86-91, 11 figs. Describes chief methods of coaling locomotives by mechanical means, and explains how considerable economies may be effected by replacement of modern methods.

ELECTRIC. *See Electric Locomotives.*

FRANCE. French Locomotive Performances, J. T. B. Alexander. Engineer, vol. 139, no. 3606, Feb. 6, 1925, pp. 153-155. Account of trips made by author on various French lines.

GREAT NORTHERN RAILWAY, CANADA. The Great Northern Railway and Its Locomotives, P. T. Warner. Baldwin Locomotives, vol. 3, no. 3, Jan. 1925, pp. 3-33, 63 figs. Development of road; weights and dimensions of locomotives in service.

HIGH-PRESSURE. D. & H. High Pressure Locomotive. Ry. Age, vol. 78, no. 6, Feb. 7, 1925, pp. 353-357, 4 figs. "Horatio Allen," new consolidation-type locomotive, develops 350-lb. boiler pressure; has water-tube firebox and cross-compound cylinders.

INTERNAL-COMBUSTION. The Internal Combustion Locomotive, J. W. Hobson. North-East Coast Instn. Engrs. & Shipbldrs.—advance paper, no. 2679T, for mtg. Feb. 13, 1925, 41 pp., 23 figs.

OIL-ENGINED, WITH STEAM-PNEUMATIC DRIVE. Oil-Engined Locomotive with Steam-Pneumatic Drive. Oil Engine Power, vol. 3, no. 1, Jan. 1925, pp. 25-26, 2 figs. Proposal has been put forward to utilize compressed air furnished by integral Oil-engined compressor unit in combination with steam generated partly by contact with uncooled compressed air and partly by waste heat; mixture is to be delivered to locomotive gear of ordinary type.

STEAM-TURBINE. A Turbine Locomotive for British Railways. Ry. Engr., vol. 46, no. 540, Jan. 1925, pp. 5-6, 2 figs. Engine which is at present under construction is designed specially to meet British railway conditions; consists of boiler-carrying and a turbine-driven condenser vehicle, latter having 3 pairs of coupled and driving wheels; main turbine is of axial flow type.

THREE-CYLINDER. Flexibility of the Three-Cylinder Principle Demonstrated by Application in 1924. Ry. Rev., vol. 76, no. 7, Feb. 14, 1925, pp. 297-299, 7 figs. Describes some of 3-cylinder locomotives constructed in United States during past year.

LUBRICATING OILS

CRANKCASE DILUTION. Foreign Material in Used Oil: Its Character and Effect on Engine Design, G. A. Round. Soc. Automotive Engrs.—Jl., vol. 16, no. 2, Feb. 1925, pp. 232-236, 11 figs. Studies of samples of used engine oil under microscope show that carbonaceous material is extremely finely divided, and that particles are held together loosely by oxidized oil.

LUBRICATION

PROBLEMS. Symposium on Lubrication. Mech. Engr., vol. 47, no. 2, Feb. 1925, pp. 109-114, 6 figs. Abstracts of three papers as follows: High-Pressure-Bearing Research, L. Illmer; An Investigation of the Critical Bearing Pressures Causing Rupture in Lubricating-Oil Films, L. N. Linsley; A Graphical Study of Journal Lubrication, H. A. S. Howarth; and discussion of papers.

M

MACHINE SHOPS

MAINTENANCE AND REPAIR EQUIPMENT. Maintenance Tools and Repair Shop Equipment. Indus. Engr., vol. 83, no. 2, Feb. 1925, pp. 84-89 and 110-111, 24 figs. Recent developments in repair shop and maintenance tolls and supplies tending to reduce maintenance expense.

MALLEABLE CASTINGS

HEAT TREATING. Heat Treating Malleable Castings Prior to Galvanizing. Iron Trade Rev., vol. 76, no. 6, Feb. 5, 1925, pp. 383-384, 2 figs. Process developed by Bur. of Standards by use of which castings to amount of 10 to 20 per cent of production which formerly were rejected now are saved.

MANUFACTURE. Malleable Cast Iron, D. Wilkinson. Foundry Trade Jl., vol. 31, no. 438, Jan. 8, 1925, pp. 28-32. Discusses processes in manufacture of malleable iron castings, notes on grading; cupola practice; foundry practice; experiment with black-heart malleable; annealing; heat control; silver as pyrometer control.

MANGANESE STEEL

MANUFACTURE. History, Manufacture and Applications of Manganese Steel, J. H Hall. Am. Welding Soc.—Jl., vol. 4, no. 1, Jan. 1925, pp. 7-14, 1 fig. Properties of manganese steel; manufacturing methods of Taylor-Wharton Iron & Steel Co.

MATERIALS HANDLING

EQUIPMENT. Money-Saving Material Handling, Geo. E. Hagemann. Mgt. & Administration, vol. 9, no. 2, Feb. 1925, pp. 153-156. Date on conveyors, cranes and hoists.

Typical Jobs Where Material Handling Devices Pay for Themselves, F. E. Gooding. Indus. Engr., vol. 83, no. 2, Feb. 1925, pp. 65-70 and 112-113, 31 figs. Review of equipment developed and applied during 1924 by manufacturers for speeding up and reducing cost of handling of materials between machines or presses.

FACTORIES. Mechanical Handling in the Factory, Geo. F. Zimmer. Indus. Mgt (Lond.) (Cassier's Mech. Handling Co.), Jan. 1925, pp. 20-29, 16 figs. Advantages of mechanical handling devices; routing; continuous production; progressive assembly; contributory conveyors; selective conveyors; lifting trucks and stillages; combination conveyors.

HOPPERS FOR AUTOMATIC MACHINERY. Hopper Design for Automatic Machinery. Machy. (Lond.), vol. 25, no. 641, Jan. 8, 1925, pp. 461-464, 6 figs. Discusses types most generally required and examples of their design; hoppers for granular and other substances and for liquids.

Engineering of Material Handling Machinery Installations, E. T. Bennington. Am. Mach., vol. 62, no. 5, Jan. 29, 1925, pp. 195-197, 3 figs. Deals with problem of designing and applying machinery to handling and moving of materials; importance of standardization of product and of containers. Paper presented before Cleveland Section of A.S.M.E.

MECHANICAL, EFFECT ON PRODUCTION. Material Handling's Larger Part in Production, Geo. F. Johnson. Factory, vol. 34, no. 1, Jan. 1925, pp. 41-43 and 212 Experience of Endicott Johnson Corp. in wholesale adoption of machine methods of moving materials.

MATHEMATICS

FORMULAS Solution of Formulas With Four Variables (Résolution des formules à quatre variables), M. Mathieu. Arts et Métiers, vol. 77, no. 51, Dec. 1924, pp. 466-472, 12 figs. Details of rapid method for solution with aid of slide rules and charts; gives examples.

MEASURING INSTRUMENTS

SMALL MOTIONS. The Measurement of Mechanical Vibrations, H. A. Thomas. Engineer, vol 139, no. 3604, Jan. 23, 1925, pp. 102-104, 7 figs. Results and details of applications of method of measuring small motions by means of electrical arrangement; method was described in former issue of same journal (Feb. 9, 1923).

TYPES. Instruments and Gauges, H. A. Randall. Eng. Production, vol. 8, no. 149, Feb. 1925, pp. 45-52, 12 figs. Deals with microscope lathe attachments; machines for testing fatigue-resisting qualities of metals; clink detector which gives autographic record of shocks which may occur in forging during heating and cooling process, vibrograph for accurately measuring vibrations of machine tools or roads, bridges and buildings; micro-indicator for taking diagrams from high-speed internal combustion engines; torsion meter; and instruments for temperature measurement.

METALLOGRAPHY

ETCHING, REVELATIONS BY. Some Revelations by Deep Etching, J. F. Harper. Am. Soc. Steel Treating—Trans., vol. 7, no. 2, Feb. 1925, pp. 237-243, 11 figs. Discusses acid etching of forgings and castings for purpose of inspecting soundness and fitness for use of materials under examination; draws conclusions as to advantages of this method of inspection; to considerable extent it is possible to identify method of manufacture by which particular specimen under examination had been manufactured in steel mill.

METALLURGY

PHYSICAL, TREND OF. The Trend in Physical Metallurgy, C. H. Mathewson. Franklin Inst.—Jl., vol. 199, no. 1, Jan. 1925, pp. 37-50. Most marked modern trend is said to be toward comprehensive theory of constitution of individual phases or phase elements which shall be susceptible to quantitative expression in defining properties and interrelationship of these phases; knowledge of this sort will permit, for example, specification of amount and kind of cold work an alloy of given constitution will stand, or specification of mechanical properties after operations resulting in rearrangement of strain or recrystallization.

METALS

FATIGUE. Fatigue Tests of Metals and the Theory of Elasticity, H. F. Moore. Eng. News-Rec., vol. 94, no. 6, Feb. 5, 1925, pp. 225-226. Endurance tests on bars with holes indicate that local high stresses are relieved by adjoining metal.

STRUCTURE. Heat Treatment and Metallography of Steel, H. C. Knerr. Forging—Stamping—Heat Treating, vol. 11, no 2, Feb. 1925, pp. 54-62, 12 figs. Part of practical course in elements of physical metallurgy. Notes on structure of metals; deals with pure metals, eutectics, iron-carbon alloys, wrought iron, steel, white and gray cast iron; malleable, impurities, segregation, etc.

TESTING. Experiments on the Resistance of Materials to Vibration (Quelques résultats d'essai des matériaux aux vibrations), L. Jannin. Revue de Métallurgie, vol. 21, no. 12, Dec. 1924, pp. 742-749, 11 figs. Results of experiments show that resistance of metals to vibrations grows with limit of elasticity of metal, and with its purity and homogeneity.

MILLING MACHINES

PRODUCTION METHODS AND EQUIPMENT. Specializing in Milling Machine Production. Can. Machy., vol 33, no. 3, Jan. 15, 1925, pp. 17-20, 4 figs. Development work begun in Hamilton plant of Ford-Smith Machine Co. in 1912; simple routing system greatly facilitates manufacturing operations.

MINES

ACCIDENT PREVENTION. Some Suggestions for the Prevention of Accidents from Falls of Ground in Mines, E. Watts. Colliery Guardian, vol. 129, no 3341, Jan. 9, 1925, pp 90-93, 17 figs. Control of roof; face supports; special timbermen; study of rules; importance of discipline; practical suggestions.

FANS. The Choice of an Efficient Fan or Ventilator for a Mine, J. Parker. Instn. Min. Engrs.—Trans., vol. 68, Pt. 4, Jan. 1925, pp. 296-309, 6 figs. Considers resistance of a mine, and how far it may change during life of a mine, and in this connection best method of expressing, representing, and computing resistance; and behavior of fans throughout any change in resistanee, or modification therein, and how best to represent and compute relations between resistance, volume of air circulated, and efficiency of fan.

VENTILATION. The Application of Air-Screws to Mine Ventilation, F. A. Steart. Instn. Min. Engrs.—Trans., vol. 68, Pt. 4, Jan. 1925, pp. 310-322, 8 figs. Particulars of further investigation, and results of tests conducted with experimental air-screw fan at Northfield Colliery Natal, S Africa.

MINE TIMBERING

PRESERVATION. Timber Preservation at the Verde Extension, R. H. Marks. Ariz. Min. Jl., vol. 8, no. 16, Jan. 15, 1925, pp. 5-6, 1 fig. Results to date of use of Ac-Zol in treatment of mine timbers by United Verde Extension Min. Co., Jerome, Ariz.

MINING

STANDARDS. Co-ordination of Mining Standards, E. A. Holbrook. Min. Congress Jl., vol. 11, no 1, Jan. 1925, pp. 25 and 36. Outlines possibilities of mining standards and devices procedure into three classifications, recommended practice, specification, and exact procedure.

MOLDING METHODS

GREEN AND DRY SAND. Small Work Moulding in Green and Dry Sand, J. D. Nicholson. Foundry Trade Jl., vol. 31, no. 441, Jan. 29, 1925, pp. 92-94 and 99, 15 figs. Emphasizes important features in green and dry-sand molding which must he adhered to in order to produce reliable molds and sound castings.

GATING. Gating Errors—and Their Correction, F. C. Edwards. Metal Industry (Lond.), vol. 26, no. 4, Jan. 23, 1925, pp. 87-89, 4 figs. With aid of a few varied examples, author shows how gating troubles can be dealt with.

MOLDS

INGOT, IRON FOR. Iron and Other Metals for Ingot Molds, H. J. Hruska. Iron Age, vol. 115, no. 5, Jan. 29, 1925, pp. 341-342. Influence of certain thermochemical factors; analyses of metal used; special alloys for molds.

MONEL METAL

SAND CASTING. Sand Casting Monel Metal. Metal Industry (N. Y.), vol. 23, no. 2, Feb. 1925, pp. 55-56, 2 figs. Hints to foundryman on melting practice, desirable composition, deoxidation, temperature and molding.

N

NICKEL

MALLEABILITY. The Malleability of Nickel, P. D. Merica and R. G. Waltenberg. Am. Inst. Min. & Met. Engrs.—Trans., no. 1398-E, Jan. 1925, 8 pp., 4 figs. Investigation to ascertain why ordinary cast nickel is not malleable, when not treated with magnesium, and what is mechanism by which magnesium treatment produces malleability in such nickel.

NICKEL ALLOYS

ADMIRALTY NICKEL. Admiralty Nickel, W. B. Price. Metal Industry (N. Y.), vol. 23, no. 1, Jan. 1925, p. 7. New white metal alloy for corrosion and heat resistance.

ENDURANCE PROPERTIES. Endurance Properties of Alloys of Nickel and of Copper, D. J. McAdam, Jr. Am. Soc. Steel Treating—Trans., vol. 7, no. 2, Feb. 1925, pp. 217-236, 8 figs. Results of investigation at U. S. Naval Engineering Experiment Stations of effect of severe cold working on endurance properties of nickel, and of moderate cold working on endurance properties of several alloys.

NON-FERROUS METALS

ANALYSIS. The Choice of Solvents in Analysis, H. C. Dews. Metal Industry (Lond.), vol. 26, no. 5, Jan. 30, 1925, pp. 101-102. Advocates method of separate estimations in non-ferrous alloy analysis in preference to carrying out all estimations from one sample; discusses applications of freer use of more suitable solvents which method makes possible.

O

OIL ENGINES

HEAVY-OIL. Present Day Heavy-Oil Engines, J. L. Chaloner. World Power, vol. 3, no. 13, Jan. 1925, pp. 31-36, 1 fig. Medium-pressure engines of horizontal and vertical types; details of construction. High-pressure engines of air-injection and mechanical-injection types.

SOLID-INJECTION. Solid-Injection Engine with Novel Features. Power, vol. 61, no. 6, Feb. 10, 1925, pp. 212-214, 4 figs. New Foos 4-stroke-cycle engine has plain Diesel combustion chamber; no spray needles are used with single oil pump; reaction on governor is very low, giving close speed regulation.

Some Interesting Airless-Injection Experiments, R. Hildebrand. Oil Engine Power, vol. 3, no. 1, Jan. 1925, pp. 43-45, 2 figs. Deals principally with developments during last 2 years with 4-cycle stationary oil engine of airless-injection type; discusses combustion chambers and turbulence effect. (abstract.) Paper read before A.S.M.E.

OIL FIELDS

ALBERTA, CANADA. The Wainwright-Irma Oil and Gas Area, Alberta, G. S. Hume. Can. Min. Jl., vol. 45, no. 52, Dec. 26, 1924, pp. 1259-1264, 5 figs. Results of drilling in 1924; data on the different wells.

OIL FUEL

CHARACTERISTICS. Characteristics of Fuel Oil, W. R. Quinn. Combustion, vol. 12, no. 1, Jan. 1925, pp. 40-43, 1 fig. Methods of determining those characteristics of fuel oil which relate to its value as a fuel and serve as a guide to operation.

FACTORS GOVERNING USE OF. The Control of Power Production, Chas. L. Hubbard. Factory, vol. 34, no. 2, Feb. 1925, pp. 274-277, 336, 338 and 340, 10 figs. Factors governing use of fuel oil.

OIL SHALES

DISTRIBUTION AND DEVELOPMENTS. Oil-Shales, J. C. Dawson. Can. Inst. Min. & Metallurgy—Bul., no. 153, Jan. 1925, pp. 26-59, 4 figs. Present oil situation; nature and origin of oil shales; chemical examination of the Kerogen-constituent elements; distribution of oil shale throughout world; method of mining; destructive distillation of oil shale; retorts; oil-shale products and additional equipment required.

ORE DRESSING

MILLING. Milling and Flotation, C. E. Locke. Eng. & Min. Jl.—Press, vol. 119, no. 3, Jan. 17, 1924, pp. 109-111. Developments during 1924. Simplification of mill flow sheets; all-flotation becomes of greater importance.

OXY-ACETYLENE CUTTING

APPLICATIONS TO CONSTRUCTION JOBS. How the Oxy-Acetylene Cutting Torch and Blow Pipe Can Help the Contractor, D. C. McGiehan. Contract Rec., vol. 39, no. 2, Jan. 14, 1925, pp. 28-32, 9 figs. Oxy-acetylene process said to be unexcelled for repairing equipment or demolishing old buildings; it is being used for fabrication and erection of structural units.

P

PACKING

EXPORT. Packages That Satisfy the Foreigner, D. P. De Young. Mgt. & Administration, vol. 9, no. 2, Feb. 1925, pp. 139-142, 6 figs. Influence on export shipping costs, deterioration of product and selling appeal. Practice of Quaker Oats Co.

PAPER MANUFACTURE

RAW MATERIAL, TREATMENT OF. Treatment of Raw Material, Helen U. Kiely. Paper Trade Jl., vol. 80, no. 2, Jan. 8, 1925, pp. 51-54. Treatment of rags, wood pulp and waste papers.

PAPER MILLS

DESIGN AND EQUIPMENT. The Modern Fine-Paper Mill; Design and Equipment, H. M. Grasselt. Eng. News-Rec., vol. 94, no. 7, Feb. 12, 1925, pp. 274-276, 2 figs Selecting mill location; economics of building design and plant layout; importance of light and ventilation; machinery and processes; materials-handling equipment.

PATTERNMAKING

BENCH AND VISE. Patternmaker Utilizes Bench, W. C. Ewalt. Foundry, vol. 53, no. 2, Jan. 15, 1925, pp. 80-83, 7 figs. Describes good type of bench for use by patternmakers; types of quick-acting vises.

PATTERNS

METAL GEARS. Metal Gear Patterns. Machy. (Lond.), vol. 25, no. 643, Jan. 22, 1925, pp. 536-537, 1 figs. Details of construction of metal patterns which are especially satisfactory for casting spur and bevel gears; making patterns.

PAVEMENTS, ASPHALT

MIXTURES, STABILITY OF. Better and Cheaper Asphalt Pavements. P. Hubbard. Contract Rec., vol. 39, no. 1, Jan. 7, 1925, pp. 11-15, 5 figs. Results of experimental work leading to development of simple stability test; if this recently developed method for investigating stability of asphalt mixtures is perfected, it is believed present arbitrary and restrictive requirements will have to be broadened.

PHOTOGRAMMETRY

AERIAL. Accuracy of Points Determined by Aerial Photogrammetry (Ueber die Genauigkeit luftphotogrammetrisch bestimmter Punkte), A. Schlötzer. Bauingenieur, vol. 5, no. 24, Dec. 25, 1924, pp. 809-815, 2 figs Details of tests made and checking of results with trigonometric or polygonometric measurements.

PIPE

CAPACITIES CALCULATION How to Calculate Pipe Capacities, W. F. Schaphorst. Modern Min., vol. 2, no. 1, Jan. 1925, pp. 28-29, 1 fig. Gives chart that will give capacities of various size pipes at a glance, and explains use.

FITTINGS, STANDARDS FOR. Proposed American Standards for Malleable and Cast-Iron Screwed Fittings. Mech. Eng., vol 47, no. 2, Feb. 1925, pp. 117-118. Report of sectional committee on Standardization of Pipe Flanges and Fittings.

INDUSTRIAL, IDENTIFICATION COLORS FOR. Colors for Industrial Pipes. Paint Mfrs.' Assn. U. S., Circular No. 223, Jan. 1925, pp. 159-170, 3 figs. Describes uniform system of coloration devised by committees of Am. Eng. Standards Committee by joint sponsors, Am. Soc. Mech. Engrs. and Nat. Safety Council, without any attempt to standardize composition of paints to be used or exact shades of each paint.

LOSS OF HEAD. New Tables for Computing Loss of Head in Pipes, J. O. Jones. Eng News-Rec., vol. 94, no. 6, Feb. 6, 1925, pp. 240-242. Darcy coefficients for use in Chezy formula; relation between *f* in Chezy formula and exponential formula.

PIPE, WOOD-STAVE

DESIGN. Design as a Factor in Upkeep of Wood-Stave Pipe, B. E. White. Power, vol. 61, no. 4, Jan. 27, 1925, pp. 139-142, 5 figs. Experience has shown that many of difficulties encountered with wood-stave pipe can be avoided by giving proper attention to design and construction details; number of these are discussed and remedies for troubles suggested.

PIPE, WROUGHT-IRON

LOSS OF HEAD. New Tests of Loss of Head in 2-In. Black Wrought-Iron Pipe, L. Perry. Eng. News-Rec., vol. 94, no. 7, Feb. 12, 1925, pp. 272-273, 1 fig. General agreement shown with results obtained by Davis, Saph and Schoder and various earlier investigators.

POWER FACTOR

CORRECTION. Power-Factor Correction, L. W. W. Morrow. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 2, Feb. 1925, pp. 150-156. Study of types of systems in existence shows that in general correction is most economically and effectively instituted at loads; and greatest effect of correction is to improve voltage-regulation and service quality; it has been shown that kva. demand charge and kw energy charge can be used most successfully to secure power-factor correction.

PULVERIZED COAL

ADVANTAGES AND LIMITATIONS. The Control of Power Production. Chas. L. Hubbard. Factory, vol. 34, no. 1, Jan. 1925, pp. 68-71, 196 ,198, 200, 202, 204, 206 and 208, 11 figs. Notes on growing use of pulverized fuel.

BOILER FIRING. The Development of Pulverized Coal as a Boiler Fuel, H. W. Brooks Mech. Eng. vol. 47, no 2, Feb. 1925. pp. 89-93, 3 figs. Historical outline showing it not to be new and untried experiment and that experience of nearly century of research may be applied to present-day problems.

PREPARATION. The Preparation of Pulverized Coal, H. G. Barnhurst. Mech. Eng., vol. 47, no. 2, Feb. 1925, pp. 87-88 Outlines methods that have gained field of use sufficiently wide to involve standardization of major details in central pulverizing plants; deals with crushing, drying and transporting pulverized coal; cost of preparation.

SAFETY IN OPERATION OF PLANT. Safety in the Operation of Pulverized-Fuel Systems. Mech. Eng., vol. 47, no. 2, Feb. 1925, pp. 115-117, 3 figs. Discussion of papers presented at A.S.M.E. annual meeting, including particulars regarding fire recently occurring in coal-pulverizing plant.

TRANSPORTATION AND FEEDING SYSTEMS. The Indirect or Multiple Systems versus the Unit System, L. D Ponzio. Combustion, vol. 12, no. 1, Jan. 1925, pp. 38-39. Compares the two general systems of transporting and feeding pulverized fuel.

PUMPING STATIONS

DRYDOCK, ESQUIMALT, B. C. The Canadian Government Dry Dock at Esquimalt, B. C. Engineering, vol. 119, no. 3082, Jan. 23, 1925, pp. 99-101, 13 figs., partly on supp. plate. Details and illustrations of pumping plant.

HIGH-HEAD WATER-SUPPLY. High Head Pumping Plant for Simla Water Supply. Engineer, vol. 139, no. 3606, Feb. 6, 1925, p. 167 4 figs. partly on supp. plate and 162. Consists of two units, each having electrically driven, quadruple-acting pump designed to lift 580 gal. per min. against head of 4200 ft.; results of tests.

PUMPS

BOILER-ROOM. Boiler Feed and General Supply Pumps. South. Engr., vol. 42, no. 5, Jan. 1925, pp. 48-66, 45 figs. Practical information regarding various pumps found in boiler room as to their operation and uses.

RECIPROCATING DISPLACEMENT. Test Code for Reciprocating Steam-Driven Displacement Pumps Mech. Eng., vol. 47, no. 2, Feb. 1925, pp. 135-138. Republication of code after review and revision by reorganized committee.

PYROMETERS

FOUNDRY USES. Pyrometers in the Metal Plant, C. L. Simon. Metal Industry (N. Y.), vol. 23, no. 2, Feb. 1925, pp. 61-62, 5 figs. How pyrometers aid in rolling mill and brass foundry.

OPTICAL. Optical Pyrometers. W. E. Forsythe. Optical Soc. Am.—Jl., vol. 10, no. 1, Jan. 1925, pp. 19-37, 10 figs. Discusses different types; effective wave length and monochromatic screens; calibration; "neutral" absorbing screens; observations on non-black sources.

PYROMETRY

CONTINUOUS CHART RECORDER. The Foster Continuous Chart Recorder. Engineering, vol. 119, no. 3081, Feb. 6, 1925, pp. 176-177, 7 figs. Describes instrument which combines sensitiveness with mechanical robustness desirable for industrial pyrometry and similar work.

R

RADIO COMMUNICATION

DEVELOPMENTS. Radio Communications, G. Marconi. Roy. Soc. Arts, vol. 73, no. 3762. Dec. 26, 1924, pp. 120-131 and (discussion) 131-133, 3 figs. Brief account of latest and most important developments. Deals with difficulties which it has still to contend with.

RADIOTELEPHONY

RECEPTION DEVELOPMENTS. Progress in Radio Receiving During 1924, A. N. Goldsmith. Gen. Elec. Rev., vol. 28, no. 1, Jan. 1925, pp. 59-62, 9 figs. Brief account of significant advances in radio receiving art which were realized during 1924.

RAILS

BOND TESTING AND MAINTENANCE. Bond Testing and Maintenance Practice. Elec. Ry. Jl., vol. 65, no. 3, Jan. 17, 1925, pp. 87-89, 1 fig. Types of bonds employed. causes of failure, methods of testing and replacement standards are summarized for 25 electric railways; while welded joints eliminate need for bonds, there are occasional failures, so that checking of return circuit is desirable.

RAILWAY ELECTRIFICATION

MAIN-LINE, ADVANTAGES OF. Railway Electrification—An Urgent Problem, P. Dawson. World Power, vol. 3, no. 13, Jan. 1925, pp. 4-7. Points out that advantages of partial electrification are few compared with electrification according to rational all-embracing scheme; developments on European continent; fallacy of railway electrification's dependence on abundant supplies of water power; bulk supplies; state assistance for electrification.

RAILWAY OPERATION

Costs of Service. Unit Costs of Railroad Service. Ry. Rev., vol. 76, no. 5, Jan. 31, 1925, pp. 223-224. Analysis of study submitted to Interstate Commerce Commission by Director of Bureau of Statistics.

Suburban. Suburban Services, E. C. Cox and A. R. Cooper. Int. Ry. Congress Assn.—Bul., vol. 7, no. 1, Jan. 1925, pp. 31-78, 28 figs. Deals with suburban services of Great Britain, America and British Colonies, including sub-surface railways, discussing terminal and intermediate stations, layout and equipment of track, rolling stock, car cleaning, operation, and fares.

RAILWAY SHOPS

Design. Shops and Locomotive Terminals. Am Ry. Eng. Assn.—Bul., vol. 26, no. 271, Nov. 1924, pp. 131-157, 10 figs. Committee report. General layouts and designs of car shops; typical layouts for storage and distribution of fuel oil, including fuel-oil stations between terminals; ventilation of enginehouses.

RAILWAY SIGNALING

Developments 1924. Signal and Interlocking Review for 1924. Ry. Signaling, vol. 18, no. 1, Jan. 1925, pp. 19-27. More apparatus installed in 1924 than any year since 1919; tabular data on automatic block signals, and interlocking plants completed and under construction for 1924, and contemplated for 1925.

Fixed Signals. Fixed Signals, W. J. Thorrowgood. Int. Ry. Congress Assn.—Bul., vol. 7, no. 1, Jan. 1925, pp. 79-117, 21 figs. Discusses practice in Great Britain and Dominions; lamps for signals, fog pit repeaters, automatic signaling, etc.

RAILWAY TIES

Hollow Steel. Hollow Steel Ties Tried in Germany. Eng. News-Rec., vol. 94, no. 7, Feb. 12, 1925, p. 273. Experiments with Schiebe hollow steel ties filled with ballast on German State Railway show advantages over trough type of steel tie extensively used in Germany.

Treating Plant. Treating Five Charges of Timber in Eleven Hours. Ry. Age, vol. 78, no. 5, Jan. 31, 1925, pp. 310-313, 7 figs. New wood-preserving plant at Nashua, N. H., evidences distinct advance in operating facilities; adzing and boring mill; how plant is operated.

Treatment. Tie Treatment Justified by 15-Year Test on C. B. & Q. Railroad. Wood Preserving News, vol. 3, no. 1, Jan. 1925, pp. 1-3. Results of 1924 inspection of experimental tracks laid in 1909 and 1910 on 20 divisions in eight of the states through which the Burlington passes to determine relative economy and durability of different tie species, untreated and treated by standard processes.

RAILWAY TRACK

Maintenance. How to Organize Track Maintenance for Highest Efficiency, I. H. Schram. Ry. Eng. & Maintenance, vol. 21, no. 1, Jan. 1925, pp. 13-14, Points out that budget of year's work affords one of most effective means of securing economy. (Abstract.) Paper presented before Maintenance of Way Club.

REFRACTORIES

Manufacture. Manufacture of Refractories by Dry Press Method, E. Hagar. Am. Ceramic Soc.—Jl., vol. 8, no. 2, Feb. 1925, pp. 122-124. Brief description of manufacture of refractories by this method, emphasizing following points in preparation of materials: weathering, grinding and tempering, screening, and mixing; describes pressing of shapes and amount of pressure; advantages of method.

Silica. European Silica Refractories, S. S. Cole. Am. Ceramic Socl.—Jl., vol. 8, no. 1, Jan. 1925, pp. 55-58, 1 fig. Results of investigation on silica brick and shapes made in Europe and ganister supplied for same. Gives analyses of rock and brick produced according to American practice and in Europe from same rock; results of tests on best grades of brick.

RESEARCH

Co-operative. Research—What It Is and What It Isn't F. H. Colvin. Am. Mach., vol. 62, no. 6, Feb. 5, 1925, pp. 238-240, 4 figs. Points out that research can save money for any concern if properly managed; co-operative research.

Industrial Institutions, in. The Field of Research in Industrial Institutions, E W. Rice, Jr. Franklin Inst. — Jl., vol 199, no. 1, Jan. 1925, pp. 65-81. Review of what has been accomplished by application of scientific methods in industry.

Scientific. The Baconian Method of Scientific Research, F. Cajori. Sci. Monthly, vol. 20, no 1, Jan. 1925, pp. 85-91. Discusses applications which exhibit its importance as well as its limitation.

ROAD CONSTRUCTION

United States. State Highway Construction in 1924 and 1925. Eng. & Contracting (Roads & Streets), vol. 63, no. 1, Jan. 7, 1925, pp. 25-37. Reports from state officials showing mileage and expenditures in 1924 and proposed mileage and funds available for 1925.

ROADS, ASPHALT

Design. Asphalt Pavements, P. Hubbard. Boston Soc. Civ. Engrs.—Jl., vol. 11, no. 10, Dec. 1924, pp. 456-467. Notes on asphalt, types of asphalt pavements, foundations, and notes on highway investigations and research.

Old Macadam and Gravel as Foundations. Worn Macadam and Gravel as Foundations, C. E. Murphy. Eng. & Contracting (Roads & Streets), vol. 63, no. 1, Jan. 7, 1925. Suggestions on utilization of old construction as bases for asphalt wearing surfaces, together with a brief history of such usage.

ROADS, CONCRETE

Construction. Some Notes on the Construction of Reinforced Concrete Roads, H. M. Lewis. Surveyor & Mun. & County Engr., vol. 67, no. 1721, Jan. 9, 1925, pp. 23-26, 6 figs. Reviews roadmaking of Great Britain, compares advantages and disadvantages of reinforced concrete with methods adopted at present, proves need for a concrete road and shows that opinion differed in past just as it does to-day.

ROLLING MILLS

Electric Drive. Electrically-Driven Rolling Mills, L. Rothera. Elec. Rev., vol. 96, no. 2458, Jan. 2, 1925, pp 33-34. Recent electrical developments. (Abstract.) Paper read before Cleveland Instn. Engrs.

S

SAND BLAST

Nozzle Design. Orifice Design in Sandblast Nozzles, L. D. Peik. Am. Mach., vol. 62, no. 8, Feb. 19, 1925, pp. 311-312, 4 figs. Gives table of operating costs in cents with varying orifices, pressures, and unit charges for power.

SAND, MOLDING

Moisture Control. Controlling Moisture in Sand, A. A. Grubb. Foundry, vol. 53, no. 4, Feb. 15, 1925, pp. 145-147, 5 figs. Describes apparatus and methods of procedure in rapid determination of sand quality; temper is said to influence bond, permeability and gas content of sands.

Physical Properties. A Review of the Physical Properties Involved in a Study of Moulding and Foundry Sands, L. Deltour. Foundry Trade Jl., vol. 31, no. 440, Jan. 22, 1925, p. 66. Discusses theories put forward to account for plasticity and presents conclusions from experimental results. (Abstract.) Translated from paper presented to Paris Foundry Congress.

SCREWS

Efficiency Curves. Efficiency of Screws, M. H. Sabine. Machy. (Lond.), vol. 25, no. 641, Jan. 8, 1925, pp. 465-467, 4 figs. To save time in calculating efficiencies of various screws, writer has worked out values for square and Acme threads, these being most commonly used screws for transmission of motion and power in machine tools.

SEWAGE DISPOSAL

Activated Sludge Process. Activated Sludge Process: Aeration and Circulation, W. T. Lockett. Surveyer & Mun. & County Engr., vol. 66, no. 1719, Dec. 26, 1924, pp. 525-529, 1 fig. Details of investigation on methods of applying air to mixed liquor and economic period of aeration.

SEWERS

Storm and Combined. Notes on the Relation Between the Capacity of Combined and Storm Sewers, Their Cost and the Frontage Assessment, S. A. Greeley. West. Soc. Engrs.—Jl., vol. 30, no. 1, Jan. 1925, pp. 13-24, 6 figs. Data secured in connection with project for new and relief sewers at Decatur, Ill; investigation of rainfall and runoff; computations; costs and assessments; summary of experience in other cities.

SHAFTS

Vibration. How Shaft Whipping Is Produced. Power, vol. 61, no. 6, Feb. 10, 1925, pp. 215-219, 14 figs. Where rotating elements revolve above critical or natural vibrating speed, slow oscillating movement is sometimes set up, frequency being considerably below that of normal operating speed; this has been termed "whipping," one cause of which has been studied with its relation to design of rotating elements.

SLIDE RULES

Complex-Quantity. A Complex Quantity Slide Rule, J. W. M. DuMond. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 2, Feb. 1925, pp. 133-139, 6 figs. Points out need for device to shorten numerical work with complex quantities and describes slide rule in two dimensions devised to fill this need.

SMOKE

Abatement. Smoke-Abatement Investigation at Grafton, W. Va., O. Monnett and L. R. Hughes. U. S. Bur. Mines. Technical Paper 338, 1924, 29 pp., 27 figs., partly on supp. plates. Shows how an exceptionally bad smoke situation was remedied by methods that are widely applicable.

SNOW REMOVAL

United States Highways. The Snow Removal Problem on Highways of the United States, J. B. McCord. Good Roads, vol. 68, no. 1, Jan. 1925, pp. 3-5, 42 and 44, 4 figs. Report of investigation of snow removal programs, methods and costs among states which lie within area over which snow falls to an average annual depth of 20 inches or more.

STANDARDIZATION

Developments. Engineering and Industrial Standardization. Mech. Eng., vol. 47, no. 2, Feb. 1925, pp. 142-144. Substantial progress made in standardization of bolts, nuts, and rivets; developments in industrial standardization during 1924; code of standard practice in steel construction; standard methods for rating rivers; simplified-practice recommendation on sheet metal.

STANDARDS

Classification. Classification of Engineering and Industrial Standards, F. J. Schlink. Mech. Eng., vol. 47, no. 2, Feb. 1925, pp. 119-122, 7 figs. Deals with fundamental units and standards of length, mass, time, temperature, etc.; nomenclature; standards of size and form—dimensional standards; standard ratings; standards of quality and of practice; scope of standardization and simplification; classification of standards by use.

STANDPIPES

Steel, Pitting in. Pitting in Two Steel Standpipes Near St. Louis, Mo. Eng. News-Rec., vol. 94, no. 7, Feb. 12, 1925, p. 281, 1 fig. Coating of coagulant and clay checked pitting in first standpipe and largely prevented it in one built at later date.

STEAM

Physical Properties of. Physical Properties of Water Vapor, A. Lartigue. Mech. Eng., vol. 47, no. 2, Feb. 1925, pp. 123-125, 14 figs. Author attempts to co-ordinate results of recent researches in Munich by Knoblauch, Raisch, and Hausen with those carried out at Mass. Inst. of Technology in America, and to present them from point of view of dynamic functions, using Fresnel method for this purpose. (Abstract.) Translated from Chaleur & Industrie, vol. 5, no. 54, Oct. 1924, p. 591.

Research. Progress in Steam Research. Mech. Eng., vol. 47, no. 2, Feb. 1925, pp. 103-108, 11 figs. Reports presented at session on Progress in Steam Table Research of A.S.M.E., as follows: Report of Executive Committee of Steam Table Research Fund; Report of Progress in Steam Research at Harvard, University, R. V. Kleinschmidt; Report on Progress in Steam Research at the Mass. Inst. of Technology, Fred. G. Keyes; Report on Progress in Steam Research at the Bureau of Standards, N. S. Osborne and H. F. Stimson; Progress Report on the Joule-Thomson Effect, H. N. Davis.

STEAM ACCUMULATORS

Calculation. Thermodynamic Calculation of Steam Accumulators (Il calcolo termodinamice degli accumulatori di vapore), M. Medici. Industria, vol. 38, no. 23, Dec. 15, 1924, pp. 633-638, 6 figs. Discusses Rateau, Ruths and Siemens types and develops formulas for calculation.

Principles. The Steam Accumulator, F. Dawson. Eng. & Boiler House Rev., vol. 38, no. 7, Jan. 1925, pp. 279-281, 3 figs. Principles and possibilities of development.

STEAM METERS

Flowmeters. Steam-Flow Meters. South. Engr., vol. 42, no. 5, Jan. 1925, pp. 74-78, 17 figs. Necessity of knowing rate of steam consumption, kinds of steam meters and their use.

STEAM PIPES

Design. Boiler-Room Piping. South. Engr., vol. 42, no. 5, Jan. 1925, pp. 21-37, 32 figs. Reliability and safety of piping important; size and steam velocity with saturated and superheated steam; fittings and their application; taking care of expansion and contraction.

Elastic Capacity and Expansion. Elastic Capacity of Steam Piping as Affecting Expansion, H. Carlier. Mech. Eng., vol. 47, no. 2, Feb. 1925, pp. 131-132, 3 figs. In author's opinions, in order to take care of situation created by use of steam at high temperatures and pressures piping itself should have sufficient flexibility; investigation of following factors: (1) maximum bending moment and determination of fatigue factor corresponding to pipe adopted for piping; (2) reactions at points of support; and (3) examinations of deformed piping as element in study of support problem. (Abstract.) Translated from Revue Industrielle des Mines, vol. 4, no. 5, Dec. 1, 1925, p. 276.

STEAM POWER PLANTS

Heat Balance. A Heat Balance Study, F. H. Rosencrants. Elec. Times, vol. 66, no. 1731, Dec. 18, 1924, pp. 719-721, 1 fig. Author attempts to solve following problems: With regard to interception of heat from flue gases or from steam in turbine, how much of available heat-absorbing capacity of both air and water should be utilized in power station; how should this capacity be apportioned between turbine room and boiler house to produce lowest cost.

Interconnected. Manufacturer Has His Own Superpower System. Power, vol. 61, no. 7, Feb. 17, 1925, pp. 261-262, 2 figs. Factory system where separate power plants were interconnected electrically; exhaust steam used for process heating.

STEAM TURBINES

Foundations. Foundations for Steam Turbines, W. Slader. Power Plant Eng., 29, no. 4, Feb. 15, 1925, pp. 232-235, 6 figs. Requirements of turbine foundation; use of piling; use of standard structural shapes.

Multi-Stage. Test of a Multi-Stage Steam Turbine, J. M. Drabelle. Power Plant Eng., vol 29, no. 4, Feb. 15, 1925, pp. 236-238, 6 figs. Iowa Railway & Light Co. gives results of tests of 15-stage, 3,500-kw. turbine generator.

Standing Torque of. Standing Torque of Small Turbines, J. Y. Dahlstrand. Power Plant Eng., vol. 29, no. 3, Feb. 1, 1925, pp. 184-185, 3 figs. Standing and running torque approach each other as turbine becomes less efficient.

Thermodynamic Cycle, Increasing Efficiency of. The Steam Turbine—as a Study in Applied Physics, Chas A. Parsons. Franklin Inst.—Jl., vol. 199, no. 1, Jan. 1925, pp. 1-12. By practical application of principles discussed to expansion of steam in turbine, overall thermal efficiencies can be realized which are not inferior to those of internal-combustion engines.

Types. Steam Turbines for the Boiler Plant. South. Engr., vol. 42, no. 5, Jan. 1925, pp. 1-12, 30 figs. Discussion of types of steam turbines of small size used for driving boiler-feed pumps, blower fans, circulating-water pumps and other power-plant apparatus.

STEEL

Alloy. *See Alloy Steels.*

Manganese. *See Manganese Steel.*

Stainless. Manufacture and Uses of Stainless Iron, H. S. Primrose. Iron & Coal Trades Rev., vol. 110, no. 2966, Jan. 2, 1925, pp. 18-19. New process, known as Hamilton-Evans process; cost of making mild stainless steel; physical properties; resistance to corrosion; heat resistance or non-scaling at high temperatures; hot rolling and forging; annealing; cold rolling and drawing. (Abstract.) Paper read before Manchester Assn. Engrs.

Temperatures of Molten. Finishing Melting Temperatures of Simple Ingot Steels, H. D. Hibbard. Min. & Metallurgy, vol. 6, no. 218, Feb. 1925, p. 97, Author seeks to put in useful form information at hand regarding temperatures of molten steels, covering all carbon contents up to 1.5 per cent. (Abstract.)

Tool. *See Tool Steel.*

STEEL CASTINGS

Manufacture. Makes Heavy Steel Castings, P. Dwyer. Foundry, vol. 53, no. 2, Jan. 15, 1925, pp. 61-67, 11 figs. Molding, melting and handling equipment is provided for producing exceptionally large castings, used in railway industry and in generation of electric power, at plant of Dominion Foundries & Steel Co., Hamilton, Ont.

Strengthening with Alloys. Making Steel Castings Stronger, Chas. McKnight, Jr. Iron Age, vol. 115, nos. 7 and 8, Feb. 12 and 19, 1925, pp. 469-472 and 555-557, 12 figs. Effect of nickel, chromium and other alloys in heat-treated product; application in railroad, mining, rolling-mill and motor fields. Metallurgy and heat treatment; foundry problems; physical and dynamic properties.

X-Ray Examination. The Improvement of Foundry Practice with the Aid of X-Rays. Engineer (Met. Supp.), vol. 139, no. 3605, Jan. 30, 1925, pp. 7-8. Review of work by H. H. Lester and his colleagues at U. S. Arsenal, Watertown, Mass., in investigation of steel castings.

STEEL, HEAT TREATMENT OF

Spring Steel. The Heat Treatment of Spring Steel, J. E. Burns, Jr. Ry. Mech. Engr., vol. 99, no. 2, Feb. 1925, pp. 111-114, 3 figs. Points out that knowledge of steel, temperature effect, quenching media and drawing or tempering is essential.

Tool Steel. Practical Hints on Forge Shop Practice and Heat Treatment of Steel, W. E. Biggs and W. R. Woolrich. Nat. Engr , vol. 29, no. 2, Feb. 1925, pp. 69-71, 1 fig. Instructive data on hardening and tempering of shop tools and tool steels.

STEEL MANUFACTURE

Hard Manganese. Making Hard Manganese Steel, H. Hermanns and H. Meixner. Iron Trade Rev., vol. 76, nos. 7 and 8, Feb. 12 and 19, 1925, pp. 452-454 and 509-511, 7 figs. Hardness and dependability of steel is contingent upon manganese content; loss by oxidation is reduced by adding ferro-manganese in molten state; thick wall castings are discussed. Wear depends upon proper heat treatment; imperfect handling in heating and quenching causes castings to remain brittle.

STREAM POLLUTION

Toxicity of Trade Waste. Notes on the Toxicity of Trade Waste, R. F. Stephenson. Chem. & Industry, vol. 44, no. 2, Jan. 9, 1925, pp. 23-24. Review of position with respect to discharge of substances toxic to fish; deals with dyeworks, paper-and-pulp-works, and gas-works refuse; oil waste.

SUBSTATIONS

30,000-Kva. Pittsburgh's New Substation, G. Sutherland and H. S. Moore. Elec. World, vol. 85, no. 4, Jan. 24, 1925, pp. 188-193, 11 figs. Duquesne Light Co. completes 30,000-kva. structure; unusual features in design, including compartment isolation of all equipment; electrical features used to secure proper voltage regulation and isolation of circuits in trouble are also new.

T

TELPHERS

Electric. The Electric Telpher, H. Blyth. Indus. Mgt. (Lond.), Cassier's Mech. Handling No.), Jan. 1925, pp. 79-85, 13 figs. Although telpherage has been adopted by many important industrial undertakings, of which examples are given, writer points out that there are still very extensive fields which it has scarcely touched, notwithstanding its general applicability and utility.

TELEPHONE

Theory of Probability Applied to. The Theory of Probability, E. C. Molina. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 2, Feb. 1925, pp. 122-127, 5 figs. Applications to engineering problems; recalls subjects in which theory of probability has been used, states fundamental principles and applies them to three problems chosen from field of telephone engineering.

TIN PLATE

Rolling Methods. Dispelling Drudgery in the Hot Mill, J. D. Knox. Iron Trade Rev., vol. 76, no. 8, Feb. 19, 1925, pp. 503-506 and 543, 8 figs. Discusses use of mechanical doubler and automatic feeding machine for tin pots and possibility of their revolutionizing American methods of rolling and tinning black plate.

Manufacture and Use. Comments on the Making and Use of Alloy Tool and Special Steels, J. A. Mathews. Blast Furnace & Steel Plant, vol. 13, no. 2, Feb. 1925, pp. 147-167 and (discussion) 167-170. Résumé of development of tool-steel industry; melting methods used in producing tool steel; elements used in production of high-grade product; discusses chemical specifications as basis for purchase of tool steels, pointing out that such a method of buying tool steel places unnecessary burden upon buyer.

TRACTORS

Detachable Trailer. The Auto-Traction Tractor, Automobile Engr., vol. 15, no. 198, Jan. 1925, pp. 2-8, 15 figs. Describes 4-wheel tractor with detachable trailer, which, when coupled together form 6-wheel vehicle having load capacity of 6 to 7 tons.

TRANSFORMERS

Delta-Connected. Delta-Connected Transformers Loaded at Full and Half Voltage, E. P. Wimmer. Elec. Jl., vol. 22, no. 2, Feb. 1925, pp. 66-67, 5 figs. Determination of relationship between simultaneous loads from full-voltage and half-voltage taps.

Three-Winding. Three-Winding Transformers, J. F. Peters. Elec. Jl., vol. 22, nos. 1 and 2, Jan. and Feb. 1925, pp. 12-16 and 71-77, 24 figs. Jan.: Impedance of transformers; impedance network; regulation; normal loading of windings; parallel operation. Feb.: Short-circuit currents; interlacing of windings; tertiary windings; three-phase transformers.

TRANSPORTATION

Electric Road Vehicles. The Electric Road Vehicle, D. E. Batty. S. African Eng., vol. 35, no. 12, Dec. 1924, pp. 256-260, 8 figs. Discusses general technical characteristics; trolley bus, gasoline-electric vehicles, battery vehicle, and economic field of usefulness of electric vehicles. From paper read before Instn. Automobile Engrs.

TUNNELS

Queensborough Subway, New York. Open Cut and Tunnel in Manhattan Schist. Eng. News-Rec., vol. 94, no. 7, Feb. 12, 1925, pp. 264-268, 12 figs. Queensborough cross-town subway extension at 42nd St., Manhattan, calls for careful methods in safeguarding crossing tunnels and water mains; driving tunnel and placing concrete; other details.

V

VALVE GEARS

Adjusting. Adjusting Westinghouse Valve Gears in the Field, L. Long. Power, vol. 61, no. 5, Feb. 3, 1925, pp 179-182, 4 figs. Method developed from practical experience for general overhauling, as well as useful suggestions for adjusting these gears.

VENTURI METERS

Calibrating. Calibrating Supply Meters (Tarage des appareils de mesure de débits), A. Schlag. Revue Universelle des Mines, vol. 5, no. 2, Jan. 15, 1925, pp. 73-87, 11 figs. Details of calibrating tests at machinery laboratory of Liége University of experimental weir and venturi tubes preparatory to experiments with centrifugal pumps.

VIADUCTS

Cast-Iron Railway. The Repair of La Voulte Cast-Iron Railway Viaduct. Engineering, vol. 119, no. 3084, Feb. 6, 1925, pp. 159-161, 26 figs. partly on supp. plate Account of defects which had developed in original cast-iron structure and methods adopted in making these good; repair work included replacement of cast-iron bracing connecting arched ribs; strengthening of weak parts of arched ribs, etc.

VOLTAGE REGULATION

Power Plants. Voltage Regulation in Industrial Power Plants. V. H. Todd. Power Plant Eng., vol. 29, no. 4, Feb. 15, 1925, pp. 243-247, 10 figs. Methods and devices used to maintain constant voltage on a.c. and d.c. systems.

W

WAGES

Differential Payment Plan. Burroughs Differential Wage Plan Meets Every Requirement, V. R. Bechtel. Mgt. & Administration, vol. 9, no. 2, Feb. 1925, pp. 135-138, 5 figs. Plan developed and adopted by Burroughs Adding Machine Co.; effect of plan on pay-roll and cost computation.

WATER-POWER

California Shortage 1924. California Power Shortage of 1924, E. G. Butler. Elec. World, vol. 85, no. 4, Jan. 24, 1925, pp. 193-197, 6 figs. Drought experienced during 1924 was worst in 40 years; how situation was met to produce least inconvenience and loss to consumers.

World Resources. Water-Power Resources of the World, J. W. Meares. World. Power, vol. 3, no. 13, Jan. 1925, pp. 18-19. Estimate compiled from papers presented to first World Power Conference, London, 1924.

WATER SUPPLY

Canadian National Railways. A Comprehensive Water Supply Programme, J. W. Porter. Ry. Rev., vol. 76, no. 5, Jan. 31, 1925, pp. 217-223, 11 figs. Water problems in Western Canada and how they have been solved by Canadian National Railways.

Corrosibility. Relative Corrosibility of Water Supply, J. W. Ledoux. Eng. & Contracting (Water Works), vol. 63, no. 1, Jan. 14, 1925, pp. 101-106, 2 figs. Methods for determining and suggestions for neutralization. From paper read before Pa. Water Wks Assn.

WELDING

Electric. *See Electric Welding; Electric Welding, Arc; Electric Welding, Resistance.*

Oil Industry. Welding as Applied to the Oil Industry. Am. Welding Soc.—Jl., vol. 4, no. 1, Jan. 1925, pp. 25-34, 5 figs. Discusses application of the different types of welding from standpoint of a consumer.

WIND TUNNELS

STANDARDIZATION TESTS. Standardization Tests of N. A. C. A. No. 1 Wind Tunnel, E. G. Reid. Nat. Advisory Committee for Aeronautics—Report, no. 195, 1924, 31 pp., 37 figs. Tests made in 5-ft. atmospheric wind tunnel at Langley Field with primary object of collecting data on characteristics of tunnel for comparison with others, throughout world; includes tests of disk, spheres, cylinders, and airfoils.

WIRE

BRASS AND BRONZE, ANNEALING. Annealing Brass and Bronze Wire, W. J. Pettis. Metal Industry (N. Y.), vol. 23, no. 1, Jan. 1925, p. 4. Suggestions for eliminating rough and scaly spots in wire.

WIRE ROPE

TYPES OF LAY. Longevity of the Wire Rope as Influenced by the Lay, R. Woernle. Indus. Mgt. (Lond.) (Cassier's Mech. Handling No.), Jan. 1925, pp. 111-115, 10 figs. Results of experiments made on wire ropes running for 4 years uninterruptedly, determining which lay of rope is best suited for specific purposes; comparison of ordinary, Lang's and cable lay. Translated from Maschinenbau.

WOOD PRESERVATION

PRESERVATIVES AND METHODS. Convention of the Wood Preservers' Association. Ry. Rev., vol. 76, no. 6, Feb. 7, 1925, pp. 272-275. Review of papers on preservatives, records of service and refinement in methods. See also account of meeting in Ry. Eng. & Maintenance, vol. 21, no. 2, Feb. 1925, pp. 57-63.

TREATING PROCESS. A New Wood Treating Process, A. M. Howald. Ry. Rev., vol. 76, no. 7, Feb. 14, 1925, pp. 304-310, 5 figs. Describes one-movement process for impregnating timber with zinc chloride and petroleum. Paper presented to Am. Wood Preservers' Assn.

ZONING

AREA. Area Zoning, H. Bartholomew. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 2, Feb. 1925, pp. 172-177. Considerations are offered more to suggest basis for discussion of zoning for area than to recommend particular regulations.

BUILDING LINE. Building Line Zoning, L. V. Sheridan and J. C. Hoffman. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 2, Feb. 1925, pp. 214-217. Study prompted by desire to promote proper living conditions and to provide for future street requirements of city by arranging for uniform distance back from street line, in front of which buildings should not be erected.

HEALTH, AND. Zoning and Health, Geo. C. Whipple. Am. Soc. Civ. Engrs.—Proc., vol. 31, no. 2, Feb. 1925, pp. 154-164. Outline of scientific evidence bearing on relation of zoning to health.

HEIGHT LIMITATIONS. Height Limitations in Zoning. J. L. Crane, Jr. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 2, Feb. 1925, pp. 194-206. Theory underlying height limitations as important measures for public welfare, and what can be done to improve height regulations.

HOUSING DENSITY REGULATIONS. Housing Density Regulation, Rob. Whitten. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 2, Feb. 1925, pp. 207-213. Summary of purposes of family density regulations.

ORDINANCES AND ADMINISTRATION. The Purpose of Zoning Ordinances and Methods of Administration, M. Knowles. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 2, Feb. 1925, pp. 178-193. Calls attention to pitfalls and dangers and wisdom of sane consideration of regulations before attempting to put them in effect; discusses administrative measures and points out lessons derived from experiences.

PUBLIC UTILITIES, INFLUENCE ON. The Influence of Zoning on the Design of Public Utilities. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 2, Feb. 1925. Symposium containing following papers: Relation of Zoning to Design of Drainage and Sewerage System P. Hansen, pp. 220-223, 2 figs.; Influence of Zoning on Design of Street System, T. G. Phillips, pp. 224-231; Influence of Zoning on Design of Telephone Plant, A. P. Allen, pp. 232-241, 3 figs.; Influence of Zoning on Design of Public Recreation Facilities, C. E. Brewer, pp. 242-246; Influence of Zoning on Design of Transportation Services, J. R. Bibbins, pp. 247-257, 5 figs.; Zoning and Water Supply H. M. Pirnie, pp. 258-261.

ENGINEERING INDEX—Supplementary List

B

BREATHING APPARATUS

ELECTRIC SHOCK AND GAS POISONING, FOR. Artificial Respiration in Electric Shock and Gas Poisoning, C. K. Drinker. Am. Gas Assn. Monthly, vol. 7, no. 1, Jan. 1925, pp. 8-10. Author points out that competent analysis of methods for resuscitation leads to conclusion that oxygen-carbon dioxide inhalation method devised by Henderson and Haggard is most reliable physiologic antidote for carbon-monoxide asphyxia.

BRIDGES, HIGHWAY

AUTOMOBILE ROADS, FOR. Bridges for the Autoroad from Milan to the Lakes (Ponti per le auto-strade Milano-Lagei), L. Santarella. Industria, vol. 38, nos. 21 and 22, Nov. 15 and 30, 1924, pp. 586-587 and 590-591, and 607-610 and 618-619, 38 figs. Design and construction of reinforced-concrete bridge over Gallarate-Domodessola railway near Vergiate and Sempione National Highway.

BRIDGES, RAILWAY

RENEWAL IN BOGGY GROUND. Railway Bridges in Ireland. Ry. Engr., vol. 46, no. 540, Jan. 1925, pp. 24-25, 5 figs. Example of bridge renewal in boggy ground.

BRIDGES, STEEL

ARCH. New M.C.R. Bridge Over Niagara River. Can. Engr., vol. 48, no. 1, Jan. 6, 1925, pp. 101-103, 5 figs. Old cantilever structure replaced by steel arch bridge at Niagara Falls; designed for Cooper's E 70 loading; arch is 640 ft.; span and bottom chord rise 105 ft.; erection details.

C

CEMENT, PORTLAND

MANUFACTURE. Manufacture of Portland Cement (La fabricacion del cemento portland artificial en la region laventina), V. Calatayud. Asociacion de Ingenieros del Instituto Catolico de Artes e Industrias—Anales, vol. 3, no. 5, 1924, pp. 442-447, 3 figs. Details of factory at Bunol, including mechanical and electrical equipment, power consumption, laboratory tests, etc.

COAL

CLEANING, REDUCTION FOR. Reduction of Coal, C. H. S. Tupholme. Colliery Eng., vol. 2, no. 11, Jan. 1925, pp. 30-34, 6 figs. Discusses preliminary treatment of coal for cleaning by froth flotation and other processes.

COAL DEPOSITS

RECOVERY FROM. Ultimate Recovery from Anthracite Coal Beds, H. H. Otto. Am. Inst. Min. & Met. Engrs.—Trans., no. 1397-F, Jan. 1925, 17 pp., 6 figs. Mining methods; factors affecting recovery.

CONCRETE

PROPORTIONING. Effect of Sand and Water Content on Consistency and Strength of Concrete (Ueber den Einfluss des Sandgehaltes und des Wassergehaltes auf die Konsistenz und Festigkeit von Beton), A. Hummel. Bauingenieur, vol. 5, no. 24, Dec. 25, 1924, pp. 817-819, 1 fig. Results of laboratory tests at Karlsruhe Technical High School, to determine behavior of concretes (1:6) with increasing sand content but same water content, and how to vary addition of water to maintain equal plastic consistency.

CONCRETE CONSTRUCTION, REINFORCED

SWITZERLAND. Thirty Years of Reinforced Concrete (Trente ans de béton armé), E. Elskes. Bul. Technique de la Suisse Romande, vol. 50, no. 23, Nov. 8, 1924, pp. 285-290, 5 figs. Reviews initial difficulties in introduction of Hennebique system, and continuous progress made since in production and application.

E

ELECTRICAL INDUSTRY

NORWAY. Development of the Norwegian Electrical Industry (Norges elektriske industri), V. G. Enger. Teknisk Ukeblad, vol. 71, Special No., Dec. 6, 1924, pp. 416-420, 10 figs. Historical review of growth of Norwegian electrical industry since its beginning in 1877.

ELECTRIC LAMPS

MERCURY-VAPOR. Spectral Energy Characteristics of the Mercury Vapor Lamp, G. R. Harrison and G. S. Forbes. Optical Soc. Am.—Jl., vol. 10, no. 1, Jan. 1925, pp. 1-17, 7 figs. By means of a large aperture quartz spectroradiometer spectral energy distribution of a special variable-length mercury lamp was measured between 14,000 A and 2,300 A under widely varying conditions. Effects of current, voltage and ventilation on radiation at fiteen important maxima were measured.

ELECTRIC MOTORS, A.C.

SYNCHRONOUS-INDUCTION. New Type Synchronous-Induction Motor, V. A. Fynn. Nat. Engr., vol. 29, no. 1, Jan. 1925, pp. 33-36, 8 figs. Describes new type of motor combining characteristics of both synchronous and induction, starting as an induction motor and after coming up to synchronous speed, operating as a synchronous motor. Paper read before N.A.S.E.

ELECTRIC MOTORS, D.C.

STREET-RAILWAY. Experimental Study of D.C. Motors for Street-Car Traction (Studio sperimentale di motori a corrente continua per trazione tramviaria), S. R. Treves. Industria, vol. 38, no. 24, Dec. 31, 1924, pp. 661-664, 8 figs. Details of tests with two Siemens-Schuckert motors by Hutchinson method.

ELECTRIC TRANSMISSION LINES

INTERCONNECTION. A West of Scotland Interconnection Scheme. Elec. Rev., vol. 96, no. 2459, Jan. 9, 1925, pp. 61-63, 6 figs. Scheme involved construction of 22,000-volt overhead transmission line from Greenock to Paisley, together with necessary transformers, induction regulators, switchgear, etc.

ELECTROPLATING

SOLUTION, HEATING AND AGITATING. Heating and Agitating the Solution, H. E. Pelletier. Metal Industry (N.Y.), vol. 23, no. 1, Jan. 1925, p. 15, 1 fig. Improved method of supplying heat and agitation to plating solution from single source.

ENAMELING

DEFECTS DUE TO CAST IRON. Enameling Defects Due to the Cast Iron, A. Malinovszky. Am. Ceramic Soc.—Jl., vol. 8, no. 1, Jan. 1925, pp. 72-78, 7 figs. Discusses troubles arising from cast iron; results of chemical analyses and microscopic examinations and microphotos before and after enameling.

I

IRON ORE

REDUCTION. Reduction of Iron Ores by Carbon Monoxide, H. Kamura. Am. Inst. Min. & Met. Engr.—Trans., no. 1391-C, Jan. 1925, 16 pp., 10 figs. Determination of proper temperature for reduction of iron ores by CO; difference of rate of reduction on sizes of ore under four mesh per linear inch; comparison of rates of reduction on seven kinds of ore with results of experiment, showing close relation between reducibility and density of ore; determination of maximum size of ore that can be reduced in applicable length of time; author believes that process of production of steel may be replaced by low-temperature reduction of iron ores some time in future.

L

LABORATORIES

PUBLIC WORKS. Testing Laboratory, Department of Public Works, Allegheny County, Pa., N. F. Brown. Am. City, vol. 32, no. 1, Jan. 1925, pp. 63-66, 3 figs. Notes on how concrete, sand, asphalt, oil and gasoline are tested at physical and chemical testing laboratory of Dept. Pub. Wks. of Allegheny County, Pa.

M

MINE LOCOMOTIVES

STORAGE-BATTERY. Storage Battery Locomotive in Northumberland. Colliery Eng., vol. 2, no. 11, Jan. 1925, pp. 7-8, 4 figs. Describes electric locomotive for undergroundhaulage installed at Crofton Mill Pit of Cowpen Coal Co. Ltd., England.

R

RAILWAY CONSTRUCTION

WIDENING OF MAIN LINES. Widening of the London & North Eastern Railway Main Line. Ry. Engr., vol. 48, no. 540, Jan. 1925, pp. 11-22, 27 figs. Works undertaken at Huntingdon and Peterborough on Great Northern section of London & North Eastern Ry. having considerably improved facilities for working traffic at both points; details of earthworks and bridges.

ROADS, ASPHALT

MIXTURES. Research Work to Improve Asphalt Paving Mixtures, P. Hubbard. Mun. & County Eng., vol. 67, no. 6, Dec. 1924, pp. 282-289, 8 figs. Failure by shoving; describes a simple stability test; apparatus used, and results obtained; surface tension; testing common standards; sand grading; etc. Paper read at Third Annual Asphalt Paving Conference.

S

STRUCTURAL STEEL

HIGH-STRENGTH, FOR RAILWAYS. Present Status of New High-Strength Steel Eng. News-Rec., vol. 94, no. 7, Feb. 12, 1925, p. 273. Discusses specifications of new plain carbon steel of high strength for use in steel structures for railway, as approved by German State Railway; experience with high-strength steel.

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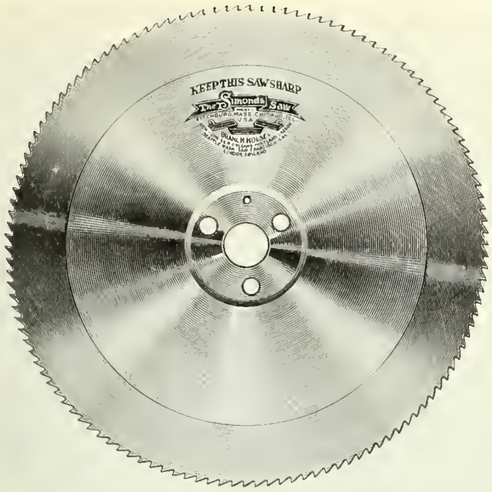

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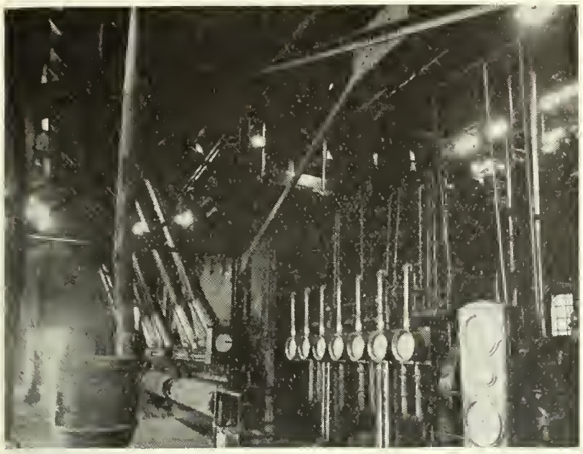

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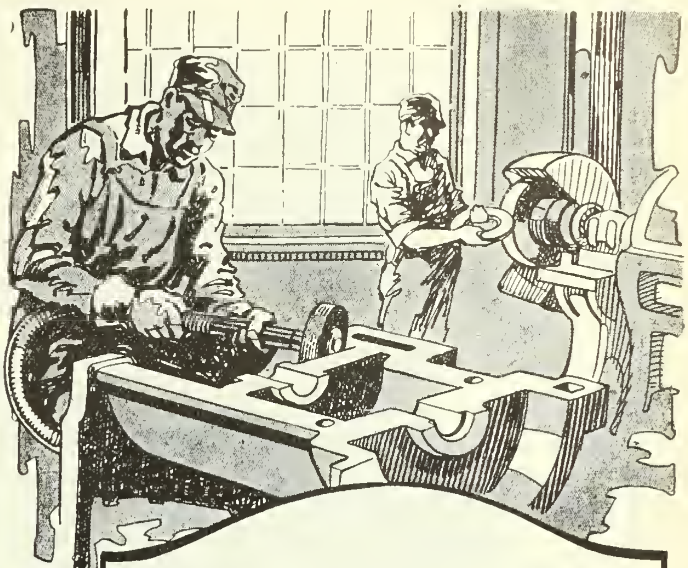

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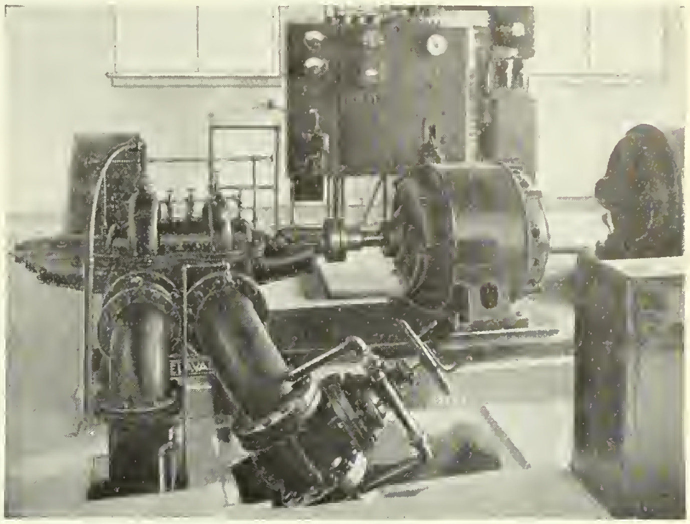

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For Alphabetical List of Advertisers see page 50

A

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B

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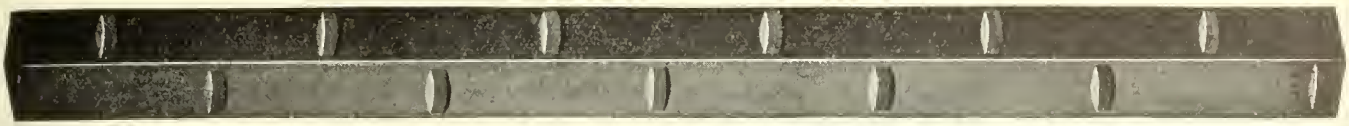

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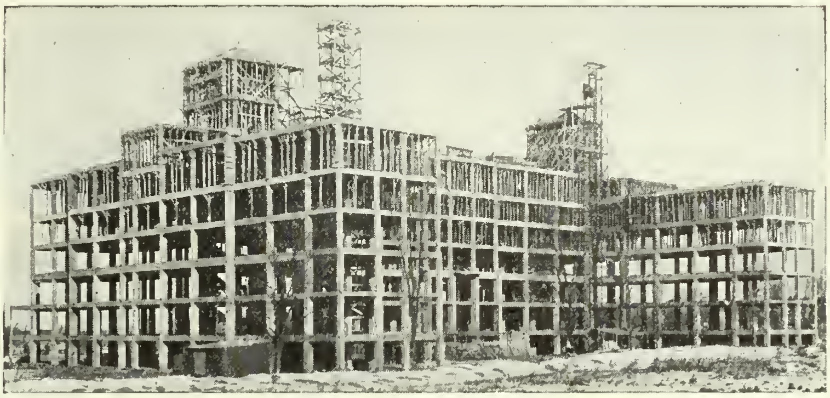

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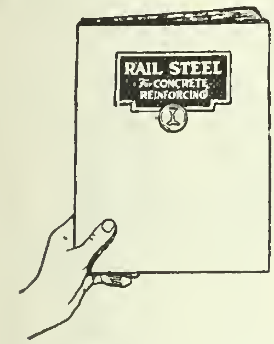
Intermediate	40,000	2.22	18,000	11.2%	
Hard (Rail or Billet)	50,000	2.50	20,000	20.0%	10%



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Specify your reinforcing steel to meet A. S. T. M. Specifications A-16-14 or equal.

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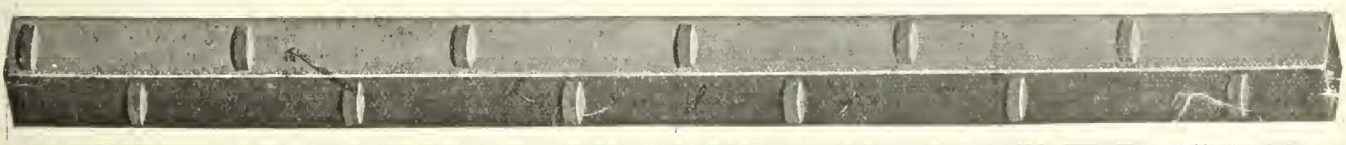

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H

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J

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K

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L

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N

Nails:
British Empire Steel Corp., Ltd.
Nipples, High Pressure Hose:
Knox Mfg. Co.
Nipples, Pneumatic Hose:
Knox Mfg. Co.
Nipples, Rock Drill:
Knox Mfg. Co.
Nozzles, Malleable Iron:
Knox Mfg. Co.
Nuts:
British Empire Steel Corp., Ltd,

O

Oil Burning Equipment:
Vickers & Combustion Engineering, Ltd.
Oil Purifiers, Centrifugal:
De Laval Steam Turbine Co.

P

Packings, Asbestos Sheet:
Canadian Johns-Manville Co., Ltd.
Packings, Rod and Plunger:
Canadian Johns-Manville Co., Ltd.
Paints, Metal Protectives:
Barrett Co., Ltd.
Paper Mill Machinery:
Dominion Engineering Works, Ltd.
Paving Contractors:
Standard Paving Ltd.
Pencils:
American Lead Pencil Co.
Penstocks:
Wm. Hamilton Co. Ltd.
Horton Steel Works, Ltd.
Pacific Coast Pipe Co., Ltd.
Vickers & Combustion Engineering, Ltd.
Pinions:
Hamilton Gear & Machine Co.
Jones & Glassco, Reg'd.
Pipe Coils:
Superheater Co., Ltd.
Pipe, Concrete:
Jno. E. Russell Co., Ltd.
Pipe Couplings, Union:
Dart Union Co., Ltd.
Pipe Fittings:
Crane Ltd.
Pipe, Lead:
Steel Co. of Canada, Ltd.
Pipes, Cast Iron:
Canada Iron Foundries, Ltd.
Gartshore-Thomson Pipe and Foundry Co., Ltd.
General Supply Co., of Canada Ltd.
Kennedy & Company, Ltd.
National Iron Corp., Ltd.
Pipe Insulations:
Canadian Johns-Manville Co., Ltd.
Pipe Lock Bar:
General Supply Co., of Canada, Ltd.
Pipe, Wood Stave:
Pacific Coast Pipe Co., Ltd.
Pipes, Reinforced Concrete:
Jno. E. Russell Co., Ltd.
Pipes, Wrought Iron:
Crane Ltd.
Planing Machines, Metal:
John Bertram & Sons Co., Ltd.,
Plate Rolls:
John Bertram & Sons Co., Ltd.,
Plates, Brass and Copper:
Openshaw & Bennet, Ltd.
Plates, Steel:
British Empire Steel Corp., Ltd.
Hamilton Bridge Works Co.,Ltd.
Vickers & Combustion Engineering, Ltd.
Vulcan Iron Works, Ltd.
Plumbing Material:
Crane Ltd.
Pole Line Hardware:
Canadian Line Materials, Ltd.
Posts, Indicator:
Jenkins Bros., Ltd.
Porcelain, Insulators:
Dominion Insulator & Mfg. Co., Ltd.
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Northern Electric Co., Ltd.
Power Plant Equipment:
Babcock-Wilcox & Goldie-McCulloch Ltd.
Vickers & Combustion Engineering, Ltd.

Purchaser's Classified Directory

Presses, Hydraulic:
John Bertram & Sons Co., Ltd
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Wm. Kennedy & Sons, Ltd.
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Dominion Engineering Works, Ltd.
William Hamilton Co., Ltd.
Pulp Pumps:
De Laval Steam Turbine Co.
Pulpwood Machinery:
Wm. Hamilton Co. Ltd.
Vickers & Combustion Engineering, Ltd.
Pulverized Fuel Systems:
Riley Engineering & Supply Co. Ltd.
Vickers & Combustion Engineering, Ltd.
Pump Governors:
C. A. Dunham Co., Ltd.
Riley Engineering & Supply Co. Ltd.
Pump Valves:
Jenkins Bros., Ltd.
Pumps:
Canadian Fairbanks-Morse Co., Ltd.
Dominion Engineering Works, Ltd.
General Supply Co., of Canada, Ltd.
Jones & Glassco, Reg'd.
Mussens Limited.
Pumps and Condensers:
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Laurie & Lamb.
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Pumps Oil:
Taylor Stoker Co., Ltd.
Punches and Punch Dies:
Pratt & Whitney Company of Canada, Ltd.
Punches and Shears:
John Bertram & Sons Co., Ltd.

R

Radiator Traps:
Canadian Johns-Manville Co., Ltd.
Radiator Valves:
Jenkins Bros., Ltd.
Radio Receiving Sets:
Northern Electric Co., Ltd.
Rail Bonds:
Dominion Insulator & Mfg., Co. Ltd.
Rail Joints:
Rail Joint Co , of Canada, Ltd.
Rails:
Algoma Steel Corp., Ltd.
British Empire Steel Corp., Ltd.
Burlington Steel Co., Ltd.
F. H. Hopkins & Co., Ltd.
Steel Co. of Canada, Ltd.
Railroad Spikes:
Steel Co., of Canada, Ltd.
Railway Equipment:
Canadian General Electrie Co., Ltd.
Rawhide Pinions:
Hamilton Gear & Machine Co.
Rawlplugs:
Dominion Engineering Agency Ltd.
Reamers:
Pratt & Whitney Co., of Canada, Ltd
Recording Instruments:
Vickers & Combustion Engineering, Ltd.
Refrigerating Machinery:
Taylor Stoker Co., Ltd.
Reinforcing Steel:
Burlington Steel Co., Ltd.
Trussed Concrete Steel Co., of Canada, Ltd.
Rivets:
British Empire Steel Corp., Ltd.
Road Oils & Preservatives:
Barrett Co., Ltd.
Road Rollers:
Dominion Insulator & Mfg. Co., Ltd.
Mussens Limited.
Rock Drills, Air and Steam:
Lancashire Dynamo and Motor Co., of Can. Ltd.
Rods, Steel:
British Empire Steel Corp., Ltd.
Roofing, Prepared:
Barrett Co., Ltd.
Roofs, Built up, Felt & Pitch:
Barrett Co., Ltd.
Roofing, Asbestos and Prepared:
Canadian Johns-Manville Co., Ltd.
Roofs, Asbestos Built up:
Canadian Johns-Manville Co., Ltd.
Roofing, Asbestos Ready-to-lay:
Canadian Johns-Manville Co., Ltd.
Roofing, Corrugated Asbestos:
Canadian Johns-Manville Co., Ltd.
Rope, Wire:
Dominion Wire Rope Co., Ltd.
Mussens Limited.
Rubber Goods, Mechanical:
Jenkins Bros., Ltd.

S

Safes:
Babcock-Wilcox & Goldie-McCulloch Co., Ltd.
Sash, Steel:
Trussed Concrete Steel Co., of Canada, Ltd.
Sawmill Chains:
Link-Belt Ltd.
Sawmill Machinery:
William Hamilton Co., Ltd.
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Simonds Canada Saw Co. Ltd.
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Canadian Fairbanks-Morse Co. Ltd.
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Mussens Limited
Vickers & Combustion Engineer ing. Ltd.
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Shafting, Cold Drawn:
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Hamilton Gear & Machine, Co.
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Irving Iron Works Co.
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Mussens, Ltd.
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Horton Steel Works, Ltd.
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Cumberland Steel Co.
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Vickers & Combustion Engineering, Ltd.
Stokers, Side-feed:
Riley Engineering & Supply Co. Ltd.
Vickers & Combustion Engineering, Ltd.
Stokers, Under-feed:
Taylor Stoker Co., Ltd.
Riley Engineering & Supply Co. Ltd.
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British Empire Steel Corp., Ltd.
Canadian Bridge Co., Ltd.
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Standard Steel Constrn.Co.,Ltd.
Steel Co. of Canada, Ltd.
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T

Tanks:
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Horton Steel Works, Ltd.
Tanks, Steel:
Horton Steel Works, Ltd.
E. Leonard & Sons, Ltd.
Vickers & Combustion Engineering, Ltd.
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Taps:
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Tar:
Barrett .Co., Ltd.
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Tractors:
Mussens Limited
F. H. Hopkins & Co., Ltd.
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Transmission Machinery:
Wm. Hamilton Co. Ltd.
Link-Belt Ltd.
Trolley Materials:
Dominion Insulator & Mfg. Co., Ltd.
Tubing, Seamless Steel:
Openshaw & Bennet Ltd.
Turbines Hydraulic:
Boving Hydraulic & Engineering Co., Ltd.
Dominion Engineering Works, Ltd.
General Supply Co., of Canada, Ltd.
Wm. Hamilton Co. Ltd.
Vickers & Combustion Engineering, Ltd.
Turbines, Steam:
De Laval Steam Turbine Co.
Turbo Generators:
De Laval Steam Turbine Co.

U

Under-feed Stokers:
Taylor Stoker Co., Ltd.
Vickers & Combustion Engineering, Ltd.
Union Pipe Couplings:
Dart Union Co., Ltd.

V

Valve Boxes:
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Valve Files:
Jenkins Bros., Ltd.
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Dominion Paint Works, Ltd.
Varnishes, Insulating:
Dominion Paint Works, Ltd.
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C. A. Dunham Co., Ltd.
Dominion Engineering Works, Ltd.
Jenkins Bros., Ltd.
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Valves, Oiler:
Knox Mfg. Co.
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Riley Engineering & Supply Co. Ltd.
Valves, Relief:
Riley Engineering & Supply Co. Ltd.
Valves, Rock Drill:
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Valves, Steam Throttle:
Knox Mfg. Co.
Valves, Throttle:
Knox Mfg. Co.
Venturi Meters:
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W

Washers:
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Water Meters:
Neptune Meter Co., Ltd.
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Canadian General Electric Co., Ltd.
Canadian Westinghouse Co., Ltd
Dominion Insulator & Mfg., Co., Ltd.
Lincoln Electric Co., of Canada, Ltd.
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Bateman-Wilkinson.
Winches:
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Taylor Stoker Co., Ltd.
Wire:
British Empire Steel Corp., Ltd.
Steel Co.,of Canada, Limited.
Wire Mesh:
Trussed Concrete Steel Co., of Canada, Ltd.
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F. H. Hopkins & Co., Ltd.
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Barrett Co., Ltd.
Woodruff Key Cutters:
Pratt & Whitney Company of Canada, Ltd.
Worm Gear:
Hamilton Gear & Machine Co.
Link-Belt Ltd.
Worm Reduction Gears:
De Laval Steam Turbine Co.

Firms advertising in The Journal are considered as absolutely reputable.

Strauss Vertical Overhead Counterweight Bascule.
Counterweights Concealed
Osborne St. Bridge, WINNIPEG.

Strauss Bridges have been developed for every requirement of navigation and land traffic, as evidenced in scores of **Strauss** bridges built in **Canada,** the **United States** and **Abroad.**

CONSULT US before adopting plans or undertaking construction.

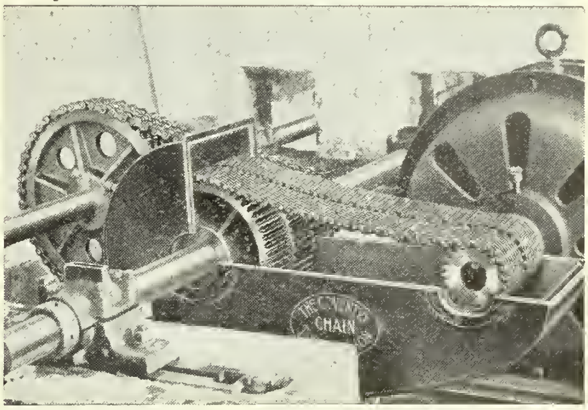
The STRAUSS BASCULE BRIDGE CO. ENGINEERS

225 No. Michigan Ave. CHICAGO, U.S.A.

Canadian Office: London Bldg., Vancouver, B.C.

New York Office: Knickerbocker Building

COVENTRY
HIGH SPEED SILENT
CHAIN DRIVES



Illustrated is an 80 h.p. double reduction drive. First reduction through Coventry Silent Chain—Second reduction through Coventry Steel Bush Roller Chain.

Note Compactness—Coventry Chains run in either direction.

QUIET RELIABLE DURABLE

Many of these drives have been running in Canada for over eleven years without any repairs.

Sole Canadian Agents

Jones & Glassco Reg'd.

St. Nicholas Bldg., Montreal
Bank of Hamilton Bldg., Toronto.

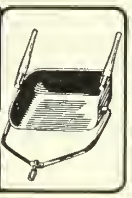
We make our own sprockets and stock chain in Montreal-giving immediate shipment.

THE HAMILTON BRIDGE WORKS
COMPANY, LIMITED
DESIGNERS, FABRICATORS AND ERECTORS OF
STRUCTURAL STEEL WORK

HEAD OFFICE
AND WORKS
HAMILTON, CANADA

BRANCH OFFICE
GENERAL ASSURANCE BLDG.
TORONTO, CANADA

BATEMAN WILKINSON
SCRAPERS WHEELBARROWS PLOWS
TORONTO



APPOINTMENTS VACANT

Wilton's Patent Furnace Co., Ltd., have available patents for Forced Draught Furnaces for Steam raising purposes for exploitation abroad. Good remunerative business to Engineers with connections among steam users can be obtained. Applications giving full details of present occupation with reference, to the above company at 76, Victoria Street, London, S.W. 1.

Institute Badge

Member's gold badge . . . $3.75
Associate Member's silver badge $2.25
Junior and Student's bronze badge $1.50

Apply to Secretary,
176 Mansfield St.,
MONTREAL.

Available in three designs: Clasp Pin, Button, Watch charm.

Journal advertisers are worthy of your business consideration.

INDEX TO ADVERTISERS

Members are urged to consult The Journal's advertising pages.

Two views on the Kingston Road Provincial Highway between Oshawa and Bowmanville. Hot-Mix Asphalt laid in 1924 by Johnson Bros. Limited, for the Department of Public Highways of Ontario.

THE ENGINEERING JOURNAL

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

"TO FACILITATE THE ACQUIREMENT AND INTERCHANGE OF PROFESSIONAL KNOWLEDGE AMONG ITS MEMBERS, TO PROMOTE THEIR PROFESSIONAL INTERESTS, TO ENCOURAGE ORIGINAL RESEARCH, TO DEVELOP AND MAINTAIN HIGH STANDARDS IN THE ENGINEERING PROFESSION AND TO ENHANCE THE USEFULNESS OF THE PROFESSION TO THE PUBLIC"

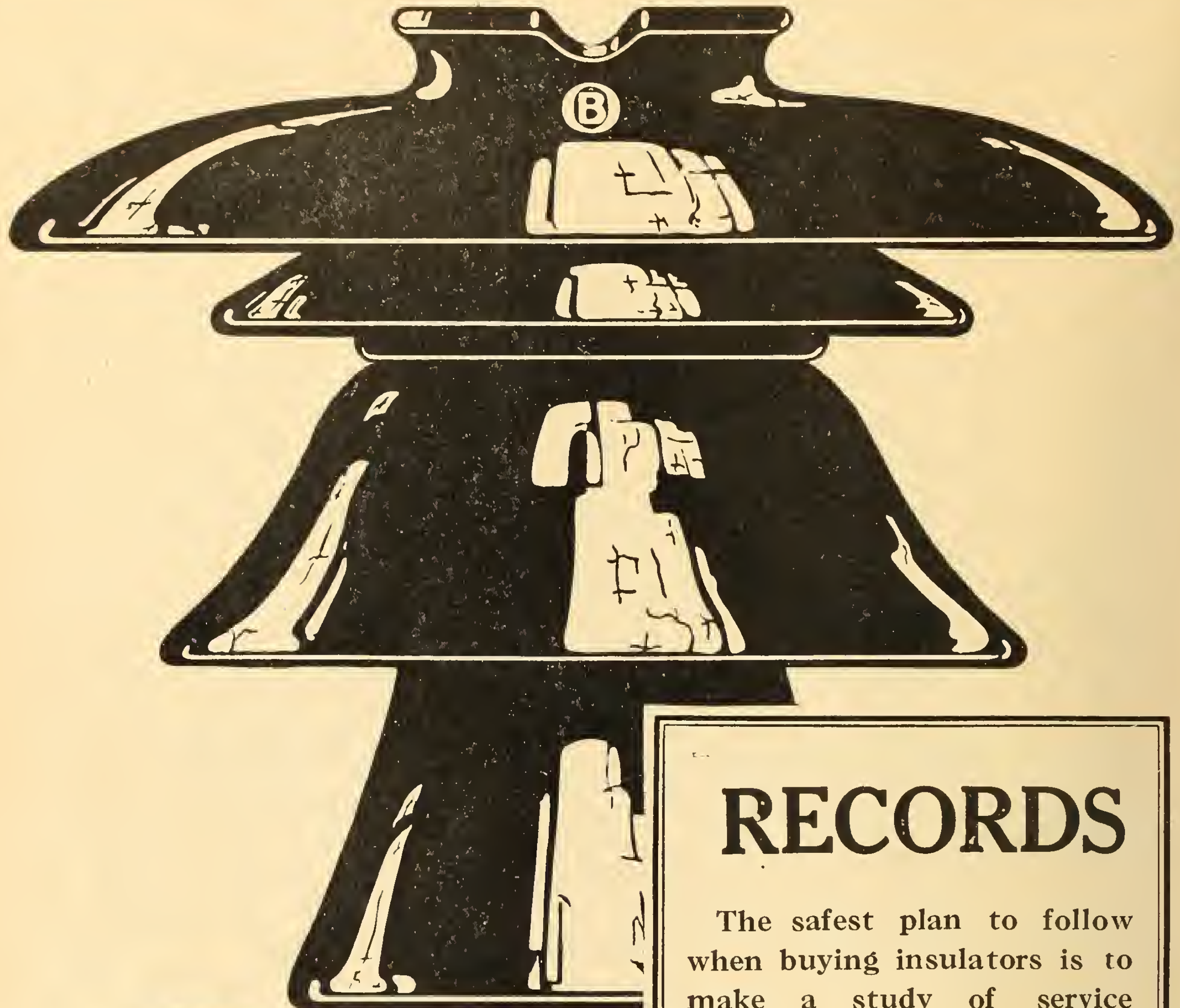
THE ENGINEERING INSTITUTE OF CANADA FOUNDED 1887

MAY 1925

PUBLISHED MONTHLY BY THE ENGINEERING INSTITUTE OF CANADA

AT 176 MANSFIELD STREET, MONTREAL

Vol. VIII No. 5



BARBER-GREENE

For one cent you can inspect thirty-five material-handling jobs

You have often wanted to examine the material-handling layouts that have proved conspicuously successful in plants similar to your own. Yet the cost of a satisfactory tour of inspection is prohibitive, both in time and money.

For one cent you can have this information, in brief and lucid form, ready for instant reference, by sending a postcard for "Mr. Barber's Scrap Book."

As designer of Barber-Greene equipment, Mr. Barber has maintained a rigid check on the way in which Barber-Greenes are meeting material-handling requirements of every sort.

He has acquired such a mass of valuable data which bears directly upon your own operations, that we have collected some of it and bound it in a compact forty-page booklet.

The photographs show graphically how a great many companies are defeating the heavy overhead costs of unskilled labor, and at the same time often increasing production speed as much as 300%.

With immigration restriction choking the supply of unskilled labor at its source, the high cost of moving materials by hand threatens to mount even higher. This presents you with a serious problem, which cannot be ignored without loss. It is just here that "Mr. Barber's Scrap Book" should prove valuable. It will point the way to greater economy, efficiency and speed, no matter what the nature of your work. Send for it.

Material Handling Equipment of All Kinds

BUCYRUS SHOVELS - WESTERN CARS - VULCAN LOCOMOTIVES

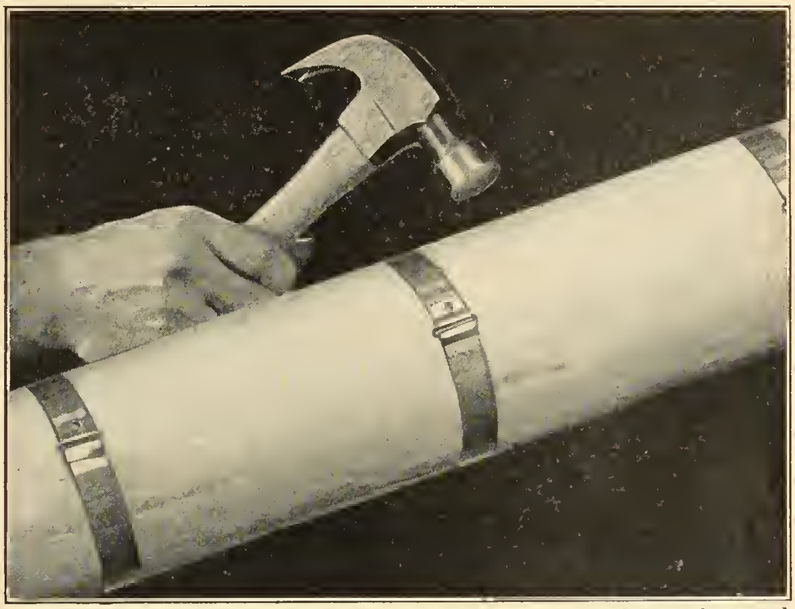
SMITH MIXERS - MARSH HOISTS

ROGERS TIMBER CLAMPS

MUSSENS LIMITED

MONTREAL TORONTO WINNIPEG VANCOUVER

for **hard** *service!*



Trade-mark registered

Asbesto-Sponge Felted Insulation

HERE'S an insulation that can stand the hardest sort of plant service and still maintain a higher efficiency than any other insulation on the market.

Hit Asbesto-Sponge Felted Insulation with a hammer—give it treatment that would reduce ordinary insulation to a powder—and it will come through unscathed.

That's why engineers prefer it. They can count on it to maintain its high efficiency in the plant as well as in the laboratory.

CANADIAN JOHNS-MANVILLE CO. LIMITED
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Johns Manville Service
Covers the Continent
Through
Asbestos
and its allied products
INSULATION
BRAKE LININGS
ROOFINGS
PACKINGS
CEMENTS
FIRE PREVENTION PRODUCTS

JOHNS-MANVILLE
Power Plant Materials
Made in Canada

Journal advertisers are discriminating advertisers.

RECO PRODUCTS

Look to Your Boiler Room

From your boiler room comes the power to produce. Though often neglected, it plays a most important part in production and it therefore follows that economies made in the cost of making power will cut the cost of your finished product.

To make available to every Canadian power plant the experience and assistance of some of the foremost engineering organizations of the continent, in bettering the economy of your power plant, is the purpose of "Reco Service".

Look at the list of products below. Each piece of equipment will do all we claim. You will find that each will stretch your dollar a little further and incidentally add you to the great number of our satisfied clients—wise men who availed themselves of that which we offer in "Reco Service".

"RECO PRODUCTS"

Griscom-Russel Equipment
- Feed Water Heaters
- Storage Heaters
- Heat Exchangers
- Separators—Filters
- Expansion Joints
- Evaporators—Coolers, etc.

Cash Standard Valves
- Pressure Reducing and Regulating Valves
- Fan Engine Regulators
- Ammonia Expansion Valves
- Relief Valves
- Pump Governors, etc.

Material Handling Equipment
Craig System Draft Control
Stets Feed Water Controller
Ellison Draft Gauges
Troy Engines
Suspended Flat Arches
Parker-Kalon Drive Screws
Marion Soot Blowers

STOKERS

RILEY UNDERFEED STOKERS
JONES UNDERFEED STOKERS
HARRINGTON TRAVELLING GRATE
"LATERAL RETORT" STOKERS
NATIONAL STOKERS
MURPHY FURNACES

As sole licensees for the manufacture, sale or distribution in Canada of the apparatus listed, this Company is able to offer the power plant owner the best apparatus of its kind on the market.

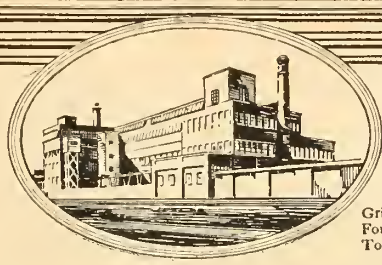
Riley Engineering and Supply Co., Limited

A consolidation of Underfeed Stoker Company of Canada, Ltd. and Riley Engineering Company of Canada, Ltd.

360 Dufferin St., Toronto 3 St. Nicholas St., Montreal

Western Representatives:
Alberta and Western Saskatchewan: J. Twomey, Camrose, Alberta
British Columbia: P. A. Goepel, Vancouver
Manitoba and Eastern Saskatchewan. W. W. Hicks & Co., Winnipeg

OUR SERVICE IS NOT COMPLETE UNTIL YOU PROFIT BY IT



Grinnell Foundry, Toronto

An O. K. that Means Something

IT makes you feel mighty good when you've done your best to do a good job and somebody who knows what he's talking about says, "Never saw better."

That's what James A. Wray of Grimsley, Ontario, said about Grinnell Cast Iron Fittings. Hundreds of other men are just as enthusiastic.

For instance:

"Your fittings are far superior in every way to any we have used. This comes from myself and men using same," wrote H. Barnes, of Hamilton, Ontario.

"Uniform tapping and free from sandholes," was the comment of J. P. Smith, Hamilton, Ontario.

"Best I have ever seen. Tapped so true and start so easy," was the word received from George Beer, Benbrooke, Ontario.

IF you want still further proof--if you want to see a hundred letters that pass the same verdict—send for the booklet on Grinnell Cast Iron Fittings, the fitting that everybody is talking about.

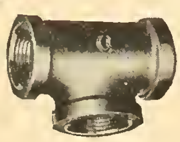
Better yet, place an order for Grinnell Fittings and try them out on your next job. We feel sure you'll agree that the Grinnell Foundry and Plant at Toronto are turning out a splendid product.

If your supply house doesn't carry Grinnell Fittings, write us immediately. Address your inquiry to our office at 2440 Dundas Street West, Toronto, Ontario. We'll send you the information you want.

GRINNELL COMPANY of CANADA, LTD.

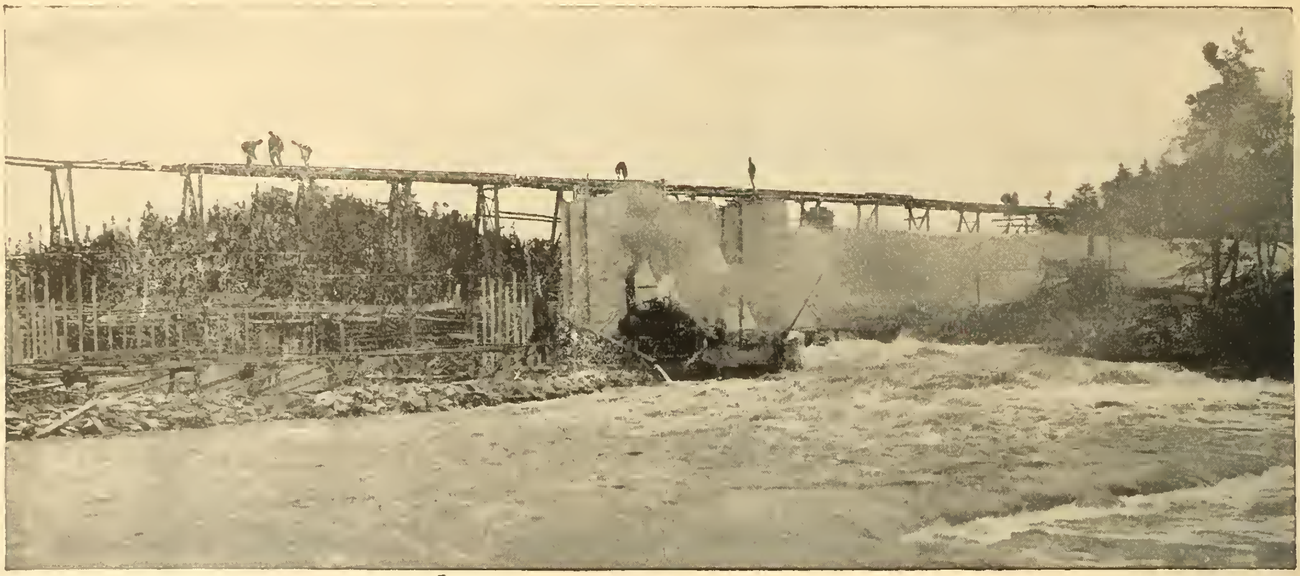
TORONTO MONTREAL WINNIPEG VANCOUVER

GRINNELL



Hangers Valves Fittings

Piping Supplies of All Kinds



Sheet Harbor Power System of Nova Scotia Power Commission. Main Dam at Ruth Falls, under construction.

Concrete Plays Leading Part in Sheet Harbor Power Development

A noteworthy addition to Canada's chain of developed water powers is rapidly nearing completion in the Sheet Harbor District, Nova Scotia.

This undertaking involves three distinct developments, one at Malay Falls, another at Ruth Falls and a third (now being in reserve) at Marshall Falls.

Concrete work on these jobs includes an intake dam, canal and the power house itself.

This year promises to be a record building year. The price of Cement continues low, while Government Statistics show that building costs generally, have declined to pre-war levels.

CANADA CEMENT
CONCRETE
FOR PERMANENCE

Specify
CANADA CEMENT
Uniformly Reliable.

We maintain a Service Department to co-operate in all lines of work for which Concrete is adapted. Our library is comprehensive and is at your disposal at all times without charge.

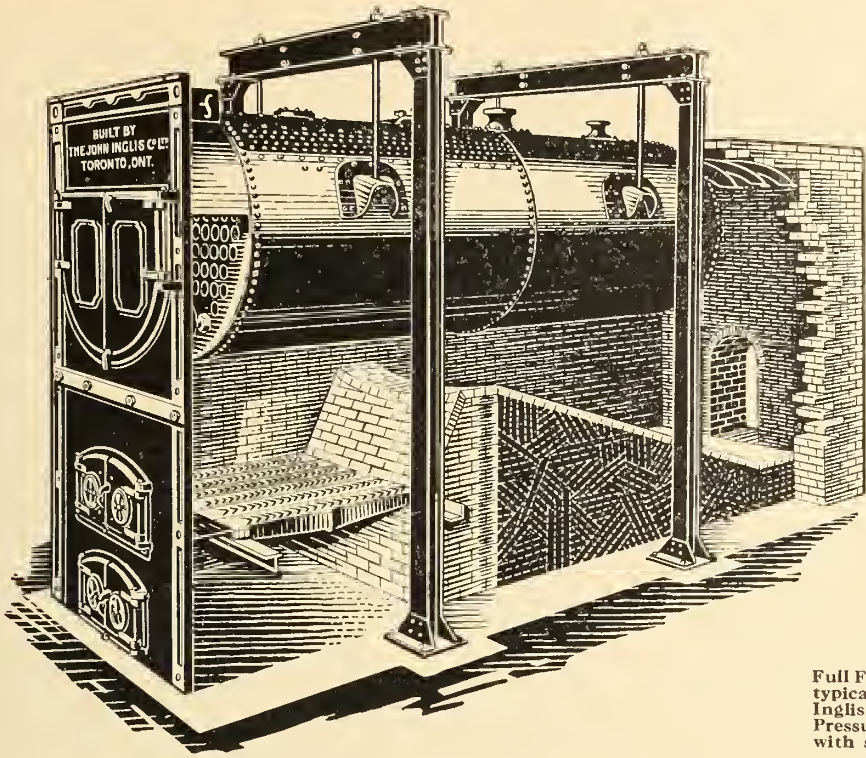
CANADA CEMENT COMPANY LIMITED

Canada Cement Company Building
Phillips Square Montreal

SALES OFFICES AT:

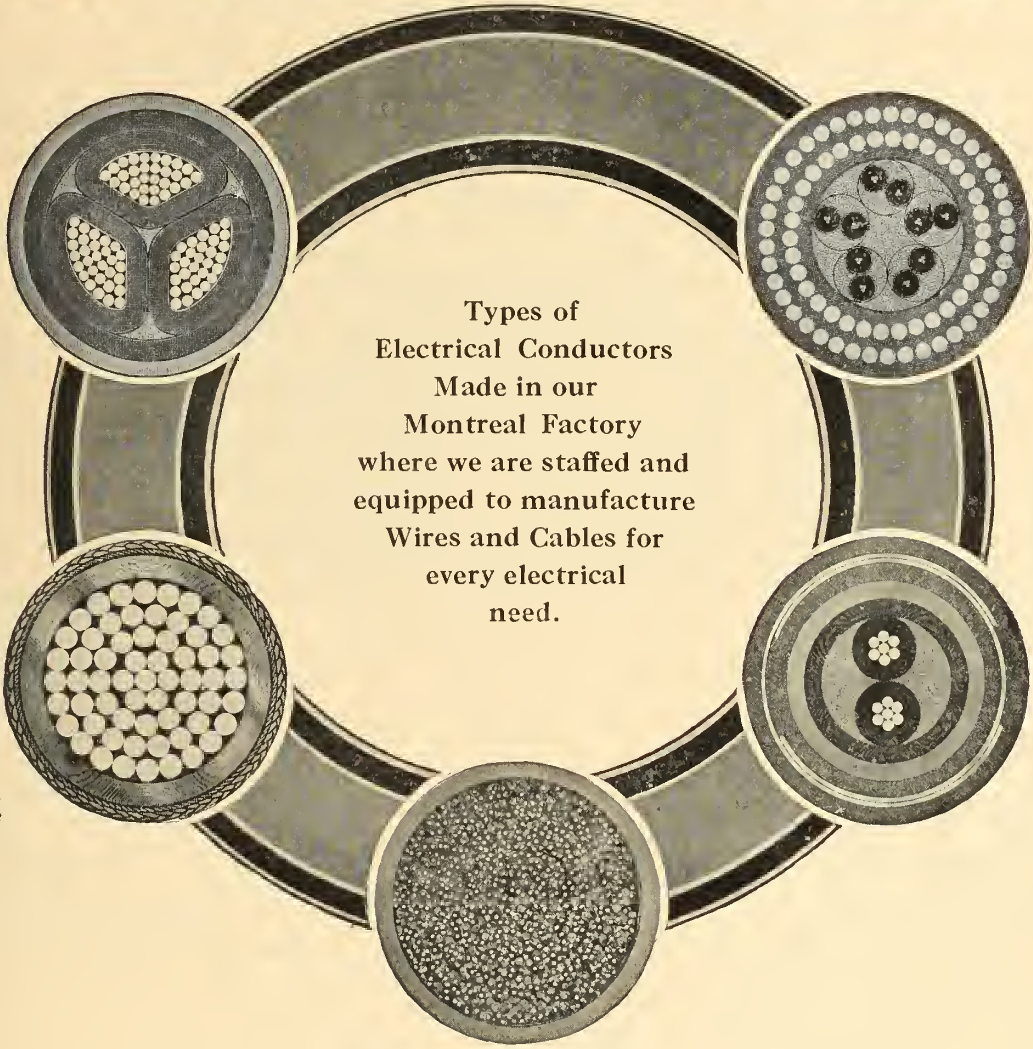
MONTREAL TORONTO WINNIPEG CALGARY

START YOUR IMPROVEMENTS NOW. BUILD WITH CONCRETE AND SAVE MONEY.



Full Front Setting for a typical installation John Inglis h H.R.T. High Pressure Power Boiler with suspension frames.

ELECTRICAL CONDUCTORS
TELEPHONE TELEGRAPH AND POWER CABLES



Paper Insulated Sector L.C. Power Cable

Submarine Telephone Cable

Varnished fabric Taped and Braided Power Cable

Paper Insulated Armored Power Cable

Paper Insulated L.C. Telephone Cable

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MARINE FITTINGS

Northern Electric Company Limited

MONTREAL	TORONTO	WINNIPEG
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OTTAWA	WINDSOR	VANCOUVER

STOKER

The versatile STOKER!

Type "E" Stokers are used:

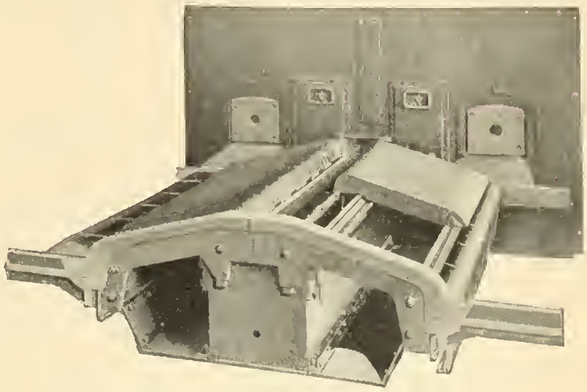
—In all industries, including Steel Plants, Pulp and Paper, Textile and Sugar Plants.

—Burning all kinds of Bituminous coals and various refuse fuels.

—Under all types of boilers and all sizes from 150 h.p. to 750 h.p.

For Instance:

In SEVEN plants of an internationally known steel company 122 TYPE "E" STOKERS are firing NINE types of boilers ranging from 250 to 728 H.P.



Rear view with some bars removed.

Engineering Limited

Green Chain Grate Stoker
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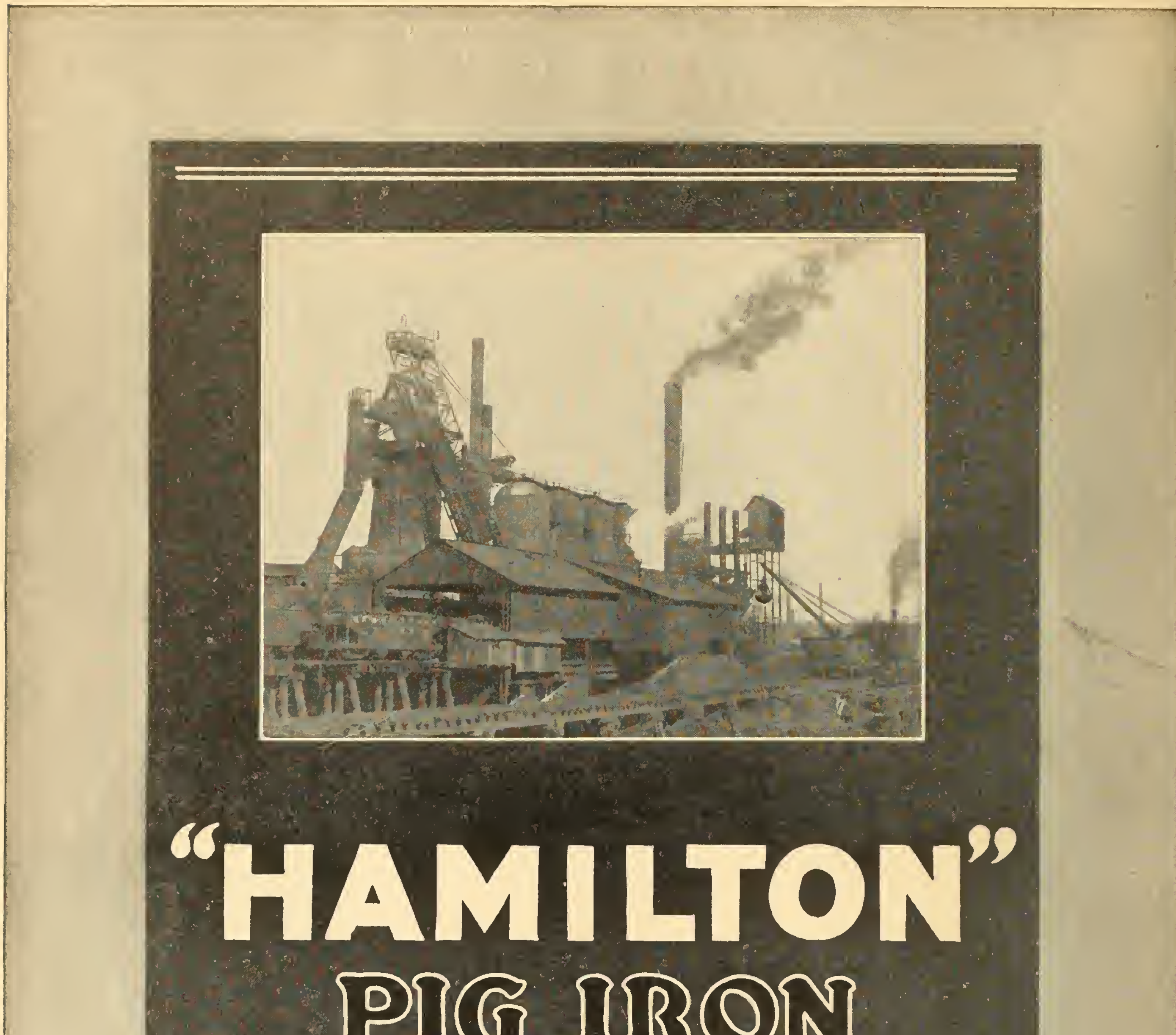
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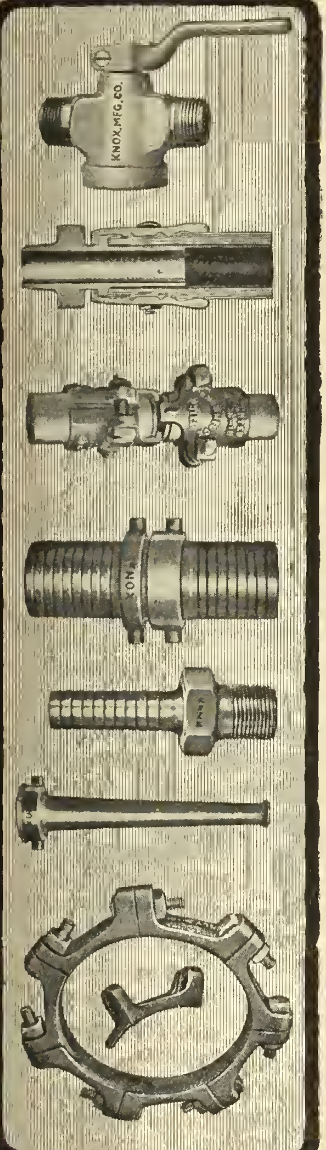

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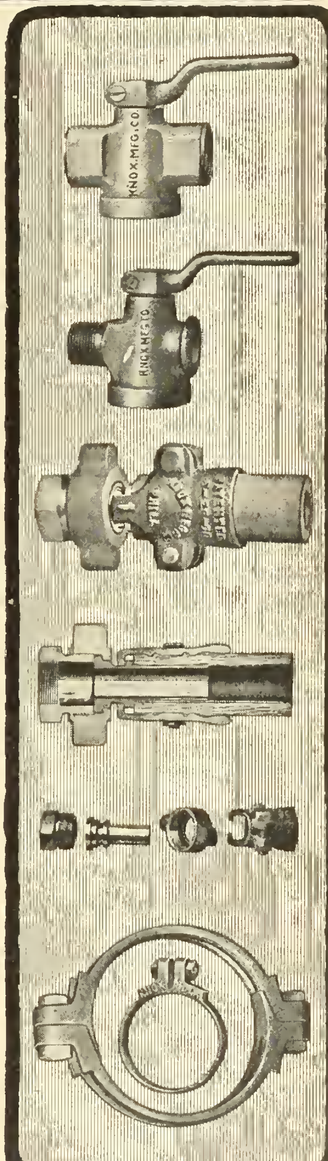

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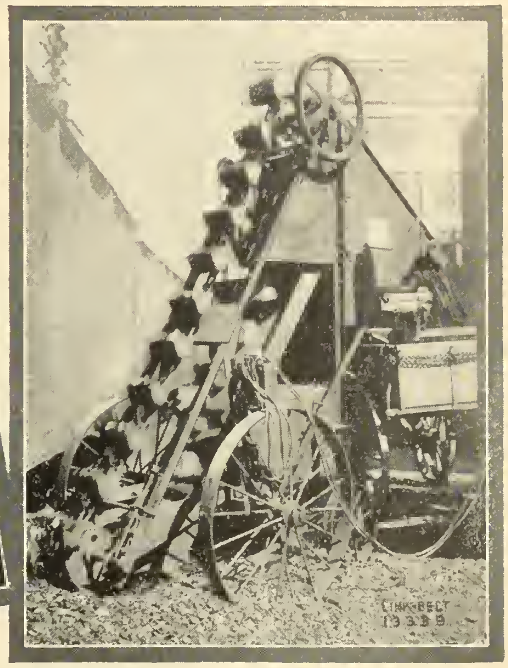

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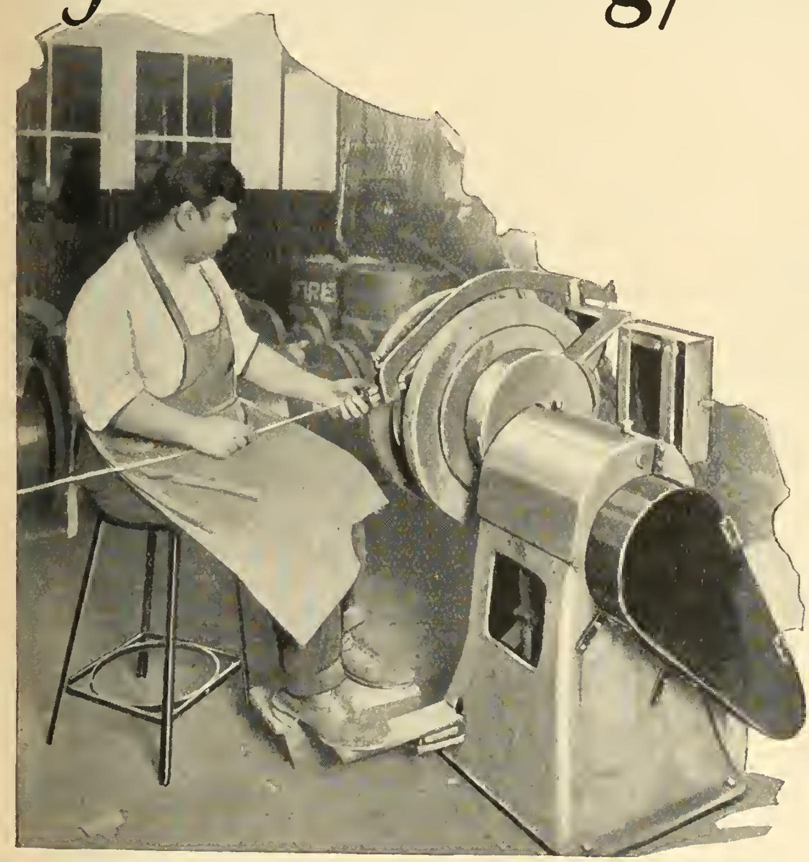

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THE

ENGINEERING JOURNAL

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OF CANADA

MAY, 1925

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The Motor Vehicle as a Transportation Facility

Factors to be considered in assigning the Motor Vehicle its proper field as a common carrier transportation facility.

R. A. C. Henry, M.E.I.C.,
Director of the Bureau of Economics, Canadian National Railways.

Paper read before the Montreal Branch, The Engineering Institute of Canada, January 15th, 1925.

From the standpoint of the public, and of those directly interested in steam, electric and motor transportation facilities in use to-day, a very important problem has to be faced; and that problem is the proper and harmonious adjustment of the scope of each of these transportation facilities to meet the conditions arising by reason of the rapid development of the motor vehicle. That the motor vehicle has become an economic factor in the transportation field there can be no doubt, and the sooner we recognize this fact the better. On this premise, the problem before us is one of the proper co-ordination of these various transportation facilities in such a manner as to maintain an economic balance between the scope and nature of the fields of activity of each.

Distribution

Everyone who gives the question any serious economic consideration must realize the importance of our problem of distribution, and the part which the steam and electric railways play as transportation agencies in facilitating distribution. Our whole social and economic structure depends upon our ability to devise and maintain transportation facilities which permit of convenient, safe and expeditious movement of necessities of life from place to place, and provide for the conveyance of persons with celerity, safety and reasonable comfort.

In the early days the barbarian tribes did not require elaborate transportation facilities. Even in the Middle Ages, under the Feudal System, the products of agriculture and of the artisans, as handicraft developed, were consumed almost entirely within each community and, naturally, the problem of distribution was not of primary importance.

With the opening of the nineteenth century, followed by the successful application of the steam engine to transportation, centralization of population and industry became possible and convenient, and commodities could be interchanged between localities and countries to an extent undreamed of in ancient times.

You are all familiar with the development of the steam and the electric railway as transportation facilities during the last century, and consequently I will not weary you with any further reference thereto except, in passing, to draw your attention to the fact that at the inception of the steam railway era, there existed a substantial body of public opinion in favour of the construction and maintenance of the railways by the state; the public to be free to provide vehicles and to use these railways at will in the same manner as highways. The practical difficulties of such a proposal soon became apparent, with the consequent development of large transportation corporations which have undertaken the design, construction, equipment and operation of the steam and electric railways.

Motor Vehicle

The motor vehicle appeared upon the horizon about twenty years ago as a pleasure vehicle. It was the outgrowth or development of the bicycle, which made clear the desire for individual transportation. The motor vehicle removed in a large part the trouble and expense of a horse, and also the necessary physical effort in the use of the bicycle. Driving an automobile became a sport in itself, and its first appeal was not the transportation it gave, but the fun derived from operating a vehicle which would travel faster than anything else one man could handle.

The early designs, however, were based upon the assumption that cheapness was essential. These proved to be under-powered, cramped and uncomfortable, and before long the early theories of design were abandoned. The rapid development of the internal combustion engine made possible the design of a car of adequate power centered in a small unit accessibly located, a clutch and sliding gear transmission, comfortable bodies with high sides, deep seats and tops, wheel steering with reduction gearing, etc.

The development of the motor vehicle in Europe was considerably in advance of its development in America, because the European roads were much better, and there were a greater number of idle rich desirous of experimenting with this new toy.

In America the motor vehicle was developed from the start largely as a transportation facility. Its development, however, was not very rapid until 1909, the production for that year being double what it was the previous year and almost equal to the entire production up to that time.

The early motor vehicles, as can be readily appreciated, were largely of the passenger type. The general growth from 1900 to 1923 was as follows:

Passenger Cars

Year	*Number*	*Value*
1900	3,700	$ 4,750,000
1905	21,281	23,634,367
1910	181,000	213,000,000
1915	818,618	565,978,950
1920	1,883,158	1,809,170,963
1923	3,694,237	1,693,808,282

In 1923, the registration in the United States was 13,464,608, or about one passenger motor vehicle for every eight inhabitants; and in Canada the registration was 512,917, or one passenger motor vehicle for every eighteen inhabitants. In this connection I have just recently read in one of the motor journals that the registration for 1925 totalled slightly over 17,000,000 — this includes buses and trucks — or one motor vehicle for every 6.5 inhabitants of the United States.

The *motor truck* is a much more recent development; the total production prior to 1915 being just about 100,000, whereas the production for 1915 proper amounted to 74,000. The growth is indicated in the following table:

Year	*Motor Trucks*	*Value*
1904	411	$ 946,947
1911	10,374	20,485,500
1915	74,000	125,000,000
1920	322,039	423,756,715
1923	392,760	311,144,434

In 1923, there were 1,627,569 motor truck licenses in the United States and 53,569 in Canada.

To-day, the annual production of motor vehicles in Canada and the United States is only slightly under 4,000,000, and the value of such combined production, at wholesale prices, is just over $2,000,000,000. If the 15,000,000 motor vehicles registered in 1923 be assumed to represent the same average investment as those produced in 1923, the investment represented, at wholesale prices, would be approximately $7,500,000,000. It might be of interest, by way of comparison, to consider for a moment the investment in equipment by the steam railways in the United States and Canada, in order that a full appreciation may be had of the importance of the motor vehicle as a transportation facility.

In the United States and Canada for 1923:

Investment in steam railway equipment—U.S.	$4,675,000,000
Investment in steam railway equipment (Est.) Can.	534,000,000
Investment in motor vehicle equipment	$7,500,000,000

From the above, it will be readily seen that the motor vehicle, not only from the standpoint of investment in the vehicle itself, but also from the standpoint of the general business activity of the country, is a substantial factor, and is, in some quarters, taken to be a barometer of trade.

Highways

Properly located, properly constructed and properly maintained highways are just as essential to the full development of the motor vehicle as is the location, construction and maintenance of the permanent way to the successful operation of the steam and electric railways. For this very reason, the motor vehicle in its early stages developed most rapidly in Europe, where the art of road-making was somewhat in advance of its development in America. During the past few years, however, the situation has changed entirely and highway construction in America has gone forward apace.

In 1924 there were 430,000 miles of federal, state and local surfaced highways in the United States. At an estimated average cost of $25,000 per mile, this would represent an investment of $10,750,000,000, oı about $18,000,000,000 in motor vehicles and surfaced highways; as against about $20,000,000,000 invested in steam railways. In 1922 alone the expenditures on highways in the United States amounted to about $900,000,000.

In Canada, according to the report of the Commissioner of highways, there were in 1923, 423,000 miles of highway, of which 88.5 per cent comprised the ordinary earth roads, and the balance of 48,695 miles included:

34,839 miles gravel;
12,998 miles waterbound macadam;
548 miles bituminous;
108 miles bituminous concrete; and
202 miles cement.

At $15,000 per mile, the improved roads in Canada would represent an investment of $730,000,000.

There is no very authentic information as to cost of maintenance of highways, but I am venturing a guess that it would average $1,000 per mile per annum if all charges of a maintenance and replacement character were included. In other words, it would seem that the annual cost of maintaining the 430,000 miles of improved highways in the United States is not less than $430,000,000, and the annual cost of maintaining the 48,000 miles of highways in Canada is not less than $48,000,000; as against an annual cost of $821,000,000 for maintaining the steam railway permanent way in the United States, and $83,500,000 for maintaining the permanent way in Canada.

The development of the motor vehicle has had a profound influence upon the design of highways. The location of the main motor highways, however, appears to have been influenced almost entirely by the consideration of the motor vehicle as a pleasure rather than a commercial facility; very little attention has been given to the development of a secondary highway system. The improvement of the main travelled highways, which are largely parallel to the steam and electric railways, has caused a competitive situation to arise in the handling of freight and passengers as between the motor vehicle and the steam and electric railways, which has tended to injuriously affect the earnings of the older transportation facilities. It is only recently that intelligent thought has been directed towards the placing of the motor vehicle in its proper sphere. The thought which I would like to leave with you, however, is this: that if the motor vehicle has an economic field as a transportation facility — and I think we are all agreed that it has — the future construction and improvement of highways should be based upon the consideration of the motor vehicle as supplementary to, rather than in competition with existing transportation facilities. This naturally entails the delimitation of the economic limits of the commercial motor vehicle.

Classification of Traffic falling within the field of the Motor Vehicle

It would appear from a review of such data as are now available that the motor vehicle might have distinct economic advantages in the handling of traffic falling within the following classifications:

FREIGHT:
(1) Haulage of commodities from the farmer to the rail or water shipping point.
(2) In relieving congested terminals.
(3) In radial operations from large cities in the delivery of L.C.L. lots of merchandise and raw materials.
(4) In the haulage of perishable farm and dairy products, such as milk, fruit and vegetables.
(5) Where no other transportation facilities are provided.

PASSENGER:
(1) To replace or supplement city tram lines.
(2) In Interurban service.
(3) Tourist service.
(4) In serving sections that are not provided with steam or electric service.

Trucks—Freight

Haulage of Commodities from the Farmer to the Rail or Water Shipping Point

The development of the motor truck appears to present great possibilities from the standpoint of improving the position of the farmer whose volume of tonnage is sufficient to justify the employment of such a facility. In the case of the horse-drawn vehicle, the economic range to which the farmer can afford to haul his product is distinctly limited, both by reason of the time element involved and also by reason of the cost. The time element is probably divided by three in the case of the motor vehicle, and the cost is substantially lowered. It would appear that this feature presents a fruitful field for economic investigation with a view to the development of secondary highways capable of accommodating motor vehicle traffic and at the same time supplementing and extending existing transportation facilities. In part III of the Report of the United States Joint Commission of Agricultural Inquiry — Transportation; October, 1921, the following observations are made:

"Surveys made by railroads in eastern territory indicate that the use of the motor truck thrives in proportion to the extent of good roads. Motor trucks can not be successfully operated over rough or muddy highways."

"It would not be out of place to say that the farmer is as much interested in the location and direction of the roads for which he is paying as he is in the type of road."

"First and foremost the road should bring into connection with the railroad as much territory as possible, and this can only be done economically when the situation is carefully studied in advance."

"If the highway is to be built primarily for passenger vehicles a route which traverses the most beautiful sections and connects the communities most directly will find most favour with the tourists and the dwellers in the cities and towns; but the farmers who want to market their products in bad weather as well as good, who produce a surplus beyond the demand of their own families and immediate neighbourhood, will ask that the highways be laid out so as to give them access to all markets, and this should not be done by paralleling the main railroads but by building and maintaining the feeder roads from the main roads and from the railroad."

Use of the Motor Truck in Relieving Congested Terminals

Probably the most serious problem in our whole scheme of distribution to-day, is that involved in and around our large centres of population commonly known as terminals. It is a comparatively easy matter to construct and equip a transportation facility which will adequately and expeditiously handle all the traffic offering between two terminals, it is quite another question to provide for adequate and expeditious distribution within the terminal itself after the road movement has been made. This is a field in which the possibilities of the motor truck appear to be capable of development, and it is being extensively studied at the present time by railway companies.

Radial Distribution from Large Centres

Radial distribution of L.C.L. shipments within certain limits to outlying centres of population, within a limited radius of the larger distributing centres is another field in which the development of the motor truck would appear to have economic possibilities. This distribution under the present method adopted by steam railways is extremely costly as well as slow. In this connection Mr. Elisha Lee, vice-president of the Pennsylvania Railroad System, made the following remarks:

"Such profits as the railroads are able to make at all come practically altogether from the mass transportation of freight and passengers over at least considerable distances; in other words, from what we may term the 'wholesale' department of transportation. This is just the form of service in which experience shows that trucks cannot consistently earn real profits. On the other hand, those forms in which trucks can and do make money are almost invariably the strictly 'retail' foim in the rendering of which railroad operation practically always involves losses and sometimes heavy ones."

The use of the motor truck for this class of traffic would tend to reduce the number of handlings of commodities considerably and to materially expedite delivery with consequent improvement in the service to the public, as it would relieve the railways of the necessity of providing facilities altogether out of proportion to the amount of business to be accommodated. So fruitful does this particular field appear to be from the standpoint of the steam railways, that a large number of them — notably the New York Central and the Pennsylvania — particularly in the vicinity of such centres as New York, Baltimore, Philadelphia, Chicago and Detroit, are going into the motor truck business very extensively, and, as far as present indications point, with considerable benefit both to the public and to the railways.

Haulage of Perishable Farm and Dairy Products

With the modern tendency towards the centralization of population into large communities, the transportation from its source of the daily supply of foodstuffs required for the sustenance of these large communities is becoming extremely difficult and costly; this refers particularly to milk and other dairy products, fruit and vegetables. The use of the motor truck over improved highways, wherever this facility has been made use of, has resulted in the extension of the territory from which the centre of population can draw its supplies. It has also resulted in a reduction in the cost per unit and, more than that, it has permitted the consumer to receive these commodities in better condition and more expeditiously. The extension of the use of the motor truck in this field would appear reasonable.

Long Hauls where there are no other Transportation Facilities, or where the Traffic is so Thin as not to Justify the Continuance of the Steam Service

There is at the present time, and there is likely to develop as time goes on, a demand for transportation of some character where there is no transportation at all or inadequate transportation facilities are at present afforded. The possibility of the utilization of the motor vehicle as a means of supplying the transportation requirements should be looked into before any expenditure is made for the provision of other more costly means. In addition to this there are many cases, both in Canada and the United States, where, under existing conditions, service is given by steam and electric railways to territories or on branch lines where the traffic is comparatively light and, consequently, the continued operation of these services by the steam and electric railways is performed at a loss. It is quite possible that with the development of the highway, the steam and electric service may be superseded by the motor vehicle and the operating losses resulting from the operation of these branch lines by steam or electricity, eliminated or reduced. There has been considerable experimentation by steam railways not only in the United States but also in Canada, with a view to cutting down the losses of lines of this character by the inauguration of what are known as "unit cars", which are nothing more or less than single units with a limited crew, propelled by gasoline, steam or electricity with a storage battery.

Buses

The motor bus, as a passenger vehicle, has undoubtedly its economic field in the passenger business as the motor truck has in the transportation of freight.

To Replace or Supplement Tram Cars in Large Centres

The motor bus is a good deal more flexible than an electric car and does not require the expensive track and overhead construction: it is much easier handled in traffic, and routes may be chosen as traffic develops to divert the movement through less congested areas without abandoning old capital expenditures or incurring new ones for expensive track construction. In addition to this, in large centres where transportation is provided by electric railways, frequently extensions are required to meet the increasing demands for transportation. The use of the motor bus to supplement present services in cases of this character will be very often found to be economical.

Radial and Interurban Service

It is quite possible that the motor bus may prove to be an economic transportation facility in the case of radial and interurban services to a certain limited extent. At any rate, it is a field the economics of which should be thoroughly exhausted.

For Sections not already Served by other Forms of Transportation

There may be localities at present not provided with — or inadequately provided with — transportation facilities, and where the improved highways would permit of the utilization of motor buses. There are cases where this is undoubtedly economic and ought to be resorted to before capital expenditures are made with a view to providing transportation facilities of a more permanent character.

Tourist Service

During the last two or three years experience has indicated another field in which the motor bus appears to have found considerable favour, and that is in the tourist field. In this respect it presents many features more flexible than the steam or electric railways; on the one hand as regards the following of scenic routes, and on the other hand from the point of view of their greater utilization by reason of it being possible to utilize the equipment in the north in the summer and in the south during the winter season.

Regulation

From earliest times in Europe, the construction and control of inland means of communication have been popularly regarded as a function of the state. This view arose out of the fact that such means of communication were essential adjuncts to the military establishment. For this reason, most of the early highway construction was carried on by the state, and private individuals or private companies were permitted to use these highways and to operate their own vehicles upon them, either with or without payment of tolls for their use and upkeep.

The early practice in the United States and Canada was influenced to a considerable extent by the same ideas, although the actual practice adopted in the construction and maintenance of the highways differed in the various states and provinces. In this country, many of the highways were originally constructed by turnpike companies, with or without assistance from the state. These companies were organized and operated under statutory authority, which obligated them to construct and maintain highways between specified points, and authorized them to collect tolls for the use of such highways by the public. In the main, however, the practice has been for the state to construct, maintain and operate the highways of the country as public works.

It was only natural when railways were first conceived, that the popular conception should be that the state ought to provide a way over which individuals or companies might operate their own vehicles. It was soon realized that in the operation of a railway, a certain harmonious and orderly relation had to exist in the movement of traffic, and that for this reason it would be impracticable to decentralize the ownership of the railway vehicles and permit their passing over the railway at will.

By reason of the state-aid granted, and also by reason of the inherent nature of the railway business in its relation to the public, there has existed in Canada and the United States the feeling that the state must maintain some relationship of a regulatory character to railway companies. Evidence of this may be found in examination of early railway charters. For example, a railway charter granted by the state of Connecticut describes rates to be provided for carrying freight. Other railway charters reserved to the state the right to revise rates when the earnings of the corporation exceeded a specified return upon their capitalization.

It was not until after the consolidation of the smaller independent railways into large and consequently powerful corporations that popular agitation for more complete regulatory authority over the operations, especially rates or railway corporations, became acute, and regulation by the state was taken up in earnest.

One of the earliest and most extensive campaigns for railway regulation was conducted by a society called "The Patrons of Husbandry", well-known in later years as the "Grange".

The farmer, rightly or wrongly, especially in the periods of depression in the seventies and eighties, blamed the railways for his troubles, because he believed that the freight and passenger rates were manipulated by these companies without any regard for the rights of the farmer or for his welfare (and, in fairness, it must be admitted that the railway transportation industry has not been altogether free from the taint of unethical practices) which, coupled with the fact that its problems and economic practices are so intricate as not to be easily understood by the lay mind, has often resulted in the railways being blamed for conditions over which they have actually had no control whatever.

In the eighties, a great change took place in the economic structure of the United States. The export trade was expanding rapidly; the markets of the country as a whole and the areas of competition were expanding, and longhaul freight traffic on the railways was increasing in importance. These factors, as well as the ever increasing popular discontent with the existing railway practices and the dissatisfaction which existed in regard to the regulation of the railways by the individual states, emphasized the need of a centralized federal control. This found its expression in the Interstate Commerce Act, which was passed in 1887. This act provided for the creation of an Interstate Commerce Commission to hear complaints and also made provisions as to reasonable rates, tariff publications, rate discrimination, pooling, etc. Appeals from decisions of the commission could be taken to the federal courts. This act is noteworthy as the beginning of the federal control of railways in the United States, but fell far short of being a solution of the problem growing out of railroad rates and practices. This was partly due to evasions of the law, and partly through the effect of court decisions limiting more or less the authority of the commission.

Amendments to the Interstate Commerce Act for the purpose of strengthening the law and the power of the Interstate Commerce Commission were made by congress at various times, and culminated in 1920 by the passage of the Transportation Act, by which the regulatory authority of the commission has been extended to embrace nature of service, capitalization, rates, and — through a similar organization — compensation to employees: this is the situation as it exists to-day.

An interesting contrast may be seen in the legislative attitude towards railways, as evidenced in the Sherman Act and the Transportation Act of 1920, respectively: the one frowned upon the development of large railway systems and thereby hampered consolidations; the other looks to such consolidations as the solution of the present railway difficulties. This is really a remarkable change in the attitude towards railways, and marks the extent of public confidence in the Interstate Commerce Commission.

The policy of the Dominion of Canada, for the same economic reasons as obtained in the United States, has been to construct substantial portions of the railway mileage as public works and to liberally assist private enterprise in railway construction by means of land grants, loans, subsidies and guarantees of bond interest and principal of railway securities.

Regulation of railways in Canada was first undertaken by the provinces and was subject to substantially the same influences and development as took place in the United States. The question became rather acute in the early eighties by reason of the railway amalgamations which then took place, when the competitive influence, as a curb on excessive rates, was in a large part destroyed. Continued efforts were made to secure legislation regulating rates, and in 1888 authority to supervise rates was given to the Railway Committee of the Privy Council which was composed of designated members of the cabinet, presided over by the Minister of Railways and Canals. Complaints in regard to rates were to be heard by this committee, and provision was made for a uniform classification of rates: rebates, as well as other forms of discrimination were prohibited.

The question of the appointment of a special regulatory tribunal came up again in 1896, and finally an amendment to the Railway Act was passed in 1903, under which the Board of Railway Commissioners of Canada was constituted. This board was given jurisdiction over rates, railway facilities and service, but was given no jurisdiction over capitalization or compensation to employees. Under certain conditions the finding of the board may be appealed to the Supreme Court and the Governor-in-Council. This is the situation as it exists in the Dominion of Canada to-day.

The foregoing review of the relation existing between the state and the railways in the United States and Canada indicates that there has been a constant trend towards a closer and more exacting regulation of these transportation facilities by the state. The importance of the functions of the railways and their close and intimate effect upon the daily life of the individual, as well as their vital relationship to industry, justifies the intervention of the state and the enforcement of such regulations as are essential for the protection of the community.

On the other hand, public opinion in respect to the motor vehicle has not crystallized to such an extent as to find expression in state regulatory laws applicable to the common carrier motor vehicle on any basis at all comparable with those applicable to the steam and electric railways.

Generally speaking, it may be said that state regulations affecting motor vehicles are confined to traffic, taxation and license features, and to size and weight of vehicles. No consistent policy has yet been developed to provide for the bringing of the motor vehicle common carrier under laws which provide for nature of service, responsibility for loss and damage, adequacy of vehicle, safety requirements, filing of tariffs, rate regulation, accounting rules and the hundred and one things provided for and against in the laws applying to other common carriers.

There can be no doubt that the common carrier motor vehicle should be placed upon a basis of state regulation which is fair and just as well as comparable, insofar as conditions permit, with those applicable to steam and electric railways. If this is not done, it will be impossible to assign to each of these facilities their proper field.

Taxation

In the relationship which exists between the state and the common carrier motor vehicle operator there is another factor of considerable importance which enters into the economics of the delimitation of the spheres of activity of the steam, electric and motor transportation facilities, and it is one of taxation. Up to the present the highways have been constructed and are being maintained at public expense, whereas the motor vehicle, generally speaking, contributes to the public exchequer in the form of taxation, according to statistics compiled by the National Automobile Chamber of Commerce in 1924, only $471,500,000, or approximately $30.00 per motor vehicle per annum. Obviously it would be difficult for a steam or electric railway, having to pay from $4,000 to $7,000 per mile of road for taxation, interest and maintenance of way, to compete with motor vehicular transportation not subjected to such charges, and, in fairness to the existing facilities, the tax on common carrier motor vehicles should be on a basis which would contribute to the cost of construction and maintenance of highways an amount commensurate with the use made of such highways. Until this is done it will be impossible to strike a true economic balance between the various transportation facilities concerned.

The steam and electric railways have had to raise large sums of money for the purpose of establishing permanent way and terminals for the expeditious handling of the traffic. This permanent way has had to be adequately maintained. In consequence the transportation charges levied upon persons and commodities by steam and electric railways have had to be based, not only upon the direct cost of operation and maintenance of the vehicles used for transportation purposes, but also have had to include an amount to provide in addition for the maintenance and perpetuation of the permanent way required for the service; for interest upon a substantial portion of the capital invested in the purchase of right-of-way and terminals; and for the construction of the permanent way. To illustrate just what this amounts to, a few figures will be given regarding steam railways in Canada and the United States in 1923:

Item	*Canada*	*United States*
Miles of steam railway operated....	40,939.1	235,661.83
Gross revenue....................	$ 421,252,000	$5,761,316,000
Estimated investment in permanent way.........................	$1,637,564,000	$9,426,473,200
Investment per mile...............	40,000	40,000
Interest at 5 per cent..............	81,878,000	471,324,000
Interest per mile..................	2,000	2,000
Maintenance of way expense........	83,501,064	821,376,694
Maintenance of way per mile.......	2,040	2,485
Railway tax accruals...............	9,301,038	336,381,765
Tax accruals per mile..............	227.19	1,427.39

From the above it appears that in Canada and the United States out of every dollar earned by steam railways 41 cents and 28 cents respectively is required to meet cost of interest and maintenance of permanent way and taxes.

In the report of the United States Joint Commission of Agriculture Inquiry, October, 1921, the following recommendations appear:

"That the several states co-operate in effecting a uniform basis for taxing motor trucks and other motor vehicles which will fairly represent the reasonable proportion of the cost of highway construction and maintenance chargeable to such vehicles."

In conclusion, I might briefly refer to a portion of the resolutions — with which I heartily concur — passed by the conference called on January 10, 1924, by the Chamber of Commerce of the United States:

(4) "The best interests of the public and of all transportation agencies lie in co-operation, and the greatest opportunity for this co-operation is in the terminal areas."

(5) "Store-door delivery by motor truck is the greatest contribution which can be made to the solution of the terminal problem."

(6) "Organized motor transport can also relieve the railroads of various forms of uneconomical service, such as trap-car service, switching between local stations, and short-haul shipments. This will reduce yard congestion and release many cars for more profitable line haul."

(7) "To secure the fullest benefit from this organized motor transport will require the utilization and further development of modern mechanical equipment."

(8) "Outside of the terminal area it is to the public interest, as well as to the interest of the respective carriers, that the economic limitations of each type of carrier be recognized, that the railroads be permitted to discontinue unprofitable service to which the motor is better suited, and that the motor abandon its efforts to handle general traffic over uneconomic distances. Unprofitable steam railroad service can in some cases be successfully replaced by the use of self-propelled railroad motor cars."

(9) "Rail lines can often advantageously extend or supplement their service by motor bus and motor truck lines, and in states where this is now prohibited such restrictions should in the public interest be abolished."

(10) "To insure to the public reliability of service in all forms of motor transportation, sound financial organization, public regulation and continuous service are necessary."

(11) "The proper regulation of common-carrier operations of motor vehicles, including the rates, should be handled by the existing authorities which now control the operations of other public carriers. It is believed to be to the best interests of all concerned that proper regulations of traffic and of size, weight and speed of motor vehicles by states and municipalities should be made uniform."

Finally, I wish to impress upon you that this question of the motor transport and its relation to existing steam and electric lines is extremely important, and that a serious situation may be precipitated in the transportation field unless the whole matter is scientifically studied, and a definite policy of highway construction, regulation of service, and unification of control of transportation matters is determined upon.

Figure No. 1.—Latour Bridge over Montreal Aqueduct.

Improvement in Design and Appearance of Highway Bridges

A Plea for Greater Architectural Consideration in the Design of Bridges

C. J. Desbaillets, M.E.I.C.,
Chief Engineer, Montreal Water Board, Montreal, Que.

Paper read before the Montreal Branch of The Engineering Institute of Canada, March 12th, 1925.

In the early days when a human being had to cross a stream the only thing to do was to select a shallow track and follow it from one shore to the other. This way of crossing a river, however, was not always practicable and was useless during high water period. This method was applicable to relatively small streams and when larger rivers with swift currents were encountered the skill of the early men were put to a test, the bridge builders developed, and signs of their activities are still standing scattered over the whole globe, from the corbel arches of the Persians to the magnificent structures of to-day.

In the evolution of the bridge the material available played the main part in the design of the structure and in the wooded countries the longest span of continuous material could not exceed the length of the highest tree, in other words, the first wood bridges consisted of trunks supported by stools tied together and thus enabling the bridging of larger streams.

Where stones were available, bridges were made of masonry and, as no stones are found resembling a beam or a girder of reasonable length, the problem of assembling a number of stone blocks was solved by successive trials and it is interesting to see that these blocks were assembled along certain curves, and, that although the characteristic of curves, like the circle, the parabola, hyperbola and the ellipse were not at the time established by definite formulas, arches were found, the curvature of which followed almost exactly some of the curves mentioned above. In the ruins of Babylon a small arch was found to be an exact ellipse and it was established that this arch was built about 3,500 B.C.

This case shows that by practice and successive experiments the ancients were successful in building arches along certain curves, the formulas of which curves were only found thousands of years after.

It is due to the fact that the material available in these times lent itself better for architectural lines and ornamentation, and also that the ancients, not experiencing difficulties in obtaining cheap labour and plenty of it, have constructed beautiful masonry bridges both regarding the purity of lines and exquisiteness of ornamentation. Perhaps, but we must admit that the structures they made have, almost without exception, lines which are in perfect harmony with the surrounding scenery. In the cities of the southern part of Europe, for instance like Spain and Italy where the architecture and ornamentation of buildings is carried to an extreme degree of refinement, the bridges are also built along the same lines and are practically a link of continuity between the architecture on one side of the stream and that on the other.

In the countries where ornamentation is furnished by the nature itself in the way of trees, flowers, planes of different colours, shadows of ravines or gorges, the lines of the bridges are more severe and the dignity of their aspect seems to indicate that the builders inspired by the vastness and beauty of the creation wanted to make structures which, free of frivolous ornamentation, would be like an acknowledgement of their respect for the wonderful creations of God.

Are we attributing to the ancients too much ideal? I do not know. Was what we call ideal to-day, a common practice for them? As creators, they could not copy anything, they must have had this sense of beauty and the esthetic born in them. The question I am now asking myself is: "Has this sense of beauty degenerated since?"

Let us come back to modern times. The steel industry has developed sections of all sorts, adaptable specially to bridge construction; the cement companies are flourishing and reinforced concrete is in use; factories are covering thousands of acres, competition has set in,

Figure No. 2.—Crawford Bridge and Control Dam dividing Montreal Aqueduct into two sections.

Figure No. 3.—Church Street Bridge over Montreal Aqueduct.

tables have been worked out, bridges are ordered almost by style number.

The object of this paper is to deal with small bridges erected in larger quantities over small streams, brooks, ditches, etc., erected in such quantity that they have become standardized and that they are now listed according to the span and traffic requirements, bridges of which you can obtain a price by return mail and which can be shipped from the factory in so many days.

In erecting such bridges are we rendering justice to the landscape? Are we building structures which can be looked at with pride by the designer and by anybody having some sense of the esthetic?

The following sketches will illustrate the methods adopted at present and what could be done with various types of landscape encountered in this country:

The steel bridge has it proper place when located in a manufacturing district surrounded by other kind of steel structure. This is best illustrated in figure No. 8, in which it can be seen that an attempt to make ornamental structures would be a failure.

As a remedy to the situation let us adopt an economical span for a beam and slab bridge deck and once this span is determined and whether the bridge is composed of one or more of these spans, the following method of construction can be adopted.

If it is not possible or economical to build a temporary bridge during the period of construction it is evident that for the convenience of traffic the main bridge should be constructed in the minimum time. In this case the bridge deck can be made of steel beams easily assembled and a wooded flooring provided for. In this manner the superstructure can be delivered for traffic requirements in the minimum time by building temporary balustrades. The design of the bridge should be such that the side girders can be installed independently of the main deck and on these side girders can be erected the parapet, the sidewalks and whatever ornaments forming part of the structure. A wooden deck can be installed immediately so as to make use of the bridge and this deck can be replaced later by a concrete slab.

The method affording the possibility of erecting the main deck first, then the side girders and parapets can be applied to both steel and reinforced concrete bridges and is recommended in view of obtaining the practicable object of the bridge, namely; the use of same to the traffic in a relatively short time and to allow for the building of the final parapet and side walls more time necessitated by

Figure No. 4.—The Asylum Bridge over Montreal Aqueduct.

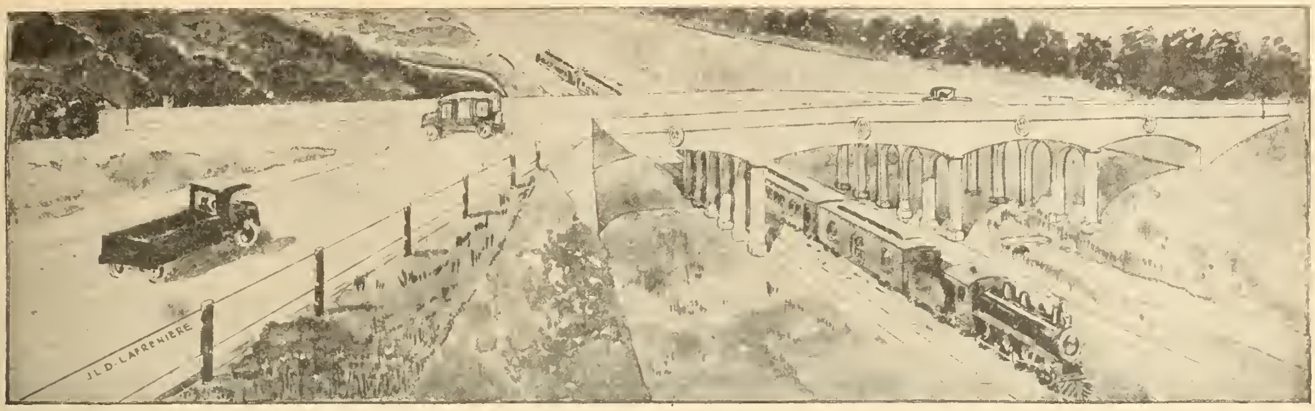

Figure No. 5.—Viaduct over C.P.R. Track at Sherbrooke Street, Montreal.

the more complicated forms or slower erection of ornamental features.

The remedy to improve the appearance of the bridge is to have the side walls, parapet, etc., designed if possible by an architect. It is evident that these side walls and parapets are the *only parts of the bridge* that can influence its final appearance, and by using the side girders to support the side walls these walls can be designed to look like an arch, although in reality they are only suspended and consequently a bridge can appear as an arched structure without involving the cost and difficulties attached to that kind of construction. Also, this method allows the building of arched bridges and appearance on ground where concrete arches would not be economically constructed. The above described method can be used on steel or reinforced concrete bridges.

Another method consists of making the main deck of the bridge of structural steel beams or plate girders covered with the concrete slab, and design the side girders also of steel to support a concrete side wall and

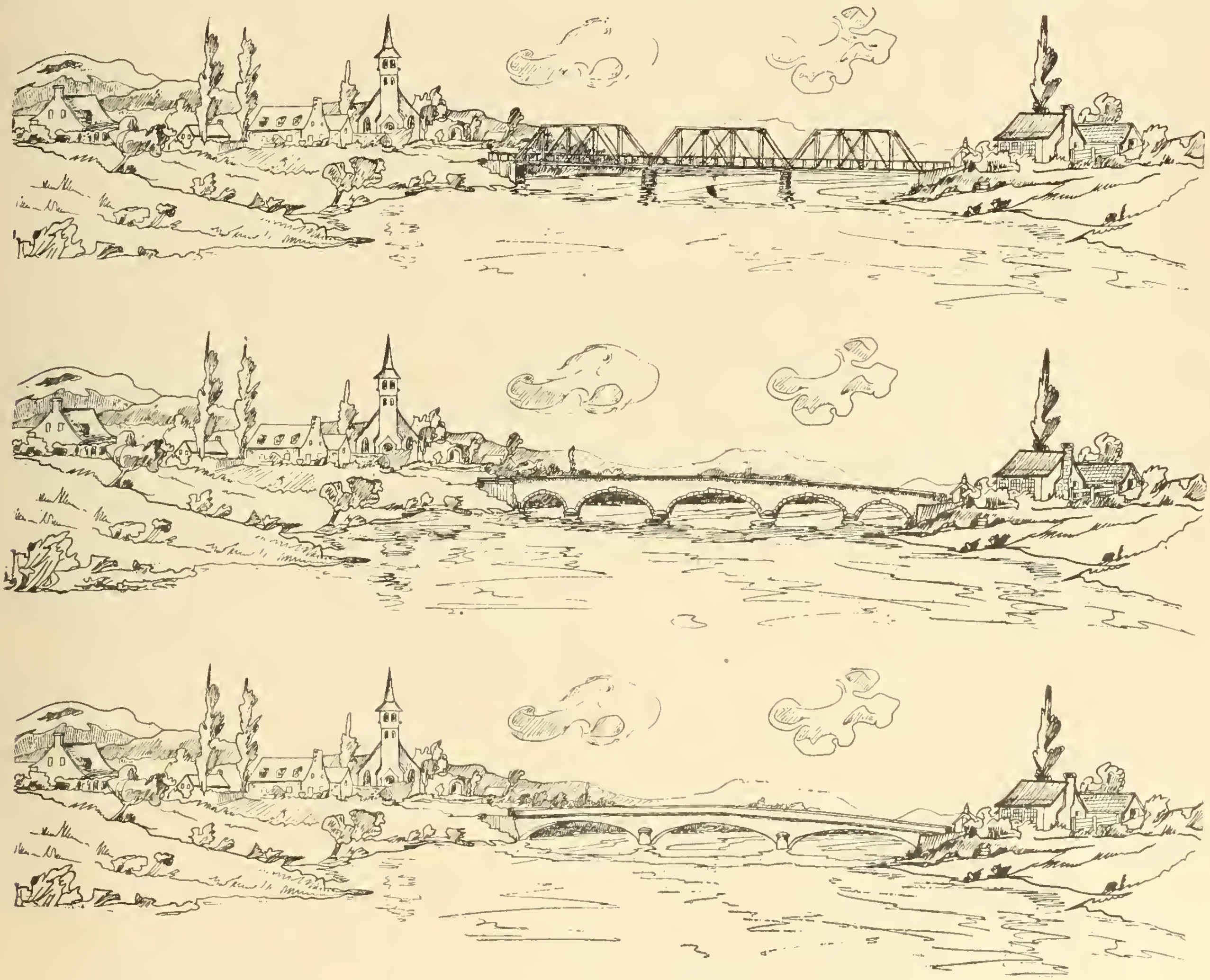

Figure No. 6.—Concrete Bridge Designs compared with ordinary Steel Truss Bridge.

Figure No. 7.—Concrete Bridge Designs compared with ordinary Steel Bridge in Mountainous Country.

concrete parapet. This kind of bridge, I suppose, will be looked upon favourably by both the structural steel company and the cement company, and I hope that in future we will more often adopt this combined method of structural steel and concrete and develop in its details the side girders equipped with devices facilitating the erection or suspension of side walls and ornaments.

By a carefully selected proportion of structural steel and concrete I believe bridges can be constructed economically and rapidly without sacrificing the architectural part of same. To the above described method we can apply the use of hollow concrete beams and precast girders as well.

The use of structural steel reinforcement is not only beneficial for bridge construction. It will be too long to enumerate the advantages of using structural steel for reinforcement, but I will say that in a large number of cases it has resulted in cutting down the expense of supporting the form work and in combining the structural steel with the reinforced steel it offers a very good means of supporting and anchoring the bars.

The spacing of the steel in the forms and the maintaining of same in pouring the concrete is also greatly facilitated and as the safety of reinforced concrete structure depends largely on the position of reinforcement, you will recognize the advantages of introducing structural steel sections as reinforcement for concrete work.

The accompanying photographs illustrate bridges designed and built by the Montreal Water Board along the suggestions mentioned in this paper and these show that in each of these bridges special care is being paid to the appearance of side girders.

As an example of the last suggestion made for the building of steel bridges encased in concrete, the photograph, figure No. 5, is shown representing the Sherbrooke Street viaduct built by the city of Montreal over the C.P.R. tracks at the east end of the city.

In conclusion and referring back to the highway bridges we can only congratulate the provincial government who initiated the bridge design competition for the building of the Montmorency Falls structure. I sincerely hope that this proceeding will be followed by other municipalities and it will certainly result, first, in improving the appearance of highway bridge and, second, in stimulating the artistic temperament of our engineers and architects and remove in time from the engineers this cold-blooded habit of selecting in their design as the shortest route the straight line between two points.

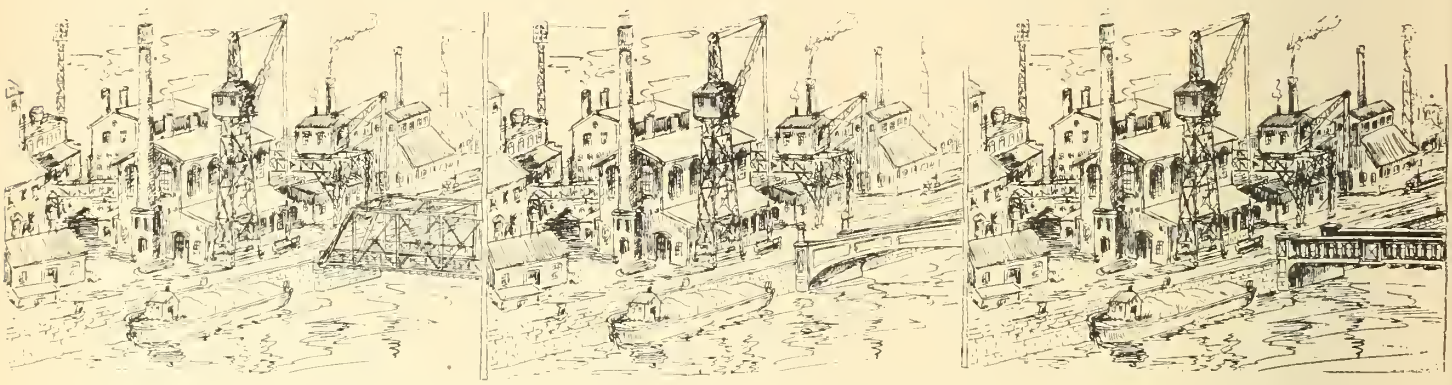

Figure No. 8.—Comparison of Designs showing Appropriateness of Steel Bridge in Industrial District.

The New Niagara Arch Bridge

Details of design and construction of the new bridge over the Niagara River for the Michigan Central Railroad Company.

H. Ibsen,
Bridge Engineer, The Michigan Central Railroad Company.

Paper read before The Toronto Branch, The Engineering Institute of Canada, February 19th, 1925

(Continued from the April issue.)

All of the bracing in the bridge are stiff members made of four angles with angle lacing.

The total weight of the arch span is 6,150 tons, including the floor which weighs 1,350 tons. The approach spans weighs 785 tons, the backstays 800 tons, and the street bridges 342 tons, making the total weight 8,077 tons.

The backstays which supported the cantilevered halves of the arch during erection, were connected to the end top chord joint with a 15-inch pin and run from there in a straight line, on an inclination of one vertical to two horizontal into tunnels in the rock bluffs at the top of the gorge.

The tunnels terminate in anchor chambers in which are placed 6 anchor girders 5 feet 6 inches deep and 17 feet long, with eight transverse I-beams 20 inches deep and 12 feet long on top.

The backstay links are pinned to the anchor girders with 15-inch pins. These links running to the mouth of the tunnels are made of nine plates 44 inches deep and ⅝-inch thick. The eye-bar links, which were the continuation of the backstays outside the tunnel, were connected to the tunnel links and top chords on hinge pins.

The backstay outside the tunnel consisted of four links each of six eye-bars, 16 inches wide by 1⅞-inch thick, joined by 16-inch pins. The second set of eye-bars from the top and the bottom connected to two sets of sliding plates 60 inches wide by 4 inches thick and 21 feet long provided to permit the necessary movement during the closing operation of the arch. Between these sliding plates the jacks used for the closing movement were supported on special pins. The details of the arrangement will be referred to later on.

Rivet holes in all parts of the structure, except that in material less than ⅝-inch thick for bracing and in batten plates and lacing, which were punched full size, were punched and reamed or drilled and reamed or drilled full size after assembling. Rivets in the bottom chord of the arch span are 1-inch diameter for shop rivets and 1¼-inch for field rivets. In the top chord and web members rivets are all 1-inch diameter, in the faces in the plane of the truss, and ⅞-inch in the transverse face. The rivets in the bracing are ⅞-inch throughout. In the approach girders they are 1-inch diameter, and in the floor of the arch and the street spans they are ⅞-inch except in I-beam stringers and floor plates where they are ¾-inch. Rivets with grip exceeding five diameters for shop rivets and four diameters for field rivets are tapered rivets.

The trusses of the arch span were assembled in the yard of the bridge company and the connections were drilled to the required dimensions while so assembled. Connections for bracing which could not be drilled or reamed while assembled were reamed to an iron template.

Paint

For the priming coat red lead was used. For the field surfaces in rivetted contact Hippo oil was used.

Drawings

Complete detail drawings of all the bridges in the project, including the arch span, were made and sent out with the invitation to bidders. These simplified greatly the making of the shop drawings, which were practically an enlarged copy of the drawings furnished by the railroad and much time was thereby saved.

The contract for the fabrication and erection of the superstructures of all bridges included in the project was awarded to the American Bridge Company, July 7th, 1922. The contract prices for the arch span, not including the floor, was $81.00 a ton f.o.b. cars at their shop and for erection $44.00 per ton, for the floor $63.80 a ton f.o.b. their shop and for erection $25.00 a ton. For the backstay material $73.00 a ton f.o.b. their shop. The cost of the erection, and of the removal of the backstay outside the tunnel, is included in the erection cost of the arch span and for the material removed a refund of $15.00 a ton for scrap was paid to the railroad. The cost of the approach spans f.o.b. cars at their shops was $59.00 a ton and the cost of erection $19.80 a ton.

On account of complications arising in procuring the necessary right-of-way, it was not considered advisable to start ordering the steel for the bridges before June 1923. In the mean time surveys for the location of the foundation work and anchorage tunnels for the erection of the arch were undertaken. This work called for an unusual degree of precision and was made very difficult and laborious by the topography of the bridge site. The results obtained speaks well for the men who did the work. The result of the triangulation was checked by direct measurements across the gorge to within ⅛ of an inch.

Substructure

The contracts for the substructure were awarded on May 9th, 1923. The work on the American side was awarded to the Gass, Thurston Company of Detroit, and that on the Canadian side to the Federal Construction Company of Toronto. For various reasons a cost plus sliding profit contract form was chosen. The railroad furnished the material.

The contractors started operations very promptly and by the end of June they had the preliminary work well under way. Most of the work had to be done on the steep slopes and vertical bluffs of the gorge, which were formidable obstacles to rapid prosecution of the work in spite of the vigorous efforts of the contractors. The site naturally afforded very little space for storing materials and this was made worse by the fact that all of the needed right-of-way was not acquired before the work was well advanced. This made it necessary to provide a storage yard at a considerable distance from the bridge site and truck the material from there as the work proceeded.

The excavation for the arch piers made it necessary to strip the talus slope from the rock down to a vertical distance of 154 feet below the top of the bluff for a width of 50 feet or more, each side of the center line, in addition to cutting back into the rock. A large amount of the material in the slope was rocks, fallen from the bluff above, which were of such dimensions that they classified as solid rock and had to be broken up by explosives for removal. In addition to this a very large amount of rock had to be stripped from the bluff where the top layer overhung the bluff below as much as 20 feet. After removing the overhang, fissures were disclosed in the remaining rock on the American side, which necessitated removing same from about 30 feet back of the face of the cliff, making it necessary to increase the span of the approach girders on this side from 100 feet, as originally designed, to 125 feet.

When the tunnels were driven there were three fissures found in the rock between 34 and 46 feet in from the backstay pin at the outer end of the tunnel, on the American side. On this account the tunnels here were carried to a depth of 105 feet, which left enough material in front of the anchor girders, to make the anchorage safe without depending on the strength of the rock. On the Canadian side no cracks or fissures were found, until within a few feet of the depth to which it had been decided to drive the tunnel, and as the strength of the sound rock in front of this point was far above the strength required, the tunnel was not extended further. The distance back from the backstay pin at the outer end was on this side 82 feet. The excavation for the arch piers and the driving and preparing of the anchor tunnels was by far the slowest and most expensive part of the foundation. The total amount of excavation of all kinds was 34,200 cubic yards, of which 21,000 yards were on the American side; 9,500 yards was rock and about 7,000 yards boulders, exceeding one cubic yard. The tunnel excavations amounted to 1,670 cubic yards, about evenly divided on the two sides. There was about 4,100 yards excavation for the street bridges. All of the masonry rests on rock. On the Canadian side the excavation was all done by hand while on the American side a caterpillar steam shovel was used to advantage. The disposal of the waste material was a simple matter as it was all dropped into the river, through chutes placed on the slope. On the American side these chutes extended over the protection shed for the Gorge road.

The anchor tunnels are 7 feet wide and 6 feet 6 inches high. The tunnel mouths are located about 25 feet below the top of the bluff and run from there downwards, on a one vertical to two horizontal slope, ending in an anchor chamber 20 feet by 20 feet by 18 feet approximately. The driving of the tunnels had to be done without damaging the surrounding rock and for this reason holes were drilled close together on the outer lines of the cross-section and the rock inside the holes blasted out with small charges of dynamite.

The work was slowed up after getting into the rock about 40 feet, by water entering the tunnels, through fissures in the rock, at the rate of about 40 gallons a minute. This made it necessary to keep pumps and a steam syphon in constant operation while the work was progressing. The fumes from the explosives also slowed up the work, as it would take nearly an hour before the tunnels were sufficiently cleared of fumes, by the use of compressed air, for the men to return to work.

To be able to concrete the anchor chamber in the dry after the anchor steel was placed it was necessary to tap the rock with pipes leading to a sump in the bottom and then grout all the water bearing seams in the rock. The steam syphons draining the sumps were concreted when the tunnels were filled and the pipes on the American side are still discharging water, showing that there is considerable pressure. The anchorage steel was placed and the anchor chambers and tunnel concreted during March 1924. It was essential that the anchor chamber should be entirely filled with concrete, and to be sure of this, vent-pipes with their mouths located at the highest point of the roof, and pipes for forcing grout into the chambers were set in the chambers and their ends were run up the tunnel. The chamber was then packed with concrete to within a couple of inches of the roof, with a bulkhead at the tunnel entrance. When the concrete had set the grout was forced in through the concrete pipes, under air pressure, until it started to run out of the vent pipes in the tunnel and at the same time the tunnels were filled to within 6 feet of the backstay pin at the outer end of the tunnel.

Arch Piers

The arch piers, built halfway down the slope of the gorge contain altogether 5,700 cubic yards of concrete. The south pier on the American side, which is the largest, contains 2,160 cubic yards and the north pier on the Canadian side, which is the smallest, contains 760 cubic yards. Each of the piers was poured in a continuous run, working day and night. Reinforcing was used only under the coping, in the footing, and on the four faces of the pier, where enough reinforcing was used to prevent cracks from shrinkage and temperature changes. On the two south piers the top front face of the pier, which is in a vertical line with the center of the hinge pin, overhangs the toe of the pier 8 feet 6 inches. If this had not been done, it would have been necessary to make the span seventeen feet longer, as the rock dropped off vertical for about 50 feet. The center of gravity of the piers is well back of the toe and with the arch in place the line of pressure strikes the footing of the pier about the center between the toe and the top edge, so that there can be no trouble from the overhang. The pouring of the concrete for the last arch pier was completed November 2nd, and on November 21st, 1923, the McMullen Company of New York, who had the contract for furnishing, setting and dressing the granite copings for the arch piers, started setting the stones. The granite copings are 2 feet 6 inches thick and 18 feet by 19 feet 6 inches in outside dimensions. The stone was quarried in Maine and was dressed to size with the faces 6 cut, and the anchor bolt holes drilled, at the contractor's yard in New Jersey. They were set ¼ inch high, to allow for dressing to correct elevation, on the piers, with ¼ inch joints and ½ inch bed. On account of the inclination of the scew backs, it was not practicable to bed the stone on mortar. One row of stone was therefore set across the pier, at a time, to correct height on lead wedges. The joints were then caulked on the outside and run full of mortar, as stiff as could be used to advantage, and worked with long flat iron bars until the mortar overran at the top. The alignment and elevation of the four copings had to be practically perfect both individually and with reference to each other, as the only adjustment provided between the copings and the planed bottoms of the base castings was 1/16-inch thickness of sheet lead, which was placed there to fill the small variations in the stone left by the tools. The final finish of the top surface of the copings was to be 10 cut.

The refinement in finish of the copings called for special means for checking and adjusting the setting and cutting the stone, and for this purpose heavy wooden uprights were bolted on each side of the pier to the main body of same, and planed steel straight edges were bolted to these uprights to the exact alignment and ¼ inch higher than the top line of the coping. By the use of these straight edges and stretching fine piano wire from one to the other, a very close control of the work was maintained. The elevations of the straight edges were checked regularly and along side of these stairways were erected, to give easy access to the work. The time taken for this work, was three times that estimated by the contractor, so it was not finished before February 18th, 1924. Part of the extra time was due to inclement weather and some to difficulty in fitting the anchor bolt holes to the bolts set in the concrete, but the principal cause was that it was not practicable to use more than a certain number of men on each pier, either in setting or cutting. However, the work done was as good as it is practically possible to do it. The aggregate used for the concrete in the piers was gravel taken from the Niagara river and furnished by the Empire Gravel and Supply Company of Niagara Falls, New York. This material makes very good concrete, but as they do not separate it into fine and coarse aggregate and the grading of it is not always uniform and often it has too high a percentage of sand, frequent sieve tests had to be made and coarse or fine aggregate added or more cement used. The conditions that had to be met in this work made it desirable however to use this material as we could get it trucked direct to the work as it was required.

The concrete was mixed in the proportion of one cement to five gravel and was held to a slump test of not to exceed 3 inches. The piers on top of the bluff, except for the high footing under the Canadian pier and the abutments for the street bridges are ordinary mass concrete construction.

The footing under the Canadian bluff pier is 58 feet high and varies in thickness as it fits the rock surfaces. It is heavily reinforced and is anchored to the rock by numerous anchor rods, set in the rock. The Cataract Avenue bridge and the Front Street bridge on the Canadian side are plate girder spans embedded in concrete and supported on steel bents, which on the Front Street bridge are encased in concrete. The approach on top of the bluff on the American side is a reinforced concrete trestle of nine spans 25 feet long and one plate girder span 64 feet long over Whirlpool street, Niagara Falls. The total amount of concrete in the work is 13,000 cubic yards.

The castings and forgings, which generally are very slow in coming out of the shop, were ordered in March and April 1923, by the American Bridge Company. The castings from Mesta Machine Company and the pin forgings from the Midvale Steel Company. The forgings were sent to Mesta Machine Company to be finished and assembled with the castings. The total weight of the four sets of castings with hinge pins is 386 tons.

The railroad inspectors followed each step in the manufacture of the members through the shop, and examined all pieces for defects as well as testing the rivets. Before the main members were rivetted, they were examined to see that they were level, square and out of wind. Where any defects were found after members were rivetted, they were cut apart and the defect rectified. Particular attention was given to the shop painting, which there is often a tendency to neglect in the shop.

Erection

The place nearest the bridge site where a suitable storage yard for the steel could be located was a large level lot owned by the New York Central Railroad about ⅓ mile east of their Suspension Bridge station. This was close to their tracks, so that a track from the yard could be easily connected up to the storage yard. This ground was rented and two tracks built, the full length of the lot, and connected with the N.Y.C. tracks. This made a very good place for handling and storing material the only objection being, that all material had to be transported over the busy yard tracks to reach the bridge, which sometimes caused delay, but after operating for a while means were found to overcome most of this. On September 25th, 1923, the American Bridge Company's foreman, who was to have charge of the erection work together with the bridge company's field engineer and some of their regular men arrived as well as some of their erection plant, and as soon as the steel for the street bridges arrived, they were erected and the concrete work in connection with them finished so that they could be operated over during the erection of the river spans.

Erection of New Niagara Arch Bridge.

The steel for the anchor chambers having arrived, work was started on January 5th, 1924, on placing the anchors on the American side. To do this a couple of track rails were laid on the floor of the tunnel. The derrick standing at the end of the bluff pier then lowered the girders and placed them on shoes set on the rail on which they were slid down to the chamber, their movement being regulated by a cable attached to the girders and leading to the drum on the derrick. When the girders reached the chamber they were set on the concrete pedestals prepared for them. The girders in the other chambers were set in the same way. As soon as the anchor girders and the I-beams, that set on top of the girders, had been bolted and adjusted, the tunnel links of the backstays were put in place, connected to the anchor girders and carefully lined up. These links were placed in the tunnels in the same manner in which the girders were handled, but on account of their length and weight they were more difficult to handle, particularly those on the Canadian side which were in one length about 75 feet overall and weighed 50 tons and besides this had to have the first set of eye-bar links attached, as the pin connecting them to the tunnel links, came inside the tunnel where there was no room to drive the pin. They were placed, without mishap, by the middle of March, and the tunnels were all filled with concrete by the end of March. In the meantime the equipment for the erection of the main span had arrived and put in condition in the storage yard and considerable material for the first three panels of the arch span had arrived, including the second vertical bent in the Canadian half of the arch span, which was to be used as temporary falsework bent for erecting the approach girder spans. Originally the intention had been to erect the skew-back castings, the end bent of the arch and the girder spans without the falsework bent, but when it became necessary to use a 125-foot span for the American approach, this was out of the question, as the weight of the girders and the long reach made it unsafe. The second bent of the arch was therefore used for this, lengthening it about 20 feet with a temporary piece on the bottom. This bent was then first erected on the American side, on top of the arch piers and 83 feet out from the pier on the bluff, with the top of the bent held to the bluff pier with two boom struts. As soon as this bent had been raised and slid out to its place, cross-girders made up of two longitudinal floor girders from the arch span were set on top of same. An I-beam grillage with a wooden bent was set on top of these girders, for a temporary support, in the first operation of the derricks, in moving out of the approach girders. Wooden bents were also placed on the bridge seat of the bluff pier so as to move the derricks out as far as possible.

Erecting 125-foot Girders

As the 125-foot approach girders each weighed 84 tons and the maximum reach in setting them was 65 feet, both derricks, that had been rigged up for the erection of the arch span, had to be used. One of the derricks was placed with the front wheels resting over the temporary wooden bents on the bluff pier on one of the tracks and anchored down there and the girder, loaded on trucks, with the front end overhanging the front truck, was moved out on the other track until the end of the girder overhung the bluff pier, far enough for the derrick to get a temporary hitch on the outer end; the other derrick which was behind, and on the same track as the girder, taking hold of the rear end. The girder was then lifted off the trucks and swung over between the two tracks, moved forward a little and set down on blocking. The trucks were then removed and the outer derrick taking hold of the front shackle hitch and the rear derrick of back hitch, the girder was moved clear, the blocking removed and by lowering the boom of the forward derrick and having the rear derrick moved forward in unison, the outer end of the girder was brought to rest on the wooden bent on top of the temporary erection bent and the rear end blocked back of the bluff pier. The back hitch was then released and the rear derrick moved up to same position as the front derrick on the opposite track and anchored there. The main falls of both derricks were then hitched to a balancing beam shackled to the main center hitch on the girder. Then, both derricks, working together, alternately lifting on the falls and lowering on the booms gradually brought the girder forward until its front end was in its correct position longitudinally after which it was swung over and lowered in place on the temporary bent, the rear end resting on the coping of the bluff pier near the center line of same. The next girder was lowered in the same manner after which the wooden bent on one-half of the bluff pier was removed, the girders slid over in place, bracing put in and the floor put on. For the two girders of the other track, with their floor and bracing the operation was repeated.

Arch Erection

The derrick, to be used on the American side, was then moved out on the approach span until the front wheel was over the temporary bent, where it was anchored down and they were ready to start the erection of the American half of the arch span. The first piece erected was the skew back casting, for the south truss, weighing about 53 tons. Next, the hinge castings and hinge pin were placed, the upper and lower hinge castings being connected by temporary plates bolted to the back ribs of these castings, to temporarily hold the top casting from revolving.

The vertical end bent was the next move in the erection. This member is the only web member that is spliced, as it was too long to handle in one piece. These posts were erected leaning 10 inches backward at the top, so as to allow the necessary clearance at the center of the span, for placing the last bottom chord members, and were held in this position by a temporary strut fastened to the post about 50 feet from the bottom of same and attached to shoes anchored to the top of the arch piers. Rivetted into the top of the end bent is a transverse box girder 10 feet deep weighing 27 tons to which are fastened shoes supporting the approach girders. The approach span moves with the arch span, being supported on rollers on the bluff pier. As soon as the bent with the bracing and transverse girder was in place, the approach span was lowered on the bent and the shore ends of the girders were temporarily attached to the back wall of the pier with rods and blocking. The falsework bent was then taken out and shipped to the Canadian side to be erected there. The boom struts were removed and the backstays were erected on the American side, pinned to the end top chord point and supported with rods from the approach span, and the rods at the shore end of the girders slacked off and they were ready to set the first panel of the arch. This was on June 26th, two and one-half months after starting the erection on the American side. On June 17th, they started on the Canadian side the same process of erection, as just described for the American side and they finished up to the same point on August 2nd, or in 1½ months against 2½ months for the American side. One reason for cutting down the time so much on the Canadian side was that the approach girders were so much shorter and lighter, so that one derrick could handle them and part of the falsework bent could be moved across and set up connected. Besides this they profited by the experience gained on the American side and they were favoured as much as possible, as it was desirable that they should catch up with the American side by the time the center of the span was reached. In the meantime the arch erection had gone forward on the American side so that by August 2nd, one and one-half panels of the truss were erected and the floor was laid on the first panel.

In general the erection proceeded in the following manner. With the derrick car standing at the end of the last floor panel erected on that side on which a bottom chord was to be erected and anchored down to that side, the bottom chord loaded on two trucks and overhanging the front truck, was run forward as far as it would go on the opposite track. The derrick then took hold of the outer end with the secondary falls and of the main hitch at the center of gravity of the chord with the main falls. Lifting the member clear of the forward truck with the secondary falls it pulled the second truck, with the rear end of the chord forward, as far as it could move. The main falls was then vertically above the main hitch and picking up the entire load, at the same time releasing the secondary falls, the boom was swung around until the load hung in front of the derrick, so that the anchor arm of the derrick could be swung across to the other truss and connected to the anchor rod, after which the chord was swung to position and lowered and entered. The splice plates overhung the joint from 6 to 7 feet, and that in connection with the batter of the truss made the entering of the chord somewhat difficult, so that at times it would take 3 to 4 hours to bring the chord to bearing. After the chord was in place every rivet hole in the joint was filled, using 50 per cent traffic pins and 50 per cent of bolts. None of the bottom chord splices were rivetted before the arch was connected up and self supporting. The chord was left cantilevered until the diagonal connecting to it was placed, except for the first section which was supported by temporary rods attached to the top gusset plate. After the diagonal was connected top and bottom, the derrick was shifted to the other track and went through the same operation for the other truss, and then all of the bottom lateral bracing in the panel, the vertical post and top chord in the same truss were erected and the diagonal sway brace connecting to the end of the top chord. The derrick was then moved to the other track again and set the vertical post and top chord in that truss and the other sway brace and the top lateral bracing in the panel, after which the floor was set, tracks laid on same and the derrick moved out on the panel just completed and repeated the work for the next panel.

Whenever the derrick was moved to a new place it was always anchored before making a lift. Special structural attachments were provided at each panel point for connecting to the swinging arms rigged on the derricks for this purpose. Until the sixth panel was erected the longitudinal anchorage was provided by cables running from the A-frame of the derrick to a tender back of the same, but to relieve the weight on the anchorage the tender was detached from there on and the derrick anchored direct to the floor with an attachment that had been provided for the purpose.

By August 20th, the first three panels of the arch on the American side had been erected and by September 8th the same point was reached on the Canadian side. This was by far the largest part of the erection work, taking four and one-half months on the American half and two and three-quarter months on the Canadian side, on account of the time consumed by erecting the approach span and the backstay and also by reason of the length and weight of the members and the additional bracing in these panels. From here, until the center bottom chords were erected ready for closing the arch, only took about five weeks on the American half and a little over four weeks on the Canadian side. During the erection strain gage readings were taken on the backstay bars and the average stresses from these checked very closely with the computed stresses. Frequent observations were taken of alignment and elevations as the erection proceeded and these disclosed a tendency of the American half to deflect north and the Canadian half to deflect south. As this, without doubt, was due to the fact that in the first four panels they started the erection on the American side of the south truss first and on the Canadian side started the north first, the operation was reversed for the remaining panels. This checked the movement to some extent but was not enough to overcome it altogether, so that when the center was reached the American truss was 2¼ inches north of the Canadian truss at that point. This was, however, very easily taken care of during the closing of the arch. When the last bottom chords were set on the Canadian side there was nearly 12 inches between that and the American half with temperature a little below normal. The computed distance was 11 21-32 inches under normal temperature so that the actual and computed distance checked up very closely. The bottom bracing was put in the last panel on the Canadian half but was left out on the American half until the arch had been closed.

View during erection of Niagara Arch Bridge.

Closing Operations

The closing of the gap between the ends of the completed half arches was accomplished by means of four hydraulic jacks, one for each backstay. The capacity of each of these jacks was 3,000 tons and they had been tested in the storage yard at the bridge site to 2,500 tons, which was about 25 per cent more than the load they had to take care of.

The jack was located at the center of each backstay between two pairs of sliding plates, of which one pair was in fixed connection with the anchorage, by way of the lower half of the backstay and the other pair of plates was connected to the end of the top chord by way of the upper half of the backstay. Two pins, specially designed to bear on the plunger end and the base of the jack, transferred the stress from the jack to the plates. The upper of these pins was fixed to the plates attached to the anchorage and was sliding in slotted holes in the plates attached to the end of the top chord. The sliding condition for the lower jacking pin was the reverse.

At the time the backstay was erected the slotted holes in one pair of sliding plates were filled out to pin bearing with ½-inch shims, there being twenty-eight shims in each plate, so that the jacking pin at this point transferred the backstay stress directly to the other sliding plate until the jack was put into operation. The jack became then a strut between the two jacking pins and first moved them sufficiently apart to release the bearing on the shims, which were then removed one by one while the plunger was retracted upward with the upper sliding plates, the lower pin and the shims, so that at no time was there more than a gap of ⅝ inch between the fixed plate and the shims.

The pumping engine for operating the four jacks, the boiler for furnishing steam to the pump, and the control levers and water connections to the four pipe lines leading to the jacks had been rigged up on a flat car and was moved out to panel point T7 on the American side on October 6th, and connections were made to the high pressure pipes leading to the jacks on the American side. The connection to the pipes leading to the jacks on the Canadian side was made on October 9th. These pipes had an outside diameter of one inch and an inside diameter of ¼ inch. The pump, which was specially designed for this job, is a double acting, steam driven pump with four pistons, one for each of the four pipe lines leading to the jacks. Each of these pipe lines was fitted with a mercury gage on the connection to the pump registering the pressure on each jack and the control was so arranged that the jacks could be operated simultaneously or each separately as required. There was telephonic connection between the engineer having charge of the removal of the shims, from the outer sliding plates in the backstays, at each end of the bridge and the engineer in charge of the control of the pump at the center of the bridge. The engineer at the center of the bridge also had a full view of the ends of each half span, so that he was in direct control of all the operations. There were provided two valves at each jack, one designed to act instantaneously and the other a safety valve with a 1/32-inch opening designed to release the pressure gradually. This was later found too slow of operation and, after having used it in testing out the piping and connections, it was removed for the final closing operation.

The operating pressure was a little above 3,000 pounds per square inch. The diameter of the jack plunger was 39 inches giving a total jack pressure of 3,600,000 pounds, equal to the pull in the backstay after the derrick car had been moved off the bridge.

The machinery for operating the jacks was tested and the two halves moved together a small amount on October 9th. The following morning they started lowering the arch and by 11:30 a.m. there was only one inch between the center pin and the pin hole. The operation was stopped and the trusses lined up with little effort, by the use of a small jack. After that the splice plates across the center were put in and on account of the difficulty in entering these the work was not finished until late at night, these plates were bolted to the Canadian side only. There was some more work to be done the next morning so that the final closing of the arch was not started before 5 o'clock and by 5:10 p.m. the arch was closed and the backstays slacked off. While the closing operation took considerable time the whole operation was very satisfactory and the movements and deflections followed the calculated movements very closely.

Erection of the center posts and the two center panels of the top chord of the arch truss and the lateral and sway bracing was then started and by October 15th, everything was in readiness for changing the condition of the arch from three hinged to two hinged. For this purpose a screw 7 inches in diameter by 6 feet long, provided with two nuts at each end, bearing on diaphragms rivetted to the top chords, each side of the center joint had been put in. The closing temperature desired was 60 degrees and as we were lucky enough to have this temperature at 4:00 o'clock p.m. on October 15th, we had only to screw the nuts up tight against the diaphragms and start drilling the rivet holes which had been left blank, in the top chord and in the gusset plate connection to the center post for this purpose, on one side of the center joint.

The field rivetting of the top chord, web members and the floor had been carried on with the erection work as far as possible. There were still a considerable number of rivets to drive on the floor and it was November 1st before the floor was completed so that waterproofing on same could be started. The waterproofing material was two layers saturated cotton and one layer asbestos felt, with a filler coat of sand mastic on the bottom and protection coat of asphalt mastic on top. The contract for this was awarded to the Johns-Manville Company, Inc., and it was hoped to have the work finished shortly after the middle of the month but inclement weather and other causes prevented this, so that the work was not completed before December 8th.

As soon as the waterproofing was completed stone ballast and the permanent tracks were put in and the precast concrete slabs for the 3-foot sidewalk on each side of the bridge were placed. After the steel was erected, there was still a large number of field rivets to drive, particularly in the bottom chord and the bracing. Altogether there were 182,500 field rivets to drive on the job and of these 37,000 were 1¼-inch tapered rivets, with a grip of from 5 to 7 inches. The balance of the rivets were ⅞- and 1-inch rivets. It was found that for the 1¼-inch rivets the ordinary number nine riveting hammer did not produce satisfactory results and for most of these a number eleven hammer was used. All of these rivets were driven with a hammer on each end. Besides rivets that tested loose, at intervals rivets testing tight, were cut out and calipered to find out to what extent they filled the rivet hole.

The observations which have been taken of the deflection of the bridge under heavy live load have checked up very well with the computed deflections, considering the difficulty of determining the correct temperature of the steel in the different parts of the structure. The measured deflection at the center with two tracks loaded was 3/16 inch less than the computed deflection. The temperature deflection which is by far the largest deflection item is plus and minus 4.9 inches, a variation of 9.8 inches for the assumed temperature variation of plus, minus 70 degrees Fahrenheit. The live load deflection is at the center 2.5 inches and at the quarter point 2.8 inches.

The American Bridge Company is to be commended for its care and efficiency in the execution of this work. The speakers' assistants have contributed greatly to the success of the undertaking by their loyalty and excellent work. Mr. C. L. Christensen, assistant bridge engineer, had charge of the development of the design, and Mr. J. H. Curtin, resident engineer, had charge of the construction work. The project was under the general direction of Mr. J. F. Deimling, chief engineer of the Michigan Central Railroad and the late Mr. Olaf Hoff, consulting engineer, acted as advisory engineer.

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THE

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A Conception of the Profession

Speaking at the annual banquet of the Peterborough Branch, Mr. F. H. Dobbin, who is associated with *The Institute* in the fact that he is the father of Mr. Ross Dobbin, M.E.I.C., who has always taken such an active part in *Institute* affairs, reviewed the work of the profession in terms that are of interest to all members. This occasion is one of the important functions of the year in Peterborough, and is looked forward to by many of the profession from outside of the city. In part Mr. Dobbin says:—

I am not, Mr. Chairman, of your profession or your cult but happen, as one might say, to live next door to an engineer. In fact our sleeping rooms adjoin. By browsing amongst the many periodicals and technical publications that come into the house I have been able to gain some conception of your duties as a profession and of your responsibilities. The spirit moves me to make a brief word or two of appreciation.

We accept the statement as true in fact that all we have of history is but a record of the movements of men. Either as individuals, in groups or in mass formation. Stop that movement and history ceases: necessarily so. To describe the years of service of this building in which we have been so graciously entertained would be a more or less minute narrative of the people who have frequented it. Close its doors, it is tenantless and idle. There is nothing to record.

If we follow back along the years that have gone sliding down the declivity of Time and ask, what is there in evidence to indicate that man has lived, moved and had a being on this old old globe for accredited centuries. Forty, fifty, sixty as may be assumed since written means of communication between man and man came into use and practice? A few ancient papyri, stylus or pen written, with sheepskin parchments, rolls and scrolls, and afterwards the printed book. Of these only the last accessable to the many.

These tell us of kings, emperors and pontiffs. Warriors, statesmen, philosophers, theologians, lawgivers, scientists, men of letters and others, leaders of and conspicuous in tribal, national and public service. Informative, very, when made use of in plotting the activities of the past. We accept, and then ask what is there in evidence to bridge the gap that widens the farther back we reach into the misty expanse of tradition and oral legend.

If you, Mr. Chairman, have been privileged to examine paintings from the brushes of those whom we now term the Old Masters you could find, lettered on the canvas at one of the lower corners a name. Michael Angelo, Titan, Raphael, Corregio, as the case may be; followed by the affix D. E. L., "I made It". Urging further instruction we push for something tangible such as the common man, if he have means of travel, may make way to, stand beside, lay his hand upon and say "He Made It".

The Pyramids of Egypt, the architectural glories of the Hellenic States, the Coliseum of Rome, a number of ruined bridges and shattered aqueducts, strongholds of stone and ecclesiastical edifices of the Middle Ages of Europe. A few stone groupings from pre-historic times, rude and undefined. All, without question, the work of the engineer. All else has perished.

And yet such is the reviving and rejuvenating ministration of the engineer that scarce a quarter century may pass until the whole world will tramp a road and beat a path to stand in reverent admiration before the encrusted mosaics and reproductions, the "frozen music" of revived and revivifed Rheims Cathedral, the work of the architect-engineer. That creative, ennobling and yet beneficient skill that is even now rescuing from impending decay and ruin, the sacred edifices of Old England.

One intense longing of the human heart is that we be not forgotten. For of this men of wealth and high purpose endow hospitals and extend munificient gifts to libraries, colleges and other public instructional sources. Grateful nations pile up pedestal and pillar, erect shaft and column, to keep in remembrance those who have worthily served the State, that he who asks may view an answer. So the honour roll of men, deservedly great, is enshrined.

We of your Canadian citizenry, standing outside your profession, but observant, would say and urge: drive your piles to resistance, lay your foundations broad, deep and enduring: erect your superstructures with diligence and in all faithfulness; and your Work and your Worth will be remembered long after Saracen Paladin, Roman Patrician, Norman Conqueror, and robber Baron are as dead and forgotten as the mummied dynasties of Ancient Egypt.

Congratulations from Minister of Mines

Referring to the work of the Fuel Committee, the Honourable Charles Stewart, Minister of Mines, in a letter to the Secretary, stated that he had had a copy of the report of *The Institute's* Fuel Committee some months ago, which he had carefully read, and congratulates *The Institute* on the work which it is doing through its committee. The Honourable Mr. Stewart says:—

Ottawa, April 16th, 1925.

Dear Sir:—

The Prime Minister has forwarded to me the copy of the report of your Fuel Committee, which you were good enough to send him.

I may say that a copy of this report was in my hands some months ago, and was carefully read at that time.

Among the recommendations made by your Committee there are two with which the Dominion Government is concerned, namely —

"That the governments, federal and provincial institute an enquiry into the real cost of moving coal",

and

"That a national fuel policy be only embarked upon after recommendations are received from the Dominion Fuel Board".

In this connection I may say that the Government has already gone some distance along the lines suggested in each of these recommendations, and I am satisfied that considerable progress has been made.

May I take this opportunity to congratulate *The Engineering Institute of Canada* on devoting its energies to a study of national problems of this nature, and to approve your policy of endeavouring to mould public opinion in Canada based upon a knowledge of the facts.

Yours very truly,

CHAS. STEWART,
Minister of Mines.

PLANS ARE BEING COMPLETED
FOR THE
WESTERN GENERAL PROFESSIONAL MEETING
TO BE HELD AT
BANFF, ALTA.
sometime between July 10th and 17th, 1925
A definite announcement as to the dates will be made in the next issue of "The Journal"

OBITUARIES

James Joseph McArthur, D.L.S., M.E.I.C.

James Joseph McArthur, D.L.S., M.E.I.C., public servant, explorer, scholar and phototopography expert, died April 14th at his home, 459 Gilmour street, Ottawa, in his 69th year. Mr. McArthur's death brings to a close a long and interesting life of service in the interests of the public of the Dominion, and brings to a host of friends the realization that a close and greatly admired and respected friend is gone.

Entering the public service in the early 80's, Mr. McArthur's duties carried him throughout the length and breadth of Canada, and he was well known in many points, not only in the eastern provinces, but also in the prairie provinces and the Pacific coast.

He was born in Aylmer, Que., on May 9, 1856, a son of Mr. James McArthur, P.L.S., and Mrs. McArthur. He spent the early years of his life in Aylmer and in Ottawa. In November, 1881, he entered the public service, and until 1887 engaged in a survey of the meridians and base lines of the Northwest Territories.

In 1887 Mr. McArthur introduced the system of phototopography for survey work in the Rocky mountains, and continued on this work until 1893, when he was appointed to the staff of the late Dr. W. F. King on the Alaskan boundary survey. At that time he assisted in the survey of the territory at the head of Lynn canal, which was fiercely disputed by the Alaskan and Canadian claimants.

Mr. McArthur branched off into exploratory work in 1897, and for three years conducted exploratory tours into the Yukon Territory, from which tours much valuable knowledge was gained. In 1899 he attended a conference at Washington as a member of the Joint High Commission in the capacity of a topographical expert. The following year he did survey work with the International Commission to establish the Alaskan boundary at the head of Lynn canal.

In 1901 he was engaged on the re-survey of the International boundary between British Columbia and the state of Washington; in 1902 he surveyed the 141st meridian at the boundary between Yukon and Alaska, and the following year was attached to the staff engaged in the final demarcation of the 49th parallel.

Mr. McArthur was attached to the staff of the British agent before the Alaska Boundary Tribunal, sitting in London in 1903, in the capacity of a geographer and topographical expert, and the following year took charge of the survey of the international boundary along the 49th parallel, from the gulf of Georgia to the lake of the Woods, and was engaged in this work for some years. He was appointed assistant international boundary commissioner in 1909.

Attended by many co-workers and friends the funeral was held on the morning of April 16th, from his residence to St. Patrick's church, and thence to Aylmer cemetery. Floral tributes and spiritual offerings were received from many bodies with which he had been connected, including the International Boundary Commission, the United States section of the International Boundary Survey, the head office of the Metropolitan Life Insurance Company, the Ottawa Branch of *The Engineering Institute of Canada*, Canada Lodge A.O.U.W., the Geodetic Survey, Dominion

Observatory and the Seed Grain Branch, Department of the Interior.

The late Mr. McArthur joined *The Engineering Institute of Canada* on August 27th, 1918, when he was elected Member.

Professor Henry M. Lamb, A.M.E.I.C.

In the death on April 1st, 1925, of Professor Henry M. Lamb, A.M.E.I.C., associate professor of civil engineering, McGill University, the faculty of applied science suffered the loss of one of its most sterling members.

The late Professor Lamb was born in Montreal on March 27th, 1883. Graduating from high school in 1900, he spent a few months with the Northern Electric Company and then went into the employ of the Dominion Bridge Company as draughtsman, where he continued until entering McGill in 1903. During his college course he was engaged in the work of designer for the Dominion Bridge Company, and on graduation became demonstrator in surveying in McGill. In 1909 he was appointed lecturer in civil engineering, assistant professor in 1911, and associate professor in 1920.

Referring to his death Dean H. M. MacKay, of the Faculty of Applied Science of McGill University said: "He was an inspiring teacher, modest and unassuming, and one who stood high in the esteem and affection of the students and his colleagues. His services were often in demand by many of the leading engineers in the country, particularly in connection with difficult or unusual problems. McGill, and particularly the faculty of science, has suffered a severe loss in his passing."

At a meeting of the Montreal Branch on April 2nd, the following resolution was unanimously passed by a silent vote:

> "The members of the Montreal Branch of *The Engineering Institute of Canada* desire to place on record an expression of its deep sorrow with which they have heard of the death of Professor H. M. Lamb, M.Sc., A.M.E.I.C. Graduating from McGill University in 1907, after an unusually brilliant career as a student, Mr. Lamb joined the staff of McGill in the same year, becoming assistant professor of civil engineering in 1911, and associate professor in 1920. Modest and unassuming, an inspiring teacher and a loyal friend, none stood higher in the esteem and affection of his students, of his colleagues in the university and in the engineering profession. He possessed in a higher degree the best quality of an engineer, strict integrity, mental grasp, vision and well balanced judgment. While he chose to devote himself mainly to his university work in which he was deeply interested, leading engineers frequently availed themselves of his skill and ability, particularly in connection with difficult and unusual problems."

Professor Lamb is survived by his wife, formerly Miss Ruth Stevens, of Stanstead, Que., and five small children, two sons and three daughters. In 1902 he became a Student Member of *The Institute* and was transferred to Associate Member in 1910.

John Ernest Hardman, M.E.I.C.

Following an illness which confined him to his bed for some months, John Ernest Hardman, M.E.I.C., mining engineer of Montreal died Friday night at his residence 660 Sherbrooke street west,. During his career he had been connected with various projects in the Dominion and during the latter period of his engineering activity wrote extensively on mining subjects.

He was born in Lowell, Mass., in 1856, of English parents. His education was received at the Massachusetts public school and at the Massachusetts Institute of Technology, from which he graduated in 1877. In 1894 he came to Montreal after having practised his profession in the maritime provinces for some years. The following year he became lecturer in mining at McGill University and later entered local practice as consulting engineer.

In addition to his membership in *The Engineering Institute of Canada*, to which he was admitted on May 17th, 1921, as Member, he was a member of and at one time president of the Mining Society of Nova Scotia, of the Canadian Mining Institute, the American Society of Mining Engineers and of the University Club.

The late Mr. Hardman was one of the founders of the Journal now known as the Canadian Mining Review.

PERSONALS

O. M. Perry, M.E.I.C., has been re-elected president of the Border Cities Electrical Association. Mr. Perry is manager of the Windsor Hydro-Electric System.

Charles M. Bowman, Jr.E.I.C., has been appointed commercial engineer of the Maritime Telegraph and Telephone Company Limited, at Halifax, reporting to A. M. Mackay, general commercial superintendent.

Charles W. Edmonds, A.M.E.I.C., formerly assistant designer in the sewer section of the Department of Works of the city of Toronto, has accepted a position with the Canada Cement Company at Belleville, Ontario.

Maurice Polet, A.M.E.I.C., who has been for the past three years engaged in engineering work in Belgium and Africa, has returned to Canada and is at present located in Edmonton, Alberta.

John H. Summerskill, A.M.E.I.C., of Montreal, Quebec, has been appointed assistant to the vice-president of the Southern Phosphate Corporation in charge of the operation and construction of their plants in Florida.

Horace L. Seymour, C.E., M.E.I.C., town planning engineer, a resident of Weston, for which town he has engaged in considerable engineering work has been named as engineer for that municipality to be assisted in surveys and supervision of construction by local officials.

G. G. Underhill, M.E.I.C., is general superintendent of the Canada Paper Company, Windsor Mills, Quebec, to which position he was recently appointed following his resignation as manager of Messrs. Fraser Brace Limited, Montreal.

G. W. F. Johnston, A.M.E.I.C., formerly contracting engineer with the Canadian Des Moines Steel Company, Ltd., of Chatham, Ontario, has recently been appointed to the head office staff of the Welland ship canal at St. Catharines, where he will reside.

F. J. Ellis, S.E.I.C., formerly with the Abitibi Power and Paper Company, Iroquois Falls, Ontario, has been appointed erecting superintendent of the Vickers and Combustion Engineering Limited, in which position he will have charge of the erection in connection with the installation of various equipment for the company.

Donald Ross-Ross, A.M.E.I.C., has resigned as assistant master mechanic of the Montreal factories of the Canadian Consolidated Rubber Company, Limited, and has joined the engineering staff of the Howard Smith Paper Mills at Cornwall. Mr. Ross-Ross is a graduate of McGill University in civil engineering.

J. G. L. Stuart, A.M.E.I.C., has been appointed sales engineer on the staff of the Clay Products Agency, Limited, Toronto. Mr. Stuart who is a graduate of the Faculty of Applied Science of the University of Toronto, was for some time prior to his present appointment connected with the Pedlar People, at Oshawa, Ont.

A. R. Décary, M.E.I.C., chairman of the Quebec Branch and a councillor of *The Institute* was elected president of the Corporation of Professional Engineers of the province of Quebec at the annual meeting recently held in Montreal. Mr. Décary is superintending engineer for the Department of Public Works, Canada, in the province of Quebec.

R. Fraser Armstrong, A.M.E.I.C., has been appointed superintendent of the Kingston General Hospital, Kingston, Ontario, having resigned the position of town manager of Windsor, N.S. Mr. Armstrong is a graduate of the University of New Brunswick having received his degree of B.Sc., in 1910. Subsequently in 1913 and 1914 he made a special study of municipal engineering at McGill University.

Gordon S. Stairs, A.M.E.I.C., formerly assistant engineer with the city engineer's office, Halifax, who was appointed town manager of Wolfville, Nova Scotia has resigned this position to accept a similar position as town manager of Windsor, N.S., succeeding R. F. Armstrong, A.M.E.I.C.

A. B. Richardson, A.M.E.I.C., formerly with the Canadian Bridge Company, is now with Messrs. Whitehead and Kales, Detroit. Mr. Richardson was for a number of years assistant to the chief draughtsman of the Toronto branch of the Dominion Bridge Company prior to his appointment to the staff of the Canadian Bridge Company.

Fred G. Cross, A.M.E.I.C., has been promoted to the position of assistant superintendent of operation and maintenance of the Department of Natural Resources, Canadian Pacific Railway with headquarters at Banff, Alberta. In last month's *Journal* there appeared a biography of Major Cross on the occasion of the announcement that he had been awarded the prizes for the designs for *The Institute's* War Memorial and Bronze Record.

Ira P. Macnab, M.E.I.C., has been appointed general manager of the Venezuela Power Company, Maracaibo, Venezuela, which company has recently been acquired by the Royal Securities Corporation, Limited, of Montreal. Mr. Macnab was sent to Venezuela to inspect this plant. He was formerly superintendent of the tramways department of the Nova Scotia Tramways and Power Company, although for the past two years he had been located in Calgary where he occupied an executive position with the Riverside Iron Works in 1923.

D. A. Y. Colquhoun, Jr.E.I.C., is construction engineer with Messrs. E. G. M. Cape on the government grain elevator in Halifax, N.S. Mr. Colquhoun was formerly construction engineer with the Dominion Coal Company at Glace Bay, N.S. He is a graduate of the Nova Scotia Technical College from which he received the degree of B.Sc., in 1920. Subsequently he was construction engineer with the Nova Scotia Steel and Coal Company on the erection of the power plant coke ovens and blast furnaces. Following this he occupied the same position with the Dominion Iron and Steel Company on the plate mill erection at Sydney, Nova Scotia.

A. L. Mudge, A.M.E.I.C., of Toronto, has been appointed power plant engineer on the staff of the Canadian Section of the Joint Board of Engineers for the St. Lawrence Deep Waterways Project. Mr. Mudge has for a number of years been connected with the firm of Kerry & Chace, consulting engineers, Toronto, Ontario, having originally joined this organization some seventeen years ago, when the firm was known as Smith, Kerry & Chace, and during this time he has given special attention to water power development and industrial electrical engineering. Mr. Mudge has been on the executive committee of the Toronto Branch of *The Institute*, and for several years acted as chairman of the Library Committee. He was also chairman of the Toronto section of the American Institute of Electrical Engineers, and first vice-president of the Canadian Electrical Association.

H. W. Frith, M.E.I.C., Chief Engineer for Vancouver Harbour

Hugh Walter Frith, M.E.I.C., has been confirmed in his appointment to the post of chief engineer of the Vancouver Harbour Commission, lately vacated by Major W. G. Swan, D.S.O., M.E.I.C., who has entered private practice as a consulting engineer in Vancouver.

Mr. Frith was born in London, England, in 1884, and received his education as a student with Messrs. Reid and Green, Cape Town and Johannesburg, South Africa, and at the Technical Institute at Cape Town, S.A. His early engineering work was in that country, and in 1907 he went to England where he was assistant chief draughtsman with the Franco-British Exhibition, but was later engaged in connection with the Imperial International Exhibition during 1909 and 1910, and the following year was superintendent of construction with the Reeds Electrical Company, Limited, London, England.

In 1912 he came to Canada as assistant in the city engineers department, Vancouver, B.C., until 1915, when he was engaged on hydrographic survey on the Fraser river and Squamish, as assistant with the Public Works Department of Canada. In 1916 he joined the staff of the Vancouver Harbour Commission as assistant engineer, being promoted to maintenance engineer the following year, and to assistant chief engineer in June 1919.

J. T. Johnston, M.E.I.C., Director of Water Power and Reclamation

J. T. Johnston, M.E.I.C., has been appointed to the position of director of water power and reclamation in the Department of the Interior, Ottawa, to succeed J. B. Challies, M.E.I.C., who recently accepted a high executive position with the Shawinigan Water and Power Company of Montreal. This announcement appropriately draws attention to Mr. Johnston's long and intimate association with the investigation and administration of water power and kindred problems, and to his eminent fitness for this responsible position in the government service.

Born in Kincardine, Ontario, and securing his early education in the public and high schools of that town, Mr. Johnston subsequently entered the University of Toronto, taking his degree in Applied Science in 1910. His first engineering experiences were with the Department of Railways and Canals on the surveys and subsequent construction of sections four, five and six of the Trent canal, his responsibilities developing rapidly from a rodman's duties to those of assistant engineer.

In June 1911, he took charge of field investigations and engineering work in connection with the advanced water power administration then being evolved by the Department of the Interior in the Prairie provinces and the Northwest Territories. In conformity with this policy the water power sites of western Canada within economic range of existing settlement have been progressively analyzed and their engineering and commercial features systematically determined. Among the more important of the comprehensive investigations carried on under this policy might be mentioned those covering the Bow and Winnipeg rivers where complete systems of hydro-electric and storage development have been designed in detail. Much of this pioneer analysis is now bearing fruit in the orderly construction of power and storage projects.

As the Dominion Water Power Branch extended its power investigatory work from coast to coast in co-operation with the various provinces, the necessity for constructive co-ordination of Dominion and provincial effort became increasingly manifest and resulted in Mr. Johnston's development of his inventory system of water resources compilation and analysis, subsequently adopted by practically all the provincial power and water administering organizations. It has also been recommended for adoption throughout the United Kingdom by the Water Power Resources Committee of the Imperial Board of Trade.

J. T. JOHNSTON, M.E.I.C.

In the course of his activities, Mr. Johnston has prepared and published as Water Resources Papers, several works having to do with power, storage and related studies. Certain of these have been recognized as standard works and have received widespread recognition as textbooks in their respective fields. He was granted the post-graduate degree of Civil Engineer in 1916 by the University of Toronto, following and based upon his treatise on the development of the Winnipeg river.

Following the amalgamation of the Reclamation Service with the Water Power organization in 1923, the combined service was re-named, Dominion Water Power and Reclamation Service. Mr. Johnston now becomes director and chief engineer of the combined service.

Mr. Johnston is a member of the Lake of the Woods Control Board, a member of the Dominion Fuel Board, a member of the Inter-departmental Committee on the St. Lawrence Waterway, and, in association with the chief hydrographer of the Dominion, W. J. Stewart, M.E.I.C., a consultant to the government on international waterway problems.

Sam G. Porter, M.E.I.C., Promoted

Sam G. Porter, M.E.I.C., superintendent of the Canadian Pacific Railway, Irrigation Branch, at Lethbridge, Alta., has been promoted to the position of assistant manager to the Department of Natural Resources of the C.P.R., being assistant to General Manager P. L. Naismith, and will assume his new duties at once. The elevation of Mr. Porter to the general offices of the natural resources department comes as a result of some reorganization of the affairs of the department recently completed. Mr. Porter will make his home in Calgary.

Mr. Porter was born on a farm at Kyle, Texas, U.S.A., in 1875. He was educated in a private school of his home county, later entering Baylor University at Waco, Texas, from which institution he received his degrees of B.A. and M.A. Leaving Baylor college he taught school in Texas for several years, then entered the Massachusetts Institute of Technology, graduating in engineering with the degree of B.A., in civil engineering. Following graduation, he entered the U.S. reclamation service engaged in preliminary and location survey work in the states of New Mexico, Colorado, Nebraska and Wyoming, during which time he was in charge of part of the construction programme of the interstate canal between Wyoming and Nebraska. He later became chief engineer of the Arkansas Valley Sugar Beet and Irrigated Land Company at Holly, Colo.

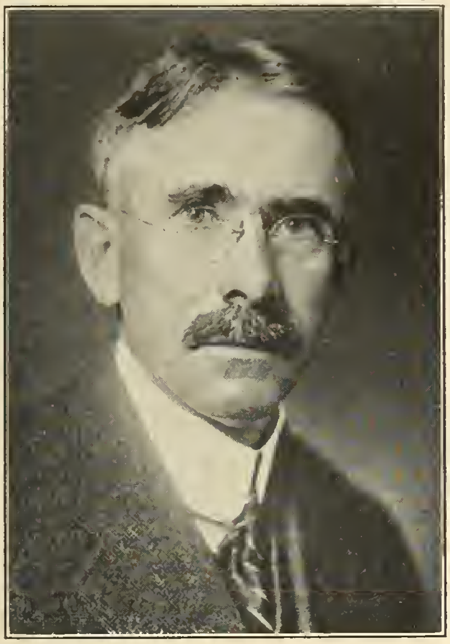
SAM G. PORTER, M.E.I.C.

In 1913 he was appointed inspection engineer for the Dominion government in Alberta in connection with the irrigation office of the department of the Interior. He was later promoted to the position of assistant chief engineer and acting irrigation commissioner. Mr. Porter's next change was from the government service to the employ of the Canadian Pacific Railway, becoming superintendent of operation and maintenance of the southern section of the C.P.R., system in 1918, with headquarters at Lethbridge, and under his administration, many new works have been carried out.

Mr. Porter has taken a very active interest in the affairs of the Lethbridge Branch, and was for three years, 1921 to 1923, on the council of *The Institute*. He has also been a member of council and vice-president of the Association of Professional Engineers of Alberta. His activities in association work have included the presidency of the Lethbridge Rotary Club of which he was also charter member, and the vice-presidency of the Lethbridge Board of Trade during the years 1923 and 1924.

G. N. Houston, M.E.I.C., Receives Appointment

G. N. Houston, M.E.I.C., of Lethbridge, Alta., has been appointed to the position of superintendent of the Canadian Pacific Railway Irrigation Branch of Lethbridge, succeeding Sam G. Porter, M.E.I.C.



G. N. HOUSTON, M.E.I.C.

Mr. Houston was born at Windham, Conn., U.S.A., in 1870, and was educated in the public and high schools of the state. He entered Princeton University as an engineering student, and had the distinction of studying economics under the late President Woodrow Wilson.

After engaging in engineering work in the east, Mr. Houston became assistant professor of civil engineering at the Colorado College of Agriculture, Fort Collins. Two years later going to Tucson, Arizona, as professor of civil engineering at the University of Arizona. A year later he was appointed superintendent of the Denver Sugar, Land and Irrigation Company, Colorado, later becoming deputy state engineer of that state, and on leaving the government service, entered private practice as consulting engineer in Denver.

Mr. Houston came to Canada in 1913, as chief field engineer for the Dominion government in charge of reclassification of lands in the western section of the C.P.R., irrigation system.

During the war, Mr. Houston returned to the United States where he did valuable war work for the government, subsequently returning to Canada to the position of assistant commissioner and later acting commissioner of irrigation for the Dominion government, with headquarters at Calgary. Three years later he became a member of the Irrigation Council for the provincial government.

ELECTIONS AND TRANSFERS

At the meeting of Council held on Tuesday, April 21st, 1925, the following elections and transfers were effected:—

Associate Members

deHART, Joseph Bertram, B.Sc. (C.E.), B.Sc. (M.E.), M.Sc., (McGill Univ.), district inspector of mines, Lethbridge District, Government of Alberta, Lethbridge, Alta.

DUPUIS, Philippe Auguste, B.A.Sc., C.E., (Ecole Polytech.), bridge dept., Dept. of Public Works & Labour, Quebec, Que.

HEUPERMAN, Frederick Justinus, D.L.S., A.L.S., asst. engr., Canadian Western Natural Gas, Light, Heat & Power Co. Ltd., Calgary, Alta.

Juniors

BROWN, John Edwin, Bach. Engrg. (Univ. of Sask.), 1116 - 9th Avenue West, Calgary, Alta.

HENSTRIDGE, Edward William Guy, dftsman., Welland Ship Canal, St. Catharines, Ont.

YOUNG, Roy, B.Sc. (London Univ.), engr. in charge, stationary battery dept., Hart Battery Co., St. Johns, Que.

Transferred from the class of Associate Member to that of Member

COPP, Walter Percy, B.A. (Acadia Univ.), B.Sc. (McGill Univ.), professor of civil engrg., Dalhousie University, Halifax, N.S.

HUGHES, Henry Thoresby, Brig.-Gen., C.M.G., D.S.O., chief engr., Canadian Battlefields Memorials Commission, France and Belgium.

Transferred from the class of Junior to that of Associate Member

ARMSTRONG, Christopher Gillette Russell, B.A.Sc. (Univ. of Tor.), D.L.S., partner in firm, Newman & Armstrong, Civil Engrs. & Ontario Land Surveyors, Windsor, Ont.

Transferred from the class of Student to that of Associate Member

TAYLOR, Frank Harold, M.C., B.A.Sc., (Univ. of Tor.), designer and estimator, Lehigh Structural Steel Co., Allentown, Pa.

Transferred from the class of Student to that of Junior

MARION, Joseph Alderic Pierre, B.A., B.Sc. (Univ. of Man.), dftsman., C. D. Howe & Co., Port Arthur, Ont.

STERNS, Laurence, B.Sc., (N.S. Tech. Coll.), topog'l. dftsman., Messrs. Pickings & Wilson, Civil & Mining Engrs., Halifax, N.S.

The following Students were admitted:—

BELL, John Archibald, B.Sc. (E.E.), Queen's Univ., of Picton, Ont.

DE PASSILLE, André B., C.E. (Univ. of Montreal), 192 Cherrier Street, Montreal, Que.

MINTER, Harry John Duncan, 375 Earl Street, Kingston, Ont.

ROY, Lucien, 115-17th Avenue, Lachine, Que.

VALIQUETTE, Joseph Philippe Charles, 329 Durocher Avenue, Outremont, Que.

Discussion on Engineering Education

C. V. Corless, LLD., M.E.I.C.

The symposium on engineering education in the March *Journal*, including the discussion, is of great interest to those who have the cause of education at heart. In such a series of papers and discussions, written independently of each other, there is naturally some repetition; also, since the papers are brief, important aspects of the subject may be omitted entirely. Two of these repetitions, indicating consensus of opinion, I am glad to note, are: emphasis on the necessity for thorough grounding in the fundamentals of science; and clearness of expression, without which there cannot be clearness of thinking.

There are two important characteristics of education in general, and of engineering education in particular, the development of which in the mind of the student is perhaps more a result of method of presentation by the teacher than of the matter presented. But I should like to see greater emphasis placed on them. These characteristics are *originality* and *initiative*, which are the real motive power, the vital energy, of progress. Without these qualifications, the enterprise or piece of work entrusted to the engineer may run along in its old groove; but it will never break new ground, it will not grow and develop. True, all the other qualifications tabulated under the six general headings of Dr. Mann's specification, quoted by Professor H. M. MacKay, are indispensable to the successful engineer; and many of them are equally necessary to success or even true manhood in any other vocation. But, in engineering at least, the chance of rising above mediocrity will depend mainly on the degree of development of these two characteristics. The same is true indeed in most other walks of life for which university education is intended to fit the student. One engineer, having these mental gifts developed to a high degree, may be of more value to the profession, to industry, and to society, than a dozen followers. In fact, a man so trained, by his selection and grasp of key problems, prevents dissipation of energy on side issues and usually provides useful employment for many of his fellows. If the importance of this aspect of education is not emphasized in our highest institutions of learning, where will it be adequately recognized? If it is not a guiding principle there, where else will it find expression?

It will be apparent that this letter is to teachers of engineering rather than to engineers themselves. They will, I am sure, welcome unacademic suggestion from a practising engineer, even though the limited space allowable for a letter precludes development of the thought, beyond a bare outline. As we all know, the simplest work of the beginner in engineering is that in which he assists in solving problems stated and assigned by others. Next, he begins to state minor problems for himself, the end to be attained by their solution still being assigned by some one else. At this stage he must discern clearly and ascertain for himself the data necessary to a solution. The next step upward is taken by the developing engineer when he selects the end or purpose to be attained, and is responsible for ascertaining the necessary data and working out the best solution of the problem involved, which he has previously stated. Finally, come discernment of many ends or purposes to be attained, some minor and some major, the statement of many problems and the selection of the key problem or problems to be solved, the solution of which generally obviates the necessity of solving a multitude of minor problems. Without success in making such selection wisely, the solution of these minor problems usually delays progress in the field of endeavour in which the engineer is engaged. Numerous examples of such errors of judgment will readily come to the mind of the reader. In making this selection of the key, on which to concentrate capital and energy, the engineer will usually find wide reactions of the solution decided upon, not only in his own special field, but also in other fields. In this final stage of his progress, the originality and initiative of the engineer, tempered by the other characteristics of Dr. Mann's specification, are at their highest. They have progressively lifted him from the lowest plane of his profession to the highest and have finally equipped him for independent flight, fitting him for the highest engineering service — in fact, for leadership.

This rise from level to level or from step to step, resulting chiefly from the engineer's originality and initiative, would be very easy to illustrate from any of the departments of engineering. But the readers of this letter will scarcely need illustrations. Our present concern is rather with the questions: Can the *matter* of engineering courses be so selected, and can the *methods* of presentation of the various subjects to the students be so adapted, as to discover and develop in the students these most essential characteristics? I have no hesitation in saying that, to a greater degree than I believe is generally realized, and certainly to a greater degree than at present is generally attained, they can be. But, to reach this most desirable goal, the first requisite is that every member of the teaching staff have a keen realization and clear grasp of the prime importance to the engineer of these two essential qualifications. In presentation, the teacher of engineering will find that, though he is not dealing with children, he is dealing with immature minds. For this reason, a thorough working knowledge of pedagogics, as contrasted with the almost exclusive use of didactics now generally followed, will go far in assisting him to develop these qualities of mind, at least in so far as the student's initiative and originality may remain unatrophied by the educational methods followed during his public and high school preparation.

These two characteristics are the creative and impelling qualities of the human mind, rooted in volition, and flowering in personality. They are in fact so fundamental as to be fore-shadowed by the simplest forms of life, of which they appear to be of the very essence. Unfortunately, their essential nature and the importance of their development is insufficiently realized, except by a very few, in our educational institutions from the lowest to the highest. Keenness in such realization and skill in such development are the marks of the successful teacher or professor.

The present educational standards, whereby the advance of the student is generally gauged rather by his acquirement of knowledge than by his power to select, seize upon, and utilize essentials for the attainment of ends in which he is interested; whereby memory is tested rather than ability to deal with situations; whereby quantity of information generally counts for more than mental attitude; such standards, in so far as these statements are true, must tend directly toward mental passivity rather than mental activity; toward suppression and atrophy, rather than stimulation and development, of the student's natural gifts of initiative and originality.

My criticism is of fundamental principles, not of details. But, for this very reason, it touches every detail of matter and method in the entire engineering course. The engineering faculty, every member of which is guided and inspired in his teaching by these principles, will soon come to be known as the center from which scientific inspiration and engineering progress radiate. Undoubtedly, our universities have more than one function. Certainly, development of real leaders is not the lowest of these. To me, this aim seems the highest. To the attainment of this end in particular, and I believe to that of other ends as well, the discovery and development of initiative and originality should deeply concern every educator. To no other, should these qualities be of deeper concern than to the educator of engineering students.

The shallow thing called "training for leadership", which Professor MacKenzie criticizes, is a ridiculous innovation in a few institutions, wholly inconsistent with the motive and spirit of a true university. Leadership attained by such superficial means will be such only in appearance. The final sentence of Professor MacKenzie's paper contains the gist of the whole matter of university education for engineering or for any other vocation. But the effectiveness of university education will be heightened by a clear grasp of certain ideals and principles, of which I conceive those briefly discussed above to be among the most important.

*Brig.-Gen. C. H. Mitchell, C.B., C.M.G., M.E.I.C.

This is one of the most interesting discussions that we have ever put on at *The Engineering Institute*. Sitting here listening to this great volume of views and information from across Canada, I think *The Institute* is greatly to be congratulated. I am speaking as one who is engaged not only in engineering education but in engineering practice, and I feel that *The Engineering Institute* to-day has done a great thing for education and for practice. I think we are very much indebted to the officers and those who proposed this scheme, and we will benefit a great deal by it.

On various occasions during the day definitions and comparisons of the engineering profession have been made with other professions. Now, one of them that struck me, (and which I would like to pass on), is that the engineering profession is so peculiar and so different from the rest of the professions that there is no reason for trying to compare them as far as education is concerned, because the professions of law, medicine, dentistry, are all more or less specific. The engineering profession has a much larger sphere. It extends to a much larger circle than the other professions do, because the engineer, particularly in this young country of Canada, where we are still growing, where we are constantly in a state of transition, intimately connected with the progress and advancement of the country, not only technically, but in almost every other respect, and consequently, the engineer must be a

*This discussion was presented at the annual meeting of the Institute in Montreal last January, but its publication was delayed as the manuscript was not available.

citizen, a leading citizen, a leader in every respect. I think we must keep that strongly in mind when we think about the education of the engineer. If you just look at the front page on the cover of our *Engineering Journal* you will see what I have in mind. The definition of our aims, our objects, in this *Institute*, is such that it covers a tremendous field for which we are trying to prepare ourselves and the younger generation.

Now, I would like to speak for a moment as one engaged in engineering education. We have heard a great deal about fundamentals. A wise man once said that, "The first hour of the morning was the rudder of the day." That is a pretty wise saying, I think. If we get the boy,—the young man, — the right kind of young man, and treat him properly, right at the start, we will direct him in a proper way. His rudder will not go askew. Consequently I am one of those who strongly believes that we should put our great concentration of efforts on fundamentals.

I know there has been a great deal of talk about fundamentals. I do not want to discuss that, but we must get the right kind of young man; we must get a high standard of entrance, and we must make proper selection.

In thinking about engineering education, I have been trying to visualize graphically some picture which would as nearly as possible indicate what we have had in mind in the discussion which has taken place here to-day, and I cannot think of anything better than the very simple picture with which we as engineers are all familiar, — a concrete foundation set on earth, which bears some particular structure.

Take for instance a foundation with a wide footing, and with a pedestal on which some structural steel structure is going to be reared. Let us take that as the idea of education. In the first place we have to dig down into the ground until we are sure that we have a firm bearing soil. Now, what is that firm bearing soil? It is the education of the young man, — the boy, as he is in the secondary school or high school. It is not only the education in the school, but it is his home environment. It is the thing which the good Lord has given him in heredity and other ways, and if that firm bearing soil is not firm enough to stand the pounds per square foot to be imposed upon it we are not going to get a good education on top of it; consequently we must get the good preliminary standard.

Now, then, I like to think of the first structure that is put on top of that as what we call the footing course, and it appears to me from the talk I have heard to-day that that might easily be compared with the first two years of a college course, the real, essential, foundation material, the fundamentals of education, which, if it is not good material, not well designed, will not bear up the structure which is to be built upon it.

The next course above that, a little smaller perhaps but more concentrated in its loading can be compared to the third and fourth years, or the fifth if necessary.

Then the young man goes out, and on top of those footing courses, and that firm bearing soil, he, by his own effort in conjunction with his employers, and environment, raises the concrete pedestal on top of the whole and upon that he can rear anything. That I think is a fair, reasonable, illustration of the early education of the young engineer.

After that he goes on. He will always learn, or always want to continue to learn, and his structure, which he rears on top of that foundation, is the progress of years.

We can talk as we like about the curriculum. There are lots of things to be said. We have struggled with it for years. I remember it was being done when I was at college. We can talk a good deal about its content, but I think the great thing to look out for is not to crowd it too far, and by all means to make it thorough.

A great deal has been said about trying to teach leadership in college education. You cannot teach that by formal lectures from professors, by laboratories or by books. A man has to absorb it, and the way to absorb it is I think through the personal contact with his professors and his teachers, and more than perhaps anything the contact with his fellow students, and in the student activities around the university. I think one of the most valuable assets in a university is the personnel, — the individuality of the actual professorial staff.

We all think about our old professors. We know what kind of imprints they have put on our lives. That is the kind of thing which really matters after all in a university. If we do not get the right kind of imprint, the quality of the man who sits with us, and lectures to us and works with us, we are not going to get the quality in the outer world.

The mark of the professor, the mark of dear old Dean Galbraith in my own college, is on every one of us graduates of Toronto University of those days, and so it is in McGill and everywhere else.

Now, may I just for a moment put myself over on to the other side, and look at it as one who is engaged in engineering practice. Someone has said that the graduate body is a large factor in this question of education. I think so, too.

We graduates must exercise influences of various kinds on our universities. To what extent these may be exercised on the curriculum is just a matter of degree, but there are various ways in which influence may be exercised, and I would call on the graduates of all the universities of Canada and elsewhere who are members of this *Institute* to assist the universities in every way they can by encouragement, suggestions, by actual work and help. The suggestion of Mr. Tennant that this *Institute* should try to do that in some practical way is a very good one. I think it would be a very valuable adjunct. We must watch our graduates; we must look to see how they have profited and benefitted by the curriculum of the various colleges from which they came.

That is one of the functions of this investigating committee of which you heard Mr. Hammond speak this morning, and I think, among our graduates, we can find a great deal of useful information which will affect our engineering education. They will give information to help this investigation along.

But there is another phase to it: We must look to the employers of the product; the employers of the graduates. Call these employers anything you like, but for convenience I will call them industries. These different industries are using different ways of employing and finding out about graduates, and using them.

There is an opinion abroad which has some direct bearing upon this investigation of the Society for the Promotion of Engineering Education in which there is an effort on the part of industry to make the universities and the colleges take a particular type of man and educate him for their particular work. I do not agree with that in its entirety by any means. As I said before, we must deal with fundamentals, and we must not lend ourselves to proposing to any university the teaching of any particular specialized course or the choosing of a particular man for a particular job. I do not think that is the proper function of engineering education at all.

The large employers of our graduates, we will say for instance the electrical companies, are particular in getting men who are well grounded in electrical work, it is true, but they do not want men right off the reel who are experts in high tension work, in transformers, and so on. They are going to teach them that after they get them.

I have had the honour to sit on a committee which was appointed a year or so ago in connection with the railway industry. My friend, Mr. J. M. R. Fairbairn, is the other Canadian who sits on this committee. This composed of chief engineers, some vice-presidents of some of the large railways of the continent, together with four or five deans of engineering colleges, some of them very prominent.

The railway people, realizing that they have not been in a position, and that they have not taken advantage, (as the electrical and telephone companies, for instance have done,) of getting enough college graduates into their employ, are now waking up to the fact that after all these years they are in serious danger of a deterioration of their personnel because they have not the right kind of men coming on up from the lower positions to fill the higher positions in the future.

The university people on that committee, realizing the truth of a good many of the things such as have been outlined to-day, said, "We will do anything within reason to help produce the graduates for the railway industry. But they do not pretend to produce specialists; that was not intended. The railway companies have not appeared prepared to induce graduates to go into their employ because they do not give them encouragement along certain lines, and any young graduate does not know quite what is ahead of him.

Take another instance, that of the pulp and paper industry. I use this as an instance, because Canada is very much interested in pulp and paper, and I have first been reading from the report which was referred to this morning; that of the International Industrial Conference Board, which is working in conjunction with the general committee of which Mr. Hammond spoke this morning.

The Industrial Conference Board found little more than seven per cent of the men in the pulp and paper industry holding executive or other appointments of importance. Of that seven per cent, twenty-two per cent are college graduates. That is roughly about one and one-half per cent of the whole. There are less than one per cent in the whole paper industry in the United States that are graduates of recognized technical colleges.

New Broadcasting Station

A new wireless broadcasting station, designed to be one of the largest and most powerful in Canada has been designed and is being installed in Toronto for the Dominion Battery Company, Limited, who will own and operate a new station, specializing on afternoon concerts for the benefit of radio dealers. The studios will be located in the Prince George Hotel and the station itself at the Toronto factory of the company. There are towers specially designed with a height of 120 feet carrying an aerial of over 100 feet of four wires. This station is equipped with the very latest type of transmitter known to engineering science and specially designed and built by the Marconi Company.

C. J. Madgett, A.M.E.I.C., has been placed in charge of the newly opened Toronto office of the Sarnia Bridge Company Limited of Sarnia, Ontario, which is located at 85 Richmond Street, West, Room 321 Federal Building, Toronto.

This office, while handling the many other products of this company, is particularly for the purpose of taking care of the sale of Massillon Bar Joists for fireproof floor and roof construction.

Abstracts of Papers read before the Branches

Harnessing the East River with Special Reference to the Development at Ruth Falls

H. S. Johnston, M.E.I.C.

Halifax Branch, March 25th, 1925.

In opening his address Mr. Johnston emphasized the fact that the energy produced by hydro-electric generation is not in itself always cheaper than electrical energy produced by steam-electric generation. He showed that cheaper energy cannot be produced simply because water power is available. Other factors such as the distance of the market from the point of the production of the energy, the fluctuations of the quantity of energy demanded by the market from time to time during each day of the year and the availability and price of coal when considered in conjunction with the hazards of water-power construction may place hydro-electric energy at an economic disadvantage.

In his opinion there will be replacement of steam-electric plants under certain conditions especially where the cost of coal is high. He spoke of electric energy being transmitted 300 miles in California and of a project in South Africa where power will be sent 600 miles into the Rand district, and suggested that in the latter case an available supply of coal might change its feasibility.

He outlined the progress made in the harnessing of the water powers of Nova Scotia. During the past ten years so much had been done that the quantity of hydro-electric energy produced per head of the population of our province now compares favourably with all other districts boasting developed water powers. During the past five years, or, since Mr. Johnston joined the staff of the Nova Scotia Power Commission, hydro-electric developments having a total rated capacity of 24,000 h.p., have been completed and put into operation. While there are no Niagaras in Nova Scotia sites are known where plants may be erected of capacities up to 20,000 h.p., and the total capacity in Nova Scotia will be around 350,000 h.p. It is the policy of the Nova Scotia Power Commission to develop these as fast as circumstances warrant.

Proceeding to his objective, the description of the development of the power possibilities on the East river, Sheet Harbour, which is on the Atlantic coast of Nova Scotia, about 62 miles northeast of Halifax, the speaker gave interesting facts and figures which he grouped around numerous pictures thrown on the screen. He gave special prominence to the work under way at Ruth falls.

Briefly, the power stretch of the East river, is 5½ miles long. In this distance there is a natural vertical drop of 175 feet. By artificial means it may be increased to 196.4 feet. It is proposed to utilize this in three developments to be located at Marshall falls, Malay falls and Ruth falls. The whole head might be utilized at one point but investigation showed that this would result in a decreased net head and economic reasons demanded that the river be developed in step with power demands.

The total drainage area above Ruth falls is 228 square miles, above Malay falls 211 square miles, above Marshall falls 209 square miles. At the end of the basin nearer the sea the average annual precipitation is 55 inches. Unfortunately the precipitation at the other end is unknown. If the precipitation at the centre of gravity of the area is the same as at the sea end the run-off is approximately 76 per cent of the precipitation.

Complete regulation of the river is possible. Seven storages totalling 68,000 acre-feet have been developed which will assure a continuous regulated flow of 365 second-feet. To make these required twenty dams of various kinds, timber-crab, earth, and bear trap. Twenty years of service are expected, with minor repairs being required during the last five. The total cost for the construction of these dams was $168,000, or $2.47 per acre-foot. If engineering, land compensation and surveying are included the total average cost was $3.81 per acre-foot varying from $1.58 to $5.82. About twelve more storages are available. Their unit cost will be greater, but they will increase the continuous regulated flow to 500 second-feet.

Malay Falls Development

The Malay falls development was commenced in October, 1922, and put into operation in May, 1924. It is situated four miles above the Ruth Falls development which is two miles above tidewater. Here the gross head is 43 feet which, because of small hydraulic losses in the intake system, is practically the net head also, except for such draw-down of the head pond as operation demands. The head pond is small having an area of 50 acres. An additional 800 acre-feet of storage was obtained as auxiliary to this small head pond by erecting a small timber-crib dam which will be replaced at some future time by the permanent intake dam of the proposed Marshall Falls development which will probably have initial use for storage purposes only giving a capacity of 15,000 acre feet. The rated capacity of the generating equipment is 4,500 k.v.a. From this station energy is supplied to the towns of New Glasgow, Stellarton, Westville, Trenton and Pictou. From Malay falls to Stellarton the power is transmitted at 66,000 volts over No. 2/0 aluminum cable, steel cored and stranded, which is supported on 50-foot, western, red cedar poles. For the additional 11 miles from Stellarton to Pictou the transmission voltage is 13,200 and the equipment similar except for the submarine cable, one half mile long, under Pictou harbour.

Ruth Falls Development

The development under way at Ruth falls was begun on January 24th, 1924. It will supply power to the A.P.W. Pulp and Power Company, most of which will be used in their pulp mill, constructed on the West river, Sheet Harbour, the remainder will be distributed chiefly for lighting purposes in the district nearby.

The development consists of an intake dam, a canal, a shaft, a tunnel, and the power house with its equipment. The dam is located immediately above Ruth falls. The main part containing the spillway is of mass concrete construction 633 feet long with a maximum height of 30 feet. Each end of the dam is terminated in the river bank by a concrete corewall on bed rock flanked by an earth fill 8 feet wide on top with side slopes 2 to 1. Stoplog sluices and a fishway are provided near the west corewall. The canal intake is near the east bank and consists of three 12-foot openings with provision for stoplogs, and a transition to the standard canal section.

The canal is 8,300 feet long, 90 per cent of which is lined with reinforced concrete 4 inches thick. The rest is unlined. The lined section is 14 feet wide at the bottom with sides sloping 1 to 1. The unlined section has 1½ to 1 side slopes and is twenty feet wide at the bottom. The canal with the exception of small fills on short sections of the lower bank is entirely in excavation. The two brooks which cross its course may be conducted in channels on the upper bank and directed across the bottom of the canal to the former course of the brook when the canal is unwatered. Ordinarily they discharge into the canal through screens. At the headworks the canal widens on the upper side for 1,000 feet to form a forebay of about two acres in area. All logs will be brought down the canal and discharged through a log-sluice opening near the headworks avoiding the loss of water necessary to take them down the rapid course of the river.

The headworks are on the hill above the power house, and consist of a reinforced concrete wall around the mouth of the tunnel, with two 12½-foot by 12½-foot gates with trash racks and ice run, and auxiliary stop logs, with all of the latter housed in a brick and tile building.

The tunnel and shaft are twelve feet in diameter and are lined throughout with concrete of minimum thickness equal to 6 inches. Approximately 6,000 cubic yards of rock were removed in sinking the vertical shaft 41 feet and driving the tunnel, which slopes first at 16° and then at 8°, a distance of 276 feet horizontally. Excavation proceeded from both ends, mucking at one while blasting was done at the other.

The tunnel terminates in a steel diffusing section embedded in concrete from which emerge three penstock connections. Two of these are completed to the turbines in the power house the third is not yet used being available for future extensions.

The power house is built between two ledges of rock which extend fifty feet into the river and reach to the surface of the water. The depth of water is 20 feet. A timber crib coffer-dam was constructed on the river side and used to unwater the site. For 32 feet above the draft pit, (i.e. to the generator floor), the building is of concrete construction. Above this it has a structural steel frame, walls of brick pilasters and hollow tile panels plastered on the inside and stuccoed on the outside. Three bays are constructed of length 21 feet with width 27 feet. Two of these are occupied by the turbo-generators. The third or southern bay contains the switch board and electrical equipment. Ultimately the power house will contain four bays.

The two vertical shaft, single runner, turbine units were supplied by the S. Morgan Smith Company of York, Pa., U.S.A. They have plate steel casings and draft tubes. Each unit has a maximum capacity of 3,290 h.p. at 400 r.p.m. under a net average working head of 107 feet. The turbine runners are of solid cast type. The main guide bearing on each turbine is of the water-lubricated, lignum vitae type. Each turbine is governed by a 12,000 foot-pound Woodward governor. The governor head and also the pumping units of the governor are driven by motors thereby eliminating the belt drive from the turbine shaft. All connections between the turbine gates and the governor are bronze bushed and provided with forced grease-lubrication.

The Swedish General Electric Company of Toronto supplied the two 2,500-k.v.a., 6,600-volt, 3-phase, 60-cycle, 400-r.p.m. vertical type, direct connected, alternating current, generators with direct connected exciters.

The thrust bearing of the Swedish General Electric type is mounted on the upper armcross and supported by the thrust ring. An oil cooling and pumping system located below the generator floor circulates cooled oil through the bearing. With this system it is not necessary to carry the cooling water pipes up over the stator to the bearing.

The switch board of nine panels, and switching equipment was supplied and installed by the Canadian Westinghouse Company, Limited, of Hamilton, Ontario.

The power is transmitted at 6,600 volts to the A.P.W. Pulp and Power Company's mill, a distance of two miles, over two separate circuits which are carried on a wood-pole transmission line. At the mill, three single-phase, 1,500-k.v.a. transformers will step down the voltage to 2,200 after which the power will be used by two 2,400 h.p. synchronous motors, and a number of small auxiliary motors aggregating about 350 h.p. which have all been designed for a 90 per cent power factor.

The head pond of the Ruth Falls development is the tail pond of the Malay falls development. It has an area of 350 acres, and will therefore be very useful in adjusting the flow of water between the two plants for the load factor at Malay falls is about 40 per cent and that at Ruth falls is nearer 70 per cent while the same water is used at each place and the headpond at Malay falls has an area of only 50 acres.

The gross head at Ruth falls is 109 cubic feet and the net head 107. The power station at Ruth falls is connected to the power station at Malay falls by a 6,600-volt circuit which will ultimately be replaced by a heavier line with transformer capacity up to 1,500 k.v.a.

The Marshall falls development remains as a possibility for supplying the augmented demands of the future. Here the gross head will be 44.4 feet and the net head 44 feet. When it is completed the whole of the 196.4 feet drop of the power stretch of this river will be utilized giving a net effective head of 194 feet.

Electricity in the Paper Industry

Professor J. W. Bain, A.M.E.I.C.
Kingston Branch, March 3rd, 1925

Modern conditions in any industry demand the maximum output for a given investment in plant and power equipment.

In considering the adoption of electric drive in a new mill, or to supersede mechanical drive in an old one, the engineer must be assured that he will thereby obtain uninterrupted service and lower production cost, either by a lower initial investment, by greater efficiency of transmission, or by lower operating expenses.

In general, electric drive permits of the power plant, whether steam or water driven to be located at the most advantageous point regardless of the location of the manufacturing buildings. These in turn may be erected in the most convenient location in regard to labour, production, receipt of raw materials and shipping of finished product, without regard to power plant.

In a new mill electric drive will considerably reduce the building construction cost due to elimination or reduction of heavy shafting and belting inseparable from mechanical drive. The structural work can, therefore, be of much lighter character. In the average mill the saving effected in this way will amount to about 5 per cent of the original cost of the buildings. The machinery may be located with a view to eliminating all unnecessary handling of material as each machine may be driven as an independent unit. Rerouting of product may be accomplished at any time when it may become necessary to meet new extension requirements. The generating plant may be divided into a number of units, thus insuring against complete shut down, and permitting economical operation of individual sections. If there are a number of small water powers, each of them too small to utilize directly with mechanical drive, each one may be developed and the total power applied at the mill located at the most suitable point. The large friction losses in building, gearing, and long shaft lines are eliminated. The power consumed by the different machines or sections may be readily measured by a recording instrument connected in the motor circuit, and the record will show at once whether the power consumed is normal or not, and will often serve as an indication of the condition of the machinery, and also as a check on the manner in which it is operated by the attendants. Additions to existing plant can be made without in any way interfering with existing equipment.

To illustrate the special features of electrical drive, and the applications of electricity in the manufacturing of paper, one special phase of the industry may be taken, and to this end the manufacture of high grade bond or ledger papers has been chosen. The sequence of events is as follows:

The Raw Materials

Cotton or linen rags constitute the principal raw material from which high grade papers are made, and the rag content of a bond or ledger paper forms the criterion by which its quality may be judged. The highest grades have a 100 per cent rag content, and the rags are clean white linen cuttings from shirt and whitewear factories. A cheaper, but excellent grade of bond paper is made with a 50 per cent rag content, the remainder being bleached sulphite pulp. The rags, clean or otherwise, white or coloured, collected by the wholesale dealers are sorted by them according to quality and colour, and sold to the paper manufacturers in carload lots at prices varying according to grade, from 15 cents a pound for No. 1 white linen to 2.5 cents for the lowest grades.

Thrashing and Dusting

The first step in the process of manufacture is to remove the dust and dirt from the rags by subjecting them to a thorough beating in a thrashing machine. This consists of a cylinder about four feet in diameter and ten feet long, made of wire netting, through which the rags are carried by an endless belt conveyor. Inside this cylinder a rotor revolves, carrying a number of paddles, which pick the rags and whirl them around the cylinder. This cylinder is encased in a wooden box to which is connected a suction fan. The fan carries the dust to a dust proof compartment, to be later disposed of in one of a number of ways. This dust is highly inflammable, and sometimes explosive. The rags are fed in at one end of this machine, and emitted at the other end comparatively free from dust. Thrashers are driven by totally enclosed induction motors, having forced ventilation. Even though the motor is enclosed the dust from the rags is so fine that it finds its way in, and the motors in the rag department must be taken apart for cleaning at least twice a year.

Sorting and Cutting

On coming out of the thrashing machine, the rags are sorted out according to grade and colour and the buttons, hooks, and other foreign materials removed. The dust and dirt remaining in the rags after thrashing fall through the wire netting tops of the sorting tables, and are disposed of. From the sorters, the rags go to a mechanical cutter in which they are cut into very small pieces. The drive for this cutter is also a totally enclosed induction motor with forced ventilation.

Boiling

The next stage in the process is boiling. The rags are placed in a large shell in which they are subjected to the action of caustic soda at the temperature of steam under a few pounds pressure. The shell is rotated slowly during the process, which is continued from four to six hours. The alkali removes all traces of oil and grease, and destroys any wool or silk contained in the original rags. Tool, silk or any other animal products are worthless for paper making.

Washing and Bleaching

On coming out of the boiler the rags are placed in large tubs called washers. Washers consist of long, oval tubs with a partition in the centre. On one side a large drum carrying a number of steel blades revolves at a small distance from the bottom similarily armored. The rags are disintegrated into the original cotton or cellulose fibres by the action of these blades. The stock circulates continously through the tub around the centre partition. Fresh water pours in at one end of the machine and the dirty water laden with alkali is continously drawn off at the suction cylinder. When the washing has gone on for about two hours the supply water is stopped, the suction cylinder lifted, bleach is added and the circulation continued for two more hours. When bleaching is complete, the stock is transferred to draining vaults situated under the washers. These are concrete vaults about 12 feet long by 8 feet wide and 10 to 12 feet high, the floors of which are made of glazed bricks pierced with a large number of small holes, about four to the inch and 1-16 inch in diameter. Through these holes the bleach-laden water escapes to the sewer. The stock remains in the drainers from one to three weeks.

Beating

The half formed stock which comes out of the drainers has lost 30 per cent of its original weight in rags and its value has increased about 60 per cent, due partly to reduction in dry weight and partly to the cost of the process it has so far undergone. The stock now goes into the beaters for one of the most important processes in the manufacture. On proper beating depend to a very large extent the uniformity and quality of the finished product. The beaters are oval tubs of similar construction to the washers. They are similarly equipped with steel toothed drums and bottom plates, the distance between which can be very accurately adjusted. The drum is gradually lowered by the beater-man as the operation proceeds and on the skill and experience of this man depends the quality of the stock. The fibers must be stretched and straightened out by a sort of combing action without being broken or the stock will become what is known as "short" and the paper made from it will lack in strength. While the stock is in the beaters, the colour, if any, is added and all other necessary chemicals, alum which acts as a mordant for the colour, china clay which gives weight to the paper and later in the calenders will contribute to the glossy finish. Rosin size is also added at this stage. In the case of low rag content paper, the wood pulp, usually bleach-sulphite, is added gradually as the beating proceeds and also a pulp made from mill shavings broken up in special machines.

Beater and Washer Drives

Beaters and washers are driven in group, in pairs or singly by squirrel cage or slip ring induction motors. A method used to a large extent is to drive them in pairs with belt or silent chain drive.

The Jordan Refiner

On leaving the beaters the stock to which large quantities of water have been added is run into the stock chests, — large vats in which the stock is kept continually agitated by mechanical means to prevent settling of the solid fibers. From the stock chests the stock is pumped up again to go through a final refining process in the Jordan refiner. This consists of a hollow cone, the interior of which is fitted with blunt steel blades similar to those of the beaters. Inside of this revolves another cone, the outside of which is similarly fitted. The stock is refined between the two sets of blades and as the operation proceeds the inner cone is moved so as to decrease the clearance between the surfaces. The driving motor is a squirrel cage induction motor mounted on a sliding base to permit axial motion of the inner or rotating cone relatively to the outer or rotating portion. On leaving the Jordan refiner the stock is ready for the paper machine which will in a few hours turn into a continuous sheet the stock, in the preparation of which, several weeks have been spent.

The Fourdrinier Machine

The modern paper machine named after the two Englishmen who were responsible for the development of the first practical machine of its type, consists of a number of parts or sections each performing a distinct and separate operation, but constituting together a complete machine, the different parts of of which must work in perfect harmony and proper speed relation. The different parts of the Fourdrinier machine are:—The stock pumps, screens, wire, the shake, suction boxes, dandy roll, couch roll, presses, dryers, calenders and reel. The stock is pumped up from the large stock chest and passes through the screens which stop any impurities, foreign substances and foam, which would mar the product. Electro-magnets gather any iron particles from wear of the beater rolls. From the screens the stock which is 98 per cent water and has the consistency of milk passes on to the wire. The Fourdrinier wire is an endless sheet of wire gauze of fine mesh, usually of from 50 to 70 wires to the inch, moving forward at the speed of production which varies in this grade of paper from 100 to 300 feet per minute. The water passes through the gauze and leaves the fibers on the wire. As the fibers flow on the wire, they have a natural tendency to set themselves parallel to the direction of flow. In order that the sheet of paper may have strength at right angles to its length, this tendency is overcome by shaking the wire continually sideways by means of suitable mechanism.

The Dandy Roll

This has two objects, it compresses and smooths down the surface of the sheet during formation and also produces the watermark in the paper by means of a raised design on the roll.

Suction Boxes

In order to remove some of the water from the stock, suction boxes are next used. These have flat surfaces lying against the underside of the wire and by means of a vacuum draw the water out of the stock.

Couch Rolls

The web of paper now leaves the wire and passes through the couch rolls which press out more water and the sheet has now sufficient mechanical strength to leave its support and pass on to the first press felt which carries it on to the first set of press rolls. It passes in succession through two and in some cases three sets of press rolls. The presses remove 40 per cent of the water contained in the sheet as it leaves the couch. The sheet is then passed on to the dryers, large hollow rolls heated by steam, in which the paper is dried. The finished sheet passes through a size tank where it is impregnated with animal glue, then through another battery of driers and finally through the calenders where it receives a glossy finish before it is wound up on the reels.

According to driving requirements the Fourdrinier machine is divided into two distinct parts.

1. The constant speed part consisting of:—stock pumps, screen shake, wire shake and suction pumps, is driven by a squirrel cage induction motor and presents no special problem from the drive point of view.

2. The part consisting of:—wire, couch, presses, dryers, calenders and reels is called the adjustable speed part. With a constant rate of stock flow on the wire, in order to be able to make on the same machine, various thicknesses and weights of sheet, the wire and other parts named must be capable of being driven at different speeds.

The speed requirements of the adjustable speed part are as follows:—

a. Speed adjustment of 3 to 1 and sometimes 4 to 1 ratio.

b. Constancy of speed once adjusted.

c. Furthermore the speed of the various sections cannot be the same. These sections are interconnected mechanically by the delicate sheet of paper which stretches in the presses, contracts in the dryers, stretches in the size tank to contract again in the second dryers and stretch slightly in the calenders.

The sections must, therefore, have slightly different speeds to conform to these variations in the length of the sheet or it would break between two sections. Moreover, the contraction in the dryers is gradual and they must be separated into a number of sections themselves in order that the sheet may not break in going through them. These changes in the length of the sheet are termed the draw. Once the speed ratios have been adjusted, however, to take care of this draw they must not vary by more than 1/10 of 1 per cent on penalty of breakages which with the consequent necessity of re-threading the machine, are a cause of great waste, and so, there are the further speed conditions of:—

1. Slightly different speeds of the sections.
2. Constancy of this speed once adjusted.
3. Adjustability of this ratio for different weights and grades of sheet.

Mechanical Drive

In the newer types of mechanical drives the adjustable speed part of the paper machine is driven by an adjustable speed steam engine coupled to a long shaft running the entire length of the machine and the various sections are driven from this shaft by means of cone pulleys, the draw between sections being adjusted by shifting the driving belts on the cone pulleys. In the older types a constant speed steam engine is used, this is coupled to the main driving shaft through a Reeves speed change. The Reeves speed change consists of a cast iron frame on which two shafts run parallel to one another. Each shaft carries a pair of cone-faced discs over which runs a V-shaped belt, fitting the V-shaped groove formed by the discs. The two pairs of discs are operated by a shifting lever in such a way that one pair is separated, while the other pair is brought together. This causes the belt to run over a smaller diameter of one pair of discs and a larger of the other giving increase or decrease of speed of the driven shaft. In the early electric drives a large d.c. motor of the shunt type designed for speed variation over a wide range by field weakening was coupled to the long driving shaft and merely took the place of the adjustable speed steam engine. The more recent developments consist of individual motors for each section of the machine, means of adjusting the speed ratio between them, means of preventing this ratio from varying and means of adjusting the speed of the paper machine as a whole.

Steam versus Electric Drives

A considerable amount of steam is used to heat the dryers of a paper machine and it does not pay, unless power is very cheap, to use live steam in the dryers. The non-condensing steam engine removes only about 6 per cent of the heat in the steam and as a rule it pays to take this power out of the steam and heat the dryers with exhaust steam. This policy is usually perfectly sound and was for a long time one of the arguments against the adoption of the electric drive. Mechanical engineers said: "We must have steam engines for reasons of economy and so we cannot have your motors." Let us, by all means, where economically desirable have the steam engine and heat our dryers with exhaust steam but let our engines drive electric generators instead of shaft lines and we shall be taking advantage of the steam power available and at the same time enjoy all the advantages of the electric drive. In certain special cases where electric power is very cheap, it is often advisable to discard the steam engine and heat the dryers with live steam generated in the electric steam generator as mentioned below.

Sectional Electric Drives

As already stated the fundamental speed requirements of the paper machine are:—

1. Adjustability over a wide range.
2. Adjustability of speed ratio between sections.
3. Constancy of adjustments once made.

The first requirement is met in all types of sectional electric drives by using inter-pole d.c. motors of the shunt type, the adjustment of speed being obtained by field weakening or by impressed voltage. The speed of a d.c. motor of this type varies directly as the voltage impressed across its terminals and inversely as the strength of its magnetic field. The means employed to adjust the speed ratio between the sections to compensate for draw are also identical in all types, but the methods used to insure the constancy of this ratio are different in the types made by each manufacturer. Two of the best known types are the Harland differential interlock, and the Westinghouse regulator.

The Electric Steam Generator

A paper on the applications of electricity in the paper industry would not be complete without a brief reference to the electric steam generator. In general, the cost of electric energy is such that it cannot be used commercially for the production of steam, but there are circumstances under which the conversion of electric energy into steam, even on a large scale is economically feasible. The required conditions are a surplus amount of electric power, for which there are no other uses at certain times, or a very cheap supply of power. One or other of these conditions frequently exists in paper mills. Where power is purchased at a flat rate, or where it is derived from the mill-owners own hydro-electric plant, all excess power at certain periods of the day can be used in the electric boiler and the saving of coal effected in this manner is a subject worthy of careful consideration. In the case of the existence of a cheap supply of power, the price which can be paid for this energy, for the production of steam is dependent upon the price of coal, and can readily be calculated. If a supply of power is available at a price not exceeding 1.65 mils per kilowatt hour in a plant where coal costs $8.00 per ton it can be shown that the production of steam by electric power is commercially feasible.

The most successful type of electric steam generator is the water resistance type. It consists of a closed pressure vessel to which is connected a source of water supply and from which water may be drawn off at the bottom and steam at the top. In this vessel electric power is made to flow through the water from an electrode in the form of a plate or tube, to the inner lining which forms the other electrode. Alternating current is used at pressures varying from 110 to 12,000 volts. The generators are constructed for the use of three phase power by employing three electrodes in one vessel or three vessels with one set of electrodes in each, in which case the outer shells are joined together and grounded, forming the neutral point of a star connection.

In this type of generator, there is no heating surface, the generation of steam taking place throughout the water and no part of the boiler is at a temperature higher than that of steam, — an extremely important feature from the point of view of safety and continuity of operation. Furthermore, the efficiency is very high as the heat is generated in the water itself, in fact it can be made as high as desired by preventing radiation losses from the outer shell by lagging. In the operation of this generator, the load or electrical input depends directly on the area of the electrodes immersed and inversely on the specific resistance of the water. The area of immersion is controlled by the operation of the feed valve and the specific resistance of the water is computed. The variation of specific resistance of the water is effected by bleeding from the bottom of the generator. The water at the bottom contains a comparatively high percentage of salts and is therefore of low resistance so that removal of a proportion of this water increases the resistance of the remainder and as the amount bled is made up with feed water of high resistance, the input is correspondingly decreased. It has been found that for ordinary fluctuations of load, a practical method of operation is to maintain a constant water level, and to vary the output by varying the water resistance by means of the bleeder valve at the bottom. In order to make possible the application of the electric steam generator under conditions where a fixed amount of power is purchased, which is not all utilized in manufacturing operations, a relay system has been developed which will govern a total amount of power taken by the consumer, and will insure that all power paid for, and not otherwise required, is utilized in the production of steam. The principle of operation consists of cutting in or out the feed water supply by means of the relays, which are operated by the total power consumed, and they can be so designed that the energy which is unused is less than 5 per cent of the total energy purchased. The water resistance electric steam generator has therefore been developed to such a point that surplus power may be utilized under any given conditions, and in cases where power is cheap, it competes very successfully with the coal fired boiler.

The subject of "The Application of Electricity to the Paper Industry" is far from being exhausted in the above paper, but possibly enough has been given to show the importance of the field open to the electrical engineer in this most important national industry.

Telephone Engineering

W. K. Detlor

Kingston Branch, March 17th, 1925

The administration of an extensive operating telephone company requires an executive staff largely composed of engineers to insure its proper functioning. These are known as telephone engineers and their studies vary widely, ranging from problematical statistical work to complex calculations on electrical circuits, but including as a major portion the engineering of sound common sense applied to the facts of the case, and treated from a point of view of least annual charges.

To the subscriber, service consists in the ability to communicate with any other subscriber in the same or associated systems within a reasonably short interval of time, and to talk to and hear the other intelligibly. To the operating company, service consists in establishing on request a satisfactory two-way channel of communication from any subscriber to any other, at any hour of the day or night. This entails the provision of facilities and personnel required to handle a constantly increasing volume of traffic, and to maintain the existing facilities in operative condition economically.

The operating telephone companies offer a service whose value to its users and the community is so greatly in excess of its cost to them, that the continuous development of the telephone industry is assured.

The rate of growth of the number of stations and the resulting traffic is enormous, and facilities must be provided in advance or the public is not well served. Much equipment must be ordered years ahead, and so planned as later to fit in the general expansion. The annual growth and necessary provision for the future are subject to the condition characteristic of this industry, that the unit cost rises as exchanges become larger; but the value of the service is increased by each telephone added to the system.

The rate of growth experienced and expected has necessitated the planning of the engineering and financing of the industry far in advance. Every year provisional budgets are made up for each of the five succeeding years, providing for the expenditures required, the budgets are based upon the estimated line and station increase for the period.

The administration is organized into five main branches in addition to the president, board of directors, and chief executives.

Five Principal Administrative Divisions

The *commercial department* sells the service, collects the revenue, calculates the rates, forecasts the sales expected in the future, analyses the problems of business administration and the results obtained, studies the reactions of subscribers under existing methods and suggests changes tending to improve them.

The *traffic department* handles the calls, and keeps accurate records of their volume, rate and holding time. From the records and expected growth forecasts, they calculate for manual offices the numbers of switchboard sections, circuits and operating personnel required: For machine switching offices, the numbers of each type of switch, accessory circuits, and equipment necessary to provide for expected traffic. From observations, a close check is maintained continuously on the operating efficiency of the system.

The *engineering department* engineers and orders the equipment, buildings and outside plant material necessary. This department also produces standards for design, construction, operation and maintenance of the plant on an economic basis. The five year budgets are produced in this department.

The *plant department* maintains all construction, equipment and buildings. They construct the outside plant consisting of aerial and underground cable, conduit, pole lines etc. and install the sets on the subscribers premises. Central office equipment is installed by the Northern Electric Company and buildings are built by contracting firms.

The *accounting department* keeps records of receipts and disbursements, capital investments, salvage, depreciation, maintenance costs, and a multitudinous array of data in connection with the financing of the company. They keep records of the activities of the company and produce a monthly balance sheet for the guidance of the executive.

Engineering in the Departments

Commercial engineering is the science of accurately estimating telephone growth and development together with the study and analysis of potential markets for the sale of telephone services and equipment under sufficient charges and well balanced rate schedules to develop the telephone markets and give a reasonable return on the investment. It also includes the development of proper practices to render an efficient commercial administration of the telephone business.

The basis of estimating telephone growth is the past, present and future trends in population, the characteristics of that population, and its ability through earning power to purchase telephone service over a period of years. Estimates are made in detail over the 5-year period for coordination of the 5-year budget plan. A more general forecast is made for the 20-year period.

Traffic engineering is the science of accurately estimating the traffic expected and the amount of equipment, numbers of circuits and personnel required to handle it efficiently and economically. Under the traffic engineer, the requirements, for the five year periods are estimated and requested from the engineering department.

Plant engineering is the science of engineering, constructing and maintaining plant facilities on a sound economical basis and entails their timely provision. For any expenditures of more than one thousand dollars a specific estimate of the cost and necessity of the work must be submitted by the plant engineer for the approval of the executive before the work is begun.

The *Engineering Department* is divided into six divisions: (1) Fundamental plans division; (2) outside plant division; (3) equipment division; (4) transmission division; (5) special studies division; (6) architects division.

The fundamental plan division determine central office locations, boundaries, conduit routes and numbers of ducts by comparing the total distribution cost over a period of twenty years for various plans and choosing the most practical and economical scheme.

From cost comparison studies they also determine the grade of facilities in loops from the subscribers stations to the central offices, and in trunks between the offices. The "loop and trunk" studies compare various destribution methods, each of which must fulfil the requirements for standard transmission. Again the most practical and economical plan is chosen. Existing and required numbers of trunks for the five-year period are studied and the necessary numbers of cables in each trunk route indicated at the proper time.

The five-year programme studies are made by the fundamental engineer in conjunction with the traffic department and the equipment division, and result in the programme giving the dates of cutover of extensions and new offices, and the numbers of terminals provided.

The *outside plant division* is responsible for the layout of outside plant construction. Tools, specifications and methods of construction are standardized for use in the plant department. The specific estimates from the plant department are checked in this division before being passed on to the executive for approval, and an economical layout is thereby assured. The cable requirements for outside plant construction are scheduled far enough in advance so that the Northern Electric Manufacturing Co., can deliver the material at the proper time.

The *equipment division* engineers all central office and substation equipment, circuits and apparatus. Specific estimates for each undertaking must receive executive approval. Following this, specifications are submitted to Northern Electric Company, price agreed upon, and the order given. The manufacturing company must receive the order far enough in advance of the required installation to fit it into their programme. Hence the coordination of the various phases of equipment engineering is a very important part of the duties of this division.

The *transmission division* determines the transmission standards by which the plant is designed in other departments. Transmission complaints are investigated. Inductive interference, crosstalk, acoustic shocks and electrolysis are the subjects of special investigation to lower their derogatory effects on the transmission. Information on transmission maintenance work and on plant design data is developed and issued by the division for use throughout the organization.

The *special studies division* prepare the five-year budget for the executive, assembling it from the budgets submitted by all departments. Special studies include the inventory, plant records, depreciation, and unit cost studies.

The *architects division* handle the engineering of the buildings, prepare the specifications for the same, and arrange the contracts for the actual construction.

Slides were shown illustrating various phases of telephone work. The following engineering studies were discussed in more detail, because of special interest: *Scheduling* and *coordinating* work; *zoning* — saving in annual charges on cable, resulting from the introduction of a newer and more efficient transmitter in certain zones or bands; *office names* — and changes necessitated by the introduction of machine switching.

Steel Caissons for New Government Graving Dock, Esquimalt, B.C.

In the early part of January, Yarrows Limited, Victoria, B.C., of which Norman A. Yarrow, A.M.E.I.C., is managing director, was awarded the contract for the construction of the two floating steel caissons for the new Esquimalt graving dock. In brief, these gates will employ nearly 2,000 tons of steel material. There is a slight difference in the dimensions of the two gates, as will be seen by the following particulars:–

Caisson, No. 1.	49′0″ high	Caisson, No. 2.	46′0″ high
	139′4⅛″ long		138′6″ long
	27′0″ beam.		27′0″ beam.

The total completed weight of each gate will be approximately 1,600 long tons, inclusive of the 550 long tons of concrete ballast in each caisson. They will draw about 28 feet 6 inches of water when floating light, and when submerged, the draft will be approximately 45 feet 6 inches. They are more or less ship-shape in appearance, insofar as they will have tapered ends or bows, and have six decks in all. The facing of the keel and stem will be fitted with Australian iron bark, which will make the watertight bedding surface against the drydock masonry face.

Each gate will have its own electrical pumping machinery for operating purposes. Electric motors of a vertical type will be situated on deck No. 2, and will operate centrifugal pumps, located on deck No. 4, by means of a vertical shaft.

The caissons are operated in the following manner:— The water is first of all pumped out in order that the gates shall float, and when in this condition, they are warped into position, the scuttling valves opened, and the gates submerged. The main pumping machinery of the drydock is then started, and as soon as the water begins to recede inside the dock, the pressure on the sea side forces the gates against their masonry bed and thus watertightness is obtained. When a ship is to be undocked, and after it has been floated by flooding the drydock, the caisson or caissons are then pumped out by means of their own pumping equipment, and when afloat, are moved away, enabling the ship to proceed out of dock.

These gates will be erected at the company's yard, Esquimalt, and built on their side, and launched in this position. When afloat and uprighted, the superstructure steel work will be completed, after which, the stability tests will be made.

It will be about the end of the year before these gates are completed and ready for operation, which will conform with about the time the drydock itself is expected to be ready. At the date of writing 98 per cent of granite is laid.

EMPLOYMENT BUREAU

Situations Wanted

Civil Engineer

Civil engineer, 1924 graduate, age 25, desires to connect with and engineering firm or consulting engineers interested in hydraulic development or municipal work; past experience in surveying, municipal layout, underground transmission construction, and four years general accounting. Immediate salary and location not primary consideration, opportunity for experience and advancement upon proven merit important. Apply box No. 181-W.

Designing Engineer

A.M.E.I.C. — 15 years experience in structural steel and reinforced concrete building work, as designer, chief draftsman, salesman, etc., with Bridge Companies and consulting engineers. Open for immediate engagement as above or in engineering executive capacity. Montreal, Toronto vicinity. Apply Box No. 182-W.

Recent Graduate in Civil Engineering

Student Member of *The Institute*, graduate in civil engineering from University of Manitoba, desires a position on Hydro-electric Development or other construction work. Some experience at power construction and in assisting the structural engineer on industrial building construction. Apply Box No. 183-W.

Situations Vacant

Structural and Designing Engineer

Experienced Structural and Bridge Engineer wanted to take full charge of Designing and Estimating Office. References required. Applications will be considered confidential. Apply The Hamilton Bridge Works Company, Limited, Hamilton, Ontario.

Members' Exchange

Request has been received for certain numbers of *The Engineering Journal* to complete sets for library purposes. Any member who could spare copies of the following numbers would confer a favour by forwarding the same to the Secretary of *The Institute:*—

September, 1922. January, 1924. May, 1924.

Transactions of The Institute

A member of *The Institute* wishes to dispose of a set of the Transactions of the Canadian Society of Civil Engineers, including all volumes issued up to 1904. These volumes are well bound, and are in perfect condition and would be suitable to complete a set for library purposes. For further information apply to Box 11-E.

Hoisting Engine

FOR SALE — Marsh and Henthorn 6½″ x 8″ double cylinder, double 12″ drum, 15 h.p. standard hoisting engine, without boiler, Sacrifice at $250.00. Roy Loucks, A.M.E.I.C., Regina, Sask.

Possibilities of Coke as a Domestic Fuel

That 52 per cent of the domestic fuel requirements of the acute fuel area of Ontario and Quebec could be supplied with by-product coke, manufactured in conjunction with gas to meet the present gas consumption of the area, is one of the outstanding statements made in a report just issued by the Dominion Fuel Board. The report gives the result of a thorough investigation of the possibilities of coke as a domestic fuel conducted for the board during the past year by J. L. Landt, consulting engineer.

By-product coke ovens, it is pointed out, can only be economically operated where there is a market for the gas produced. Strategic points selected as especially suitable for plants are Port Colborne, London, Toronto, Ottawa, Montreal, and Quebec. Industries around Port Colborne would furnish a large industrial demand for the gas produced, whilst in the other centres mentioned there is a domestic as well as an industrial demand. One of the most up-to-date by-product coking plants on the continent, with a capacity of 320 tons of coke daily, was built last year in Hamilton and is supplying that district with both coke and gas.

The importance of by-product coke lies in the fact that being manufactured from bituminous coal, it would largely make the acute fuel independent of anthracite, the supply of which is dwindling and the price advancing. The report points out that Nova Scotia bituminous coal, of which the Mines Branch have recently made coking tests, could be used in the production of by-product coke, provided it could be laid down in Ontario and Quebec at a price to compete with United States bituminous. There is a very large supply of the latter and the present mines are capable of producing much more than the United States can consume.

BRANCH NEWS

Montreal Branch

C. K. McLeod, A.M.E.I.C., Secretary-Treasurer.

Reconditioning Frogs and Rail by Oxy-Acetylene Under Traffic

On the evening of March 26th, the Montreal Branch were given a paper on the above subject by Major G. P. MacLaren, M.E.I.C., engineer, maintenance-of-way, Canadian National Railways. A complete welding apparatus had been installed in the lecture room, and a very interesting demonstration of its use was given at the termination of the lecture. H. T. Hazen, M.E.I.C. occupied the chair.

The Municipal Underground Conduit System of Montreal

At the start of Mr. Templeman's paper, he showed some very interesting slides illustrating the conditions in Montreal at certain well-known street inter-sections as they existed before the introduction of the conduit system and after. Mr. Templeman also illustrated by maps and diagrams the growth of the systems and the territory at present covered. He pointed out however that the high cost limited the application of the underground system to the congested areas only.

Various members of *The Institute* representing several of the public utilities of Montreal entered into the discussion which followed.

In presenting a vote of thanks, the chairman, De Gaspé Beaubien, M.E.I.C., said that Mr. Templeman had shown the difficulty of making such a change in methods. He traced the legislation that had started the commission and its work, which had begun in earnest in 1913. The whole subject he said was very involved, and also meant much expense. The main thing was that the commission had met with cordial co-operation from the tax payers involved in payment for the work, and without such co-operation such progress would have been impossible.

Vancouver Harbour

The history and development of the Port of Vancouver was described to the members of the Montreal Branch on April 9th by A. D. Swan, M.E.I.C. Mr. Swan was commissioned on two occasions, first in 1912, and later in 1919, to examine into and report on the general conditions at Vancouver, and to make recommendations for the further development of the port. After giving the geographical location and some data as to the areas of the various basins, Mr. Swan went on to describe the various schemes which were considered as being feasible for the development of the port.

Part of one of these schemes was carried out in the building of the Ballantyne pier, which is an up-to-date example of modern methods of mechanical equipment for expeditious handling of freight and passengers to and from the ships.

A brief discussion followed on the port of Vancouver, which was entered into by Thomas Harling, who gave some interesting figures as to the relative amount of grain shipped through Montreal and Vancouver, and who pointed out that the shipment of grain through Vancouver harbour was to the general good of Canada, and would ensure the exportation of Canadian grain by Canadian ports instead of through United States routes.

Following some further general discussion, the chairman of the meeting, F. P. Shearwood, M.E.I.C., tendered a vote of thanks to Mr. Swan.

On the evening of April 16th, J. G. Caron, A.M.E.I.C., gave a paper profusely illustrated with diagrams and tables on the subject of "Consideration of Rainfall and Run-off in Connection with Sewer Design". The use of automatic rain gauges was fully discussed and some interesting comparisons were made between the results obtained at the McGill University and at the city station in the down town section of the city.

In the discussion which followed, O. O. Lefebvre, M.E.I.C., stated that his interest in rain fall was slightly different to that of Mr. Caron's, as he was chiefly concerned with the rain fall over the watersheds of rivers, and not over comparatively small areas as is the case where the design of sewers is being considered.

The chairman, George R. MacLeod, M.E.I.C., told of some of the difficulties that the city engineering department have in obtaining scientific instruments. He complimented the author on his paper saying that it was the results of years of study.

Death of Prof. Lamb

Previous to the meeting of the Montreal Branch on April 2nd, a resolution of sympathy was moved by Dean H. M. Mackay on the sudden death of Prof. H. M. Lamb, M.Sc., A.M.E.I.C. Dean Mackay expressed his personal sorrow and that of the members of the Branch at the death of Prof. Lamb.

This untimely death, he said, had cut short a promising career. Prof. Lamb, despite his academic success, had been a man of modest and unassuming character, an inspiring teacher and a faithful friend. His friends in the engineering profession would mourn his sudden taking away. He, therefore, moved a formal resolution of regret at the death of Prof. Lamb, with an expression of sympathy for the family, this to be drawn up and sent to the widow and family as an expression of the sympathy of the Montreal Branch of *The Engineering Institute of Canada.*

This resolution was seconded by Frederick B. Brown, M.Sc., M.E.I.C., and was carried by a standing vote, the members standing in silence for a minute as a token of regard for the member and friend they had lost.

Student Section.

A Student Section of the branch has been authorized and formed on receipt of an application by the requisite number of corporate members. The object of the formation of this section is to provide a direct means of contact between *The Institute* and the students, and to increase the student interest in engineering matters. The chairman and the vice-chairman of the Student Section automatically become members of the Papers and Meetings Committee and are thereby responsible for obtaining papers from Students. F. E. Winter S.E.I.C. of McGill University has been elected as chairman and G. Gingras of Ecole Polytechnique as vice-chairman of this section.

A.S.C.E.

The American Society of Civil Engineers are holding a convention in Montreal from October 12th to the 16th, and the Montreal Branch has been invited to entertain them at a smoker on the evening of Wednesday, October 14th.

Peterborough Branch

Paul Manning, A.M.E.I.C., Secretary

W. E. Ross, A.M.E.I.C., Branch News Editor

A regular meeting of the Peterborough Branch was held on Wednesday March 25th, in the Chamber of Commerce, under the chairmanship of W. M. Cruthers, A.M.E.I.C.

Wiring Devices, Past and Present

C. S. Mallett, manager of the Ward Street works, Canadian General Electric Company, Toronto addressed the meeting on the subject of "Wiring Devices, Past and Present".

Mr. Mallett exhibited a varied and comprehensive assortment of wiring fixtures illustrating the development of the art from the days of the old wooden bases to the most up-to-date and competitive designs of the present day, and gave his audience some interesting facts regarding the factory methods and special tools required for the mass production of these small, but highly important devices.

The speaker emphasized the enormous quantities of small parts which have to be handled, as an instance, referring to the production of ordinary key sockets, which each have seventeen separate parts, some of which necessitate eight different operations, the average output of this particular socket being 9,000 per working day.

He also described the rigorous tests called for by the Underwriters Association and by the Hydro-Electric Power Commission, on this class of equipment, and gave extracts from the Underwriters' specifications.

At the conclusion of his address, Mr. Mallett was called upon to answer many questions from the members, and later indulged in some interesting reminiscences of the days when he was mechanical superintendent of the Peterborough works of the Canadian General Electric Company.

At this meeting E. R. Shirley, M.E.I.C., R. L. Dobbin, M.E.I.C., and P. P. Westbye, M.E.I.C., were appointed a nominating committee to draw up a list of nominees for office for the coming year.

On the motion of the secretary a resolution was passed in favour of daylight saving for the summer months, this being a live issue in Peterborough at the present time.

St. John Branch

W. J. Johnston, A.M.E.I.C., Secretary-Treasurer.

Joint Meeting with the University of New Brunswick

On April 1st, 1925, the members of the St. John Branch held a joint meeting at Fredericton with the Engineering Society of the University of New Brunswick. A party of sixteen made the trip from St. John, and on arrival at Fredericton were entertained at supper at a church tea in progress that evening, and later found automobiles at their disposal to convey them to hotels and the University grounds.

Prior to the meeting, the members were shown through the Memorial building, lately completed, in honour of the thirty-three men from the University of New Brunswick who fell in the Great War.

The meeting was held in the Science building, and was opened with J. L. Bond presiding as president of the Engineering Society, who welcomed the branch members to the joint meeting. On the meeting being turned over to the St. John Branch, G. G. Hare, M.E.I.C., became chairman of the meeting.

The Teredo

A paper was delivered by E. G. Evans, M.E.I.C., of Moncton, on "The Teredo", and covered in particular the work of this marine borer along the eastern coast of New Brunswick. By means of slides, samples of teredo-eaten wood, and preserved samples of the teredo, the audience were fully informed of this destructive marine pest.

New Brunswick Highways

L. L. Theriault, M.E.I.C., of Fredericton, read a paper on "New Brunswick Highways", which was a historical sketch of highways, from the early trails in 1786 to the post roads for the delivery of mails; the enlargement of the system made possible by colonization of new areas; down to the present-day automobile highway. A fine set of lantern slides of highways in different parts of the province showed how this province had each year spent its full allotment of federal aid for highway work.

Electrolysis of Lead Cable Sheaths and its Mitigation

There followed a paper on "Electrolysis of Lead Cable Sheaths and its Mitigation", by C. L. Roach, Jr. E.I.C., of St. John, which showed by means of charts the reasons for the damage of this agency to metallic conductors underground; the results of tests made during an electrolytic survey of the underground conduits of the New Brunswick Telephone Company in St. John were also given.

After the reading of each paper the chairman allowed a discussion limited to ten minutes, and a suitable vote of thanks was passed to each speaker. C. F. Sanford, K.C., of St. John, was an interested spectator, and was called on for a few remarks. A vote of thanks, on motion of G. G. Murdoch, M.E.I.C., and J. S. Armstrong, M.E.I.C., on behalf of the St. John Branch of *The Engineering Institute of Canada*, was tendered to the Faculty and Engineering Society of the University of New Brunswick for courtesies and hospitality extended in connection with the meeting.

For several years the St. John Branch have held one meeting each year in Fredericton, which is within the branch territory, and where fifteen Institute members reside. Thus it is possible for Fredericton members and the engineering students at the University of New Brunswick to attend a branch meeting, and the St. John members to renew acquaintance with the Fredericton members. From St. John to Fredericton is 65 miles by rail; under existing train schedules the party leaves St. John at 4.00 p. m., with choice of return at 9.00 a. m., or 1.00 p. m. the following day. All members from St. John who made the trip declared it a success from every standpoint.

Service Engineering at the Mount Royal Hotel, Montreal

At a meeting in St. John on April 8th, 1925, an address on "Service Engineering at the Mount Royal Hotel, Montreal" was delivered by Walter J. Armstrong, M.E.I.C., of Ross & Macdonald, Inc., Architects, Montreal. The various features of the mechanical equipment in the Mount Royal hotel were described by means of lantern slides. The subject of the address proved most timely in view of the Admiral Beatty hotel now under construction in St. John and in which many of the mechanical installations of the Mount Royal will be duplicated on a smaller scale.

The contract for construction of the Mount Royal hotel was signed on August 31st, 1921, two weeks later excavation was started, a maximum force of 1,500 men were engaged in July 1922, and the building was opened to guests on December 20th, 1922. The building contains 2,500 rooms, large and small, and of these 1,050 are guest rooms; has a content of 9,363,000 cubic feet, with a total floor area of 766,000 square feet, or approximately 18 acres on fourteen floors. This includes basements and part of Mezzanine floors. The buildings, including permanent equipment, cost about $6,000,000., of which about $2,000,000. was expended on service engineering features.

The various features of heating, ventilating, laundry, water supply. electrical installations, kitchen equipment, plumbing, elevators, etc., were explained in detail as slides, showing these, were thrown on the screen. An unusual feature was the drilling on the hotel site of a 10-inch diameter well to 900 feet testing 7,000 gallons of water per hour, so that the water supply of the hotel would be unaffected by any possible interruption of service from the water system of the city of Montreal, in addition to two separate connections with the city's water mains.

G. G. Hare, M.E.I.C., presided, and tendered a vote of thanks to Mr. Armstrong on behalf of the branch, on motion of W. R. Pearce, M.E.I.C., and H. F. Morrisey, A.M.E.I.C.

Calgary Branch

G. P. F. Boese, A.M.E.I.C., Secretary-Treasurer.
W. St. J. Miller, A.M.E.I.C., Branch News Editor.

The annual meeting of the local branch was held on March 14th, when R. S. Trowsdale, A.M.E.I.C., was in the chair. Secretary G. P. F. Boese, A.M.E.I.C., opened the proceedings by reading the financial report which showed a substantial balance in the bank, same having been duly audited by Messrs H. R. Carscallen, A.M.E.I.C. and W. St. J. Miller, A.M.E.I.C.

F. K. Beach, A.M.E.I.C., as chairman of the programme committee, reported on the activities of this committee during the year. A varied programme had been framed up and presented ranging from city finances to powdered fuel. The committee had vigorously followed out the plan of introducing a variety of subjects which had apparently been appreciated. B. Russell, M.E.I.C., reported on the prize committee's work; A. S. Chapman, A.M.E.I.C., on applications and credentials; J. H. Ross, A.M.E.I.C., on attendance; G. H. Whyte, A.M.E.I.C., on library; and the chairman, on policy. The report of the branch news editor showed a record for the Dominion in the amount of rebates received from news submitted during the twelve months. This editor is a bear for rebates ! He expressed the hope that all members took an interest in and regularly read the news of the branches. The chairman then announced the results of the ballots for incoming officers as follows:—for chairman, A. L. Ford, M.E.I.C., of the Dominion Water Power and Reclamation Service; for secretary-treasurer (re-elected) G. P. F. Boese, A.M.E.I.C., department of natural resources, C. P. R.; for vice-chairman, Lt. Col. W. S. Fetherstonhaugh, M.E.I.C., Canadian National Railway; new members on the executive, R. S. Stockton, M.E.I.C., Canadian Pacific Railway; T. Lees, A.M.E.I.C., Canadian Pacific Railway; R. M. Dingwall, A.M.E.I.C., Institute Technology and Art.

Mr. Trowsdale on retiring expressed his sincere appreciation of the support of his executive and various committees, and modestly endeavoured to discount any credit for the part he had taken in their efforts to make the year a very successful one from every point of view. He introduced the new chairman, A. L. Ford, M.E.I.C., who entered upon his duties with a suitable expression of thanks at being elected. Under Mr. Ford's chairmanship the branch looks forward to at least as successful a year as the one just terminated.

Prize Papers

On March 30th, the two prize winning papers selected from those submitted in the recent competition open to all members for the best paper on any engineering subject were read to an appreciative audience in the public library lecture hall. The judges' decisions were received with an ovation. W. D. Armstrong, A.M.E.I.C.,was successful in obtaining the first prize for his paper on "Hydraulic Mining", and W. St. J. Miller, A.M.E.I.C., obtained second prize for his paper on "Aero engines, design and performance".

Hydraulic Mining

Mr. Armstrong's paper was read by P. A. Fetterly, A.M.E.I.C., in the absence of the author, and it described a particular piece of work in connection with stripping some overburden on a bench of land at the Canada Cement Company's Works at Exshaw, Alberta. This was achieved by the use of two electrically driven pumps, one acting as a relay, to boost the pressure against a 600-foot head. Some 66,000 cubic yards of material were hydraulically moved.

Aeroplane Engines, Design and Performance

Mr. Miller's paper dealt with the construction, operation, and testing of the larger types of aero engines, also the rotary type, chiefly the results of his practical experiences in the air force during the war. Wall diagrams to correspond with blue prints in the paper showed clearly the cycle of operations, order of firing, etc., of such engines. An interesting discussion followed this paper. Certificates to accompany the money prizes were specially prepared and were presented to the prize winners by Mr. Ross.

Alas!

The following advertisement appeared recently in one of the city's daily papers.

"For sale — eight volumes of books, Exterminating engineers of America. Will sell cheap, E. 5533". It should not merely be said that this speaks for itself, it shouts a defiant challenge to the world at large. The idea of classifying the engineer with, let us say, the boll-weevil, mosquito, or common stable-fly, is thrilling to say the least. The dictionary says "extermination is the process of causing to disappear, as unknown quantities from an equation; also — to destroy utterly". Alas, my poor brother engineer !

Branch Members receive Appointments

We are very pleased to be able to announce that F. G. Cross, A.M.E.I.C., has been promoted to the position of assistant superintendent of operation and maintenance, Department of Natural Resources, C.P.R., at Brooks, Alta, and think it would be opportune that we express to him our congratulations through the columns of *The Journal.*

It is with considerable pleasure that we are able to report the promotion of two members who previously belonged to the Calgary Branch. S. G. Porter, M.E.I.C., has been appointed to the position of assistant general manager of the department natural resources, C.P.R., at Calgary and G. N. Houston, M.E.I.C., succeeds Mr. Porter as superintendent of the C.P.R. irrigation branch at Lethbridge. Accounts of these two appointments appear elsewhere in this *Journal.*

Ottawa Branch

"Canada needs a scientific conscience. Unless we awaken to the powers of science, we deserve to be the hewers of wood and drawers of water for all other nations. Canada has not got a single scientific foundation outside of the universities. Canada is in the backwaters of science. But Canada's scientists, who suffer from this lack of appreciation, are eagerly snapped up by other countries, and Americans say "We are glad to have them. Canada is the best intellectual recruiting ground in North America."

So spoke Dr. H. M. Tory, M.A., D.Sc., LL.D., chairman of the Honorary Advisory Council for Scientific and Industrial Research of Canada and president of the University of Alberta, speaking at the luncheon of the Ottawa Branch at the Chateau Laurier on March the 26th.

Dr. Tory spoke on the "Practical Man versus the Theorist". He held up the accepted or common version of the practical man, as the cause of the age-old antagonism against the theorist. The so-called practical man, he said, when he cannot answer an indisputable scientific fact, calls its utterer a theorist.

The practical men, he said, now have not reached the stage where they are willing to divide the profits made from the very inventions of the theorists. Dr. Tory said that there is a notable case of this in Ottawa, but unfortunately he could not refer to it.

Edison, Dr. Tory held up as the great type of practical theorist. Edison, Marconi and Lord Kelvin and others of this type, in addition to making successful researches, had been able to so produce them so as to bring the returns to their own pockets.

Dr. Tory told the story of Rockefeller's gift of $100,000,000. to medical research, for which he recouped himself by raising the price of gasoline. "I do not suppose that is true," said the doctor, "but if it were, it would be one of the finest pieces of statesmanship I ever heard of. Public opinion at present would not allow a government to tax a commodity for scientific research; but the government could not do a sounder thing."

"It is a singular thing that Rockefeller, who has given a large part of his fortune to benefit humanity, is hated; while Henry Ford, who has not even started to do anything on a comparable scale, is popular", he said.

The luncheon was well attended. Commissioner of Works, A. F. Macallum, M.E.I.C., presided.

London Branch

E. A. Gray, A.M.E.I.C., Secretary-Treasurer.

The regular monthly meeting for February was held in the board room of the Public Utilities Commission, Wednesday, February 25th.

After the adoption of the minutes of the annual meeting held Wednesday, January 21st, Chairman Miller introduced the speaker of the evening, J. M. Moore, O.L.S., M.E.I.C., consulting engineer and architect of this city, who has charge of the design and construction of the buildings and bridge for the University of Western Ontario.

Mr. Moore gave a most interesting address on "The Design and Construction of the University of Western Ontario Bridge". The meeting was of an informal nature and was much enjoyed by the members who were present. It is to be regretted that the attendance was not greater.

Mr. Moore kindly consented to address the branch at a later date on the design and construction of the buildings.

Dinner Meeting

A dinner meeting to commemorate the presentation of the branch charter was held in the Blue Dragon Tea Room, Thursday, March 12th, at 6.30 p. m.

After dinner, Chairman Miller introduced Vice-President J. B. Challies, M.E.I.C., of Montreal, who, in presenting the charter, delivered the following address:—

"The President and Council of *The Institute* have authorized me on this occasion to present to the London Branch a branch charter. This charter is not merely a combination of engraving and embossing, signed by the president and secretary, and bearing the seal of *The Institute*, but it constitutes a visible expression of your authority to carry on your activities as a branch of *The Engineering Institute of Canada*. It is your warrant from the grand council that you were legally established and in due form.

When the Canadian Society of Civil Engineers, through its Committee on Society Affairs, decided on making radical changes in the organization, changing the name to *The Engineering Institute of Canada*, it embarked on an era of greater influence and usefulness. The most dominant outstanding factor making towards the success of *The Engineering Institute* was the decision to give greater encouragement, greater authority and wider scope to the branches of *The Institute*.

The success of this policy is manifest in the fact that we have in *The Institute* to-day twenty-four flourishing branches, all of them doing a splendid work in maintaining interest in the profession, promoting acquaintanceship, friendship and goodwill, and exercising a potent influence in their respective centres.

Since you became organized as the London branch of *The Engineering Institute of Canada*, engineering — to the people of this community— has taken on a broader significance and the word "Engineer" an elevated status. You are to be congratulated on the interest you as a branch have taken in the affairs of your community and on the fact that as individuals a large number of you have become outstanding forces in the city of London, in all that makes for its best interests. This branch is a definite asset to the city of London, and I have it on good authority that the citizens appreciate it as such.

May I express the hope that you will treasure this charter as an emblem of your authority to represent the engineering profession in your district and to maintain its highest traditions.

By the authority in me vested, by the president and council, it is my honour, privilege and pleasure to ask you to accept, not only as an evidence of your authority to conduct the affairs of your branch, but as an emblem of responsibility to your community and to the profession at large."

Reproductions of the charter were presented to the chairman, immediate past-chairman and secretary-treasurer. Chairman Miller accepted the charter on behalf of the branch.

H. B. R. Craig, M.E.I.C., addressed the meeting, dealing with the history of the branch.

Vice-President Challies then delivered a most interesting address "Impressions of the First World Power Conference, Wembley, 1924."

Several solos were rendered by E. G. Wood and were much enjoyed.

Saskatchewan Branch

J. W. D. Farrell, A.M.E.I.C., Secretary-Treasurer.

February Meeting

The regular February meeting of the branch was held on the 12th of the month at the Parliament Buildings, Vice-Chairman Blackburn presiding. Following the dinner the meeting adjourned to one of the committee rooms and at the chairman's suggestion, a little time was spent on an informal discussion of the attendance, or lack of it, at our regular meetings, and the form of our annual meeting.

Mention was then made of the fact that at the recent session of the provincial legislature the Public Health Act had been amended to include a civil engineer on the Council of Public Health. The announcement received the favourable comment of the meeting and resulted in the following resolution moved by D. A. R. McCannel, A.M.E.I.C., and seconded by T. McGuinness, A.M.E.I.C.:

> "WHEREAS the civil engineering profession has contributed considerably to the conditions which tend to increase the standard of public health in this province, particularly with respect to the design and construction of waterworks sewerage and sewage disposal systems.
>
> AND WHEREAS the Public Health Act of the province of Saskatchewan was amended at the recent session of the legislature to provide for a civil engineer being appointed on the Council of Public Health.
>
> NOW THEREFORE BE IT RESOLVED that the Saskatchewan Branch of *The Engineering Institute of Canada* records its appreciation and satisfaction at this action on the part of the legislature."

The chairman then called on Capt. G. R. Chetwynd, A.M.E.I.C., M.C., D.C.M., for his paper on "Military Engineering".

Military Engineering

The paper commenced with an historical outline of military engineering, giving a number of interesting details in this connection. The speaker traced the organization of military engineering units from their commencement to their present highly specialized development. The number, duties and strength of the various units was also given. Capt. Chetwynd described the training of the sapper, paying tribute to the ability and steadfastness produced in the rank and file by the course of training received. In conclusion, Capt. Chetwynd mentioned the fact that in the United States a great deal of government engineering work is under the direction of their corps of engineers. This enables their army to have enrolled a large number of engineers at very little if any extra expense. The application of this practice to Canada, Capt. Chetwynd thought, should receive discussion.

In discussing the paper, A. P. Linton, A.M.E.I.C., spoke briefly of public works carried on by military engineers in the States. R. H. Murray, A.M.E.I.C., also spoke on this topic and suggested that *The Institute* should encourage and forward the interest of its members in military engineering.

Annual Meeting, Friday, March 13th

In open defiance of all well formed superstition the Saskatchewan Branch held its annual meeting on Friday, March the 13th. Owing to the very successful efforts of the Entertainment Committee every obstacle was overcome and a very pleasant meeting ensued. The first session was held in the afternoon in the council chamber, city hall, our chairman, Dean Mackenzie, M.E.I.C., presiding. The following committee reports were presented and after suitable discussion and comment adopted: Executive, Papers and Library, Legislation, Attendance, Welfare.

Copies of each of these reports are submitted for printing in *The Journal* in order that the information may go to our many non-resident members. The report of the Papers and Library Committee has been abbreviated to avoid repetition of matter already published in the February Journal.

A draft letter in regard to qualifications for admission to *The Engineering Institute of Canada* and classification of membership was finally approved and it was decided to send a memorandum on the subject to *Institute* headquarters and also copies to every branch of *The Institute*.

Election of Officers

Scrutineers then reported the result of the election as follows:

Chairman:	R. N. Blackburn, M.E.I.C.,	Regina.
Vice-Chairman:	W. H. Greene, M.E.I.C.,	Moose Jaw.
Secretary-Treasurer:	J. W. D. Farrell, A.M.E.I.C.,	Regina.
Executive Committee — (two-years)	J. M. Campbell, A.M.E.I.C.,	Moose Jaw.
	R. H. Murray, A.M.E.I.C.,	Regina.
	D. A. R. McCannel, A.M.E.I.C.	Regina.
Nominating Committee:	D. W. Houston, A.M.E.I.C.,	Regina.
	A. P. Linton, A.M.E.I.C.,	Regina.
	J. R. C. Macredie, M.E.I.C.,	Moose Jaw.
	C. J. Mackenzie, M.E.I.C.,	Saskatoon.
	A. R. Greig, M.E.I.C.,	Saskatoon.

By an unanimous vote the following were appointed auditors for the ensuing year: A. C. Garner, M.E.I.C., J. N. deStein, M.E.I.C.

Dean Mackenzie being called on in connection with the annual meeting at *Institute* headquarters, spoke briefly on engineering education and the status of the profession generally. Reference was made to the investigation at present so ably carried on by the Society for the Promotion of Engineering Education. Prof. Mackenzie remarked on the excess of modesty which has handicapped engineers but at the same time pointed out that the quality of leadership is born in a man and cannot be created simply by adding English, economics and commercial training to our curricula. The speaker believed the engineering profession was in the ascendant as compared with other professions. It is universally recognized that the engineer has something that the rest of the world wants. The engineer is always striving to do something better than anybody else has done it before and in this lies our hope.

D. W. Houston, A.M.E.I.C., reported a very pleasant evening as branch representative at the Saskatchewan Land Surveyors annual banquet. Col. Garner, M.E.I.C., also threw some interesting sidelights on the attractions of this function.

The evening session held at the parliament buildings was of a social nature, to which the ladies were invited. Following an excellent dinner, *Institute* badges were presented by our new Chairman R. N. Blackburn, M.E.I.C., to the following past-chairmen who were present: C. J. Mackenzie, M.E.I.C.; A. C. Garner, M.E.I.C.; H. S. Carpenter, M.E.I.C.; L. A. Thornton, M.E.I.C.

Presentations were the order of the evening, for with due solemnity and appropriate phrasing the chairman presented each of the following with a large gilt shield: Jack Patton, A.M.E.I.C.; Tom. McGuinness, A.M.E.I.C.; P. C. Perry, A.M.E.I.C.

The heraldic devices mounting these shields were of rare design including a face with a nose sinister, a cow puissant and a feline rampant. Then a kitchen shower was held for C. W. Doody of the Department of Telephones. Mr. Doody has been very active in the interests of the branch and it was only fitting that some poor tokens of regard should accompany him into the realm of matrimony.

The effort of the secretary-treasurer to uphold his accounting of branch funds was remembered by presenting him with a gold brick to place amongst the assets of the treasury.

By this time the orchestra had arrived and the tables were cleared away and the remainder of the evening was pleasantly spent in dancing. A feature of the dance was the Paul Jones Long Distance Survival lead by "Dutch" MacPherson.

Report of the Executive Committee

Your Executive Committee have to report as follows concerning the conditions of the branch and its operations during the past year.

The membership is 128 as compared with 130 reported this time last year and is made up as follows:

Honorary Members,	1
Members,	19
Associate Members,	81
Juniors,	7
Students,	14
Affiliates,	2
Branch affiliates,	4

The Executive Committee have held seven meetings for conducting and planning the affairs of the branch.

Eleven regular and special meetings of the branch have been held, including a summer meeting at Saskatoon, a ladies' night and a social evening on the occasion of Secretary Keith's visit.

Early in the fall the branch charter prepared by *The Institute* Council was presented by Major Geo. A. Walkem, M.E.I.C., of Vancouver.

The regular meetings have all been held at the parliament buildings and have been preceded by a dinner and excellent papers have been provided. The decreased attendance at the meetings has given cause for concern and the matter is now being made the subject of an enquiry.

The qualifications for membership in *The Institute* and alleged discrimination in elections to membership has been the subject of discussion both at executive and branch meetings and a memorandum on the subject is at present under preparation for submittal to *Institute* headquarters. In this province, where there is no legislation regulating and protecting the engineering profession, it is particularly important that membership in *The Engineering Institute of Canada* should indicate professional standing that is unquestionable.

Attached hereto is a financial statement showing the current accounts for the past year and also the assets and liabilities of the branch to date. This statement has been examined by your auditors.

On behalf of the Executive,

J. W. D. Farrell, A.M.E.I.C.,
Secretary-Treasurer.

Financial Statement

Assets

Bank balance less out cheques,	$ 51.88	
Cash on hand	17.00	
Headquarters rebates-current	215.25	
Headquarters rebates-arrears	170.00	
Branch dues-current	135.00	
Branch dues-arrears	142.00	
Furniture and library	50.00	
		$781.13

Liabilities

Accounts payable	$159.87	
1925 scholarship	50.00	
Branch dues paid in advance	28.00	
		$237.87
Surplus		$543.26
		$781.13

Revenue

Bank balance March 1924	$ 2.37	
Headquarters rebates	193.78	
Branch dues	168.80	
Sundries	25.24	
		$390.19

Expenditure

University scholarship	$100.00	
Balance honorarium 1922-23	50.00	
Sundries	36.65	
Meetings	34.37	
Printing, stamps, stationery	100.29	
		$321.31
Cash in bank and on hand		68.88
		$390.19

Report of Legislation Committee

As you are all possibly well aware, the efforts of your committee to effect the passage of "An Act Respecting the Engineering Profession" during the last session of the Legislative Assembly were unsuccessful. Before commenting further on this point a brief review of what was done leading up to that stage may be of interest.

Early in the year the convenor, A. C. Garner, M.E.I.C., after consultation with the convenor of the previous year, L. A. Thornton, M.E.I.C., entered into correspondence with all the engineering associations operating under provincial legislation, and by September of 1924 he was in possession of the views of these several associations, together with copies of all legislation, by-laws, etc., governing same. Without exception all urged legislation no matter how meagre it might be, as being in the interests of the profession and at the same time offered assistance in so far as this was possible, towards attaining that end. The views of Dr. Murray and Dean McKenzie of the University of Saskatchewan were then obtained. The convenor then made a report of what he had done, together with a synopsis of information obtained, and sent this out to each member of the committee on September 17th. A full committee meeting was then held on October 6th, and after careful consideration it was unanimously agreed to recommend to the branch that legislation be introduced at the forthcoming session and a written report embodying the views of the committee was presented to members of the branch at the regular meeting on October 7th, and was adopted. L. A. Thornton and Dean McKenzie were appointed to take the matter up with the premier and those of the ministers concerned and to mainly take care of the bill after approval by the committee. This was done and as a result a bill was drafted, This was carefully considered by the ministers concerned, approved by them and by your committee at a meeting held on December, 16th. On January 8th, 1925, at a full meeting of your executive, W. G. Robinson, member for Francis, was asked to introduce the bill and he very kindly consented to do so.

The bill No. 58 was introduced to the House almost immediately passed its first reading and shortly afterwards its second reading without any unfavourable comment, but when in committee just prior to the third reading it was rejected.

The bill is in no respect arbitrary, registration is not compulsory and does not in any way interfere or restrict the activities of those practising the profession of engineering or of those persons employed on engineering work or work of an engineering character. It merely provided for registration of engineers who desired to register under the bill, provided for examination etc., of those desiring registration and the conducting of examinations by the University of Saskatchewan, and this part of the bill was entirely satisfactory to Dr. Murray and Dean McKenzie.

The members of your committee do not know of any real reason for the bill being rejected.

The committee reaffirm their views that legislation is desirable in the interests of the profession. As previously pointed out Saskatchewan and Prince Edward Island are the only two provinces in the Dominion not having legislation of this nature. The present situation places members of the profession in this province in an undesirable position should they desire to practice in any of those provinces having legislation.

The thanks of the branch are due the dollowing persons who have been verbally thanked by members of the committee.

The Hon. Chas. Dunning, premier.
The Hon. J. A. Cross, attorney general.
The Hon. J. G. Gardiner, minister of highways.
Mr. W. G. Robinson, M.P.P., for Francis.
Mr. R. W. Shannon, legislative council.

The convenor's file, together with all other data collected in this matter has been handed over to the secretary for fyling and reference by the branch.

Respectfully submitted,
A. C. GARNER, M.E.I.C., *Convenor.*

Report of Committee on Entertainment and Attendance

Your Committee on Entertainment and Attendance was subdivided into two sub-committees with the following personnell:—

1. R. W. Allen, A.M.E.I.C., chairman.	2. H. N. MacPherson, A.M.E.I.C., chairman.
D. W. Houston, A.M.E.I.C.	Miss H. M. White, Jr.E.I.C.
W. McGuinness, A.M.E.I.C.	J. McD. Patton, A.M.E.I.C.
W. L. Campkin, Jr.E.I.C.	C. W. Doody, A.M.E.I.C.

D. A. R. McCannell, A.M.E.I.C.

About December 1st, 1924 H. N. MacPherson, A.M.E.I.C., resigned as chairman of sub-committee No. 2 and was succeeded by C. W. Doody. Subcommittee No. 1 had charge of arranging quarters for meetings, catering at meals and attendance of the members. Sub-committee No. 2 had charge of the entertainment at meetings of a regular and special nature.

For purposes of convenience the membership of the branch resident in Regina was divided into 7 groups of approximately 10 members to each group. A team captain was chosen for each group whose duty it was to keep his group members informed of the meetings and endeavor to secure their attendance.

The attendance at the meetings has not been good and as chairman of the general committee I would suggest to the incoming executive and committee on attendance that careful consideration be given to new methods of stimulating attendance. I understand that Mr. Allen as chairman of sub-committee No. 1 is making an investigation of this matter and will probably have a report to make in connection therewith.

The entertainment committee provided two functions to which the ladies were invited, one being a dinner followed by a theatre party on November 13th, last and the other the dinner-dance in connection with this annual meeting.

The summer meeting of the branch, held at Saskatchewan University Saskatoon, was in charge of members of the branch resident in Saskatoon.

The thanks of the committee on entertainment are tendered Mr. and Mrs. L. A. Thornton, who, by their generosity made possible the social evening which took place at their home on the occasion of the visit of our general secretary, Fraser Keith, M.E.I.C., of Montreal on April 5th, last.

Respectfully submitted on behalf of the committee.
R. W. E. LOUCKS, A.M.E.I.C.,
Convenor.

Report of Papers and Library Committee

The main activities of your Papers and Library Committee for the season closing with to-day's annual meeting of our branch consisted in the arranging of the papers for meetings as reported in the February *Journal* from April 10th, 1924, to December 11th, 1924, and in addition the following:

JAN. 8th, 1925. "Discussion of Admission to *Institute* and Classification of Members."
FEB. 12th, 1925. "Military Engineering" by Capt. G. R. Chetwynd, A.M.E.I.C.

Arrangements for papers for the April meeting to be held next month have also been made, the following two papers being contemplated:

"Long Distance Transmission of Voice" by S. R. Muirhead, Jr.E.I.C.
"Progress of Highways in Saskatchewan", by H. R. Mackenzie, A.M.E.I.C.

No action has been taken or recommended regarding the procuring of permanent quarters for the branch.

All of which is respectfully submitted.

J. N. deSTEIN, A.M.E.I.C,
Chairman.

Report of Committee on Attendance

On behalf of the special committee on attendance I have the following to report:—

The matter of this report will be of interest only to our resident members except perhaps to expose to the outside members an ailment with which we are contending.

Our trouble is that the attendance of our regular meetings has fallen off to such an extent that something has got to be done to remedy these conditions, and before anything could be undertaken with this end in view an effort must be made to get at the cause, or some tangible reason to which we could attribute the lack of interest.

Our first effort then was a questionnaire sent to each of our resident members-some 60 in all—and an opportunity thus given to each one to state what, if anything, was in his opinion wrong with our meetings.

Unfortunately, of those of us who have sent in returns, a few enclosed them with their ballot papers and so they were not available for this report, which, on that account, must be taken in the nature of a progress report only, and I would recommend that this matter be taken up further in committee and a final report made at the next regular meeting.

From the available returns I have endeavored to lay before you concisely the opinions as expressed:—

It would appear that there is no complaint at all regarding reminders of dates of the meetings by the team captains. It is generally thought that when we meet once each month, that is quite sufficient.

Regarding the time of receiving notifications of meetings from the secretary, while the majority agree that the notices are reaching them early enough, there are those who feel that not sufficient notice is given. At present the secretary sends the notices out two or three days ahead of the meetings. It is possible that if the secretary allowed more time prior to meetings it would be beneficial.

As regards the place of meeting. The desire of the majority in this connection is that we discontinue meeting at the parliament buildings as at present. The preference is of course to meet in some downtown building.

The dinner part of the meeting. This necessarily has a bearing on the *place* of meeting inasmuch as we may have some difficulty in obtaining the use of a meeting room except by virtue of the revenue from the dinner, which of course calls for a more regular and better attendance than we are getting at present. However the majority are in favour of continuing with the dinner part of our meetings and therefore it should be possible to arrange the holding of our future meetings downtown.

Are our meetings in any way unsatisfactory ?

Opinion generally is that there is no great dissatisfaction, although expression is given characterizing the meetings as too slow and too formal. It is quite evident that not a few of our members feel that the meetings drag.

The question as to whether our meetings are of *sufficient interest* meets with a decided answer in the negative. The inference is that they are anything but interesting.

Papers. As to whether more than one paper should be given at a meeting, opinion is divided. It would appear that unless we can obtain speakers of outstanding ability and topics of unquestionable importance, that two or more papers of limited duration, are favoured.

By way of criticism. Mention was made of the time given to the main critic of our papers. It was thought that talk on the paper should be limited in as far as the individual speaker is concerned. It is also thought that if our meetings were a little less stiff and formal, more encouragement to the newer and younger members would be given not only to attend our meetings but to participate in the discussion more freely.

Suggestions. Generally, suggestions given with the idea of more interest and more attraction for our members are as follows:—

Outside speakers are required. Not necessarily on direct engineering subjects, but such subjects as economics and business methods: Speakers on more varied subjects.

To give meetings over to different groups to be dealt with in their own way. Groups may be composed of say the telephone department; the highways department; the city; railways and general.

Have a short entertainment programme during the dinner and immediately following the dinner.

More speakers on important matters allied to engineering.

An interchange of ideas with other branches.

Secure copies of important and more especially interesting papers from other branches to be read before our branch for study and discussion.

Bring in an occasional paper on some subject such as public speaking — suggests a paper by Mr. J. J. Smith or the Rev. Mr. Whitehouse as an example.

Finally. I would say that one point at least has been cleared up as a result of the questionnaire and that is that our ailment or apathy as far as attendance is concerned is not chronic inasmuch as we have no real kicks to deal with, but our cure lies in the way of bestirring ourselves in an effort to obtain much more interesting subject matter.

R. W. Allen, A.M.E.I.C.,
Convenor Subcommittee on Attendance.

Kingston Branch

Gordon J. Smith, A.M.E.I.C., Secretary-Treasurer.

On March 10th, the meeting of the Kingston Branch of *The Institute* took the form of a demonstration of power plant design and operation when the central heating plant and thermo-dynamics laboratory of Queen's University were thrown open for inspection of the members of the branch.

Power Plant Design and Operation

Prof. L. M. Arkley. M.E.I.C., of the University gave a short talk calling attention to the chief features of design and to the methods by which efficiency of operation can be attained by the proper use of the flue gas analyzer and draft gauges. A number of the senior year mechanical students then acted as guides and explained its many details during a tour of inspection.

The plant furnishes heat to the Kingston General hospital, and the university buildings, containing altogether about 40,000 square feet of radiating surface, one third of which is hot water, and the rest low pressure steam. In severe weather about 30 tons of coal are burned per 24 hours, while 18 tons per day is the average for the seven months when heating is required for the university buildings. During the summer months the hospital requires a certain amount of steam for sterilizers, laundry, etc., but the engines in the power plant are not operated then as it is more economical to buy power from the city, when the exhaust cannot be used for heating purposes. Ordinarily, when the plant is operating as a heating plant, and furnishing electric power as a by-product, the current is supplied at a very low cost.

During the year about, 5,000 tons of bituminous slack coal are burned, this is brought to the plant by boat, unloaded into small cars and deposited in the coal storage area. The coal is bought by tender, and on B.t.u., basis, and the method has proven very satisfactory.

The average evaporation in the boilers is between 10 and 10½ pounds of water from and at 212 degrees F. per pound of coal as fired, which means an efficiency of from 70 to 75 per cent. This is a very good result when the character of the load is considered, the boilers operating from 50 per cent normal rating to 100 per cent overload.

During the demonstration, O. J. Hickey, who is in charge of the plant, placed the complete plant in operation, which was very interesting in showing the modern methods adopted in central heating plants of this type.

A regular meeting of the Kingston Branch was held in Carruthers hall, Queen's University on Tuesday evening March 17th. W. K. Detlor of the engineering staff of The Bell Telephone Company gave an address on "Telephone Engineering".

Telephone Engineering

There was a good attendance of *Institute* members, and students from the university as well as a number of members of the staff of the Kingston office of the Bell Company. Mr. Detlor is a graduate of Queen's and his address which showed him to have a most thorough grasp of the theoretical and practical phases of telephony in all its details, was very instructive.

Welland Ship Canal

The members of the Kingston Branch were the guests of the commandant and staff of the Royal Military College on Friday evening, March 27th, to hear an address on the "Welland Ship Canal", by E. G. Cameron, A.M.E.I.C., principal assistant engineer on the canal.

The lecture took place in Currie hall, R. M. C., and was attended by the staff and entire cadet body of the college, as well as a representative number of *Institute* members from the city. Mr. Cameron is a graduate of the R. M. C. and his talk, illustrated by a number of slides showing photographs of the undertaking and details of the structures of this great Canadian enterprise, proved very instructive. A vote of thanks, heartily endorsed, was moved by J. M. Campbell and seconded by Cadet Fair, the B. S. M. of the R. M. C.

Sault Ste. Marie Branch

A. H. Russell, Jr.E.I.C., Secretary-Treasurer.

A regular meeting of the Sault Ste. Marie Branch was held on Friday, March 27th, 1925, following a dinner at the Y.W.C.A., with Wm. Seymour, M.E.I.C., chairman presiding.

Paper

The chairman called the meeting to order and introduced the speaker of the evening, H. A. Morey, A.M.E.I.C., resident engineer for the Spanish River Pulp and Paper Mills Ltd., who gave a talk on "Paper". He started at the slasher mill and followed the process through all the different stages for mechanical pulp and sulphite pulp. Then he explained the refining and the mixing of the two kinds of pulp before passing over the wires and through the machines to come out the finished product, — paper. Mr. Morey used a flow chart which clearly explained the process. A very lively discussion followed and all questions were ably answered by the speaker.

A hearty vote of thanks was tendered to Mr. Morey expressing the appreciation of all present.

The subject of "Forest Conservation and Fire Prevention" was thoroughly discussed and a resolution was passed authorizing the chairman "To appoint a committee to act or assist in any way the forest conservation and fire prevention movement."

Victoria Branch

E. P. Girdwood, M.E.I.C., Secretary-Treasurer.

On Saturday, March 14th, the Victoria Branch visited the plant of the Sidney Roofing and Paper Company on the invitation of Mr. Mayhew, managing director of the company. Mr. Mayhew and Mr. S. Colgate, sales manager, received the visitors and proved themselves masters in the art of describing the various processes and answering the numerous questions.

The plant is very well laid out, the raw material being received at one end and the finished products delivered at the other. The raw materials, consisting of waste paper and rags of all kinds both local and imported, wood pulp, etc., were first inspected and their progress watched through the cutters to the beaters where, with water added, a lumpy pulp was formed. From the beaters the pulp is discharged into pits twelve feet deep and twenty feet in diameter and is thoroughly stirred and is pumped up to a flume and flows down this to the Jordan where it receives its final grinding. From the Jordan it passes over screens to eliminate any coarse particles. It now enters a stock chest and from there to the cylinders where the thickness or gauge of material is determined. On leaving the cylinders it is carried by a conveyor felt through presses to squeeze out the water and from there on to the dryers, consisting of steam heated drums. The finish to the paper or felt is obtained by running it through the callanders after which it is cut to desired widths and rolled.

Beyond the dryer house and connected to it by a gangway is the asphalting plant where the felt or paper is given various treatments depending on the purpose for which it is to be used. The highest grade of roofing consists of a burlap base and asphalt saturated felt with a layer of pure asphalt between. The surfaces are finally treated with talc to prevent sticking, and some roofings have either a red or green slate surface finish. The talc is obtained from a mine at Leach River about twenty-five miles from Victoria by the Canadian National Railways.

A large number of different kinds of paper felt and roofings are manufactured by the company at this plant and it also supplies all the plain felt and paper for their other treating plant located in Vancouver.

One product of particular interest to engineers is the asphaltic expansion joint for concrete structures and pavements, which is meeting with marked success.

An unusual feature of the plant is that instead of being located on a river and thus having its own water supply, all the water required, which averages three to four million gallons. per month, is obtained from the regular system of the Esquimalt Water Works Company.

Electric power for the wet processes is obtained from the British Columbia Electric Railway Company, Ltd., and for the other processes from the company's own steam plant. The fuel used for the steam plant is waste from the local lumber mills.

The company has its own wharf adjoining the plant, where coastal vessels can load. According to Mr. Mayhew, the company started at Sidney, V. I., in 1912, with a staff of six men working "once in awhile", and moved to its present site on the former Indian Reserve on Victoria harbour in 1921. It now covers three acres of ground and works twenty-four hours a day and employs about sixty men. The company has established an enviable reputation for itself during this short time and now does a considerable export business to New Zealand, Australia and Japan, besides reaching well on to the prairies as far east as Winnipeg.

Problems of Town Planning

The Victoria Branch held a meeting on March 25th. E. G. Marriott, A.M.E.I.C., of the Water Rights Branch, of provincial government, read a paper on "Problems of Town Planning". In his remarks on the above subject Mr. Marriott, pointed out that contrary to popular conception that town planning consisted mainly of laying out winding streets, there were a large number of varied problems to be met. As people sleep and eat, rest and play, study and work, so the aim of town planning was to make the town beautiful, attractive and convenient.

The development of any town depended on population, and a chart was shown, giving graphically the growth and population in Victoria, and in British Columbia; this cheeringly suggested that good times are bound to come, and that of Victoria and its neighborhood are not limited in growth by food, transit, or water supply difficulties. The principles of town planning should receive immediate application to ensure the most economical and attractive development possible.

The advantages of a study of the density of the population in a town were touched on, the relation of the height of buildings in the business section in terms of street width having a vital bearing on the problem of the parking of motor cars.

The growth of traffic was emphasized by the fact that a radius of incoming horse-drawn traffic of 15 miles, equal to a contributing area of 700 square miles, had been replaced by a radius of 80 miles by motor, or a contributing area of 20,000 square miles. The increase of street traffic was being met by the setting back of buildings, widening roads at the expense of sidewalks, more scientific traffic, regulation. While in the past the traffic problem has been considered mainly one for settlement by police regulation, it has become more and more a far-reaching engineering problem.

The primary importance of industrial and waterfront development was emphasized, and the advantages of zoning in relation to stability of investment values was noted, and references made to recent Canadian progress in this regard.

Parks, playgrounds, libraries, museums, school location and consolidation, the design of streets, boulevards, and scenic drives, building lines in residential areas, regulation of fences and billboards, and even reforestation and flood prevention were shown to come within the scope of town planning, after which the questions of administration and finance, with special reference to the status of legislation in the other provinces, and the proposed British Columbia bill, were briefly dealt with.

Visit to Victoria Gas Plant

Marking the completion of the new gasometer of the Victoria Gas Company, prior to testing, a party of members of the Victoria Branch paid a visit, on March 26th, to the premises, and were received by F. H. Hewlings, the manager, and other officials.

After having a technical explanation of the details of construction made to them, those who had not hitherto inspected the new retort in the same yards, took the opportunity of seeing it, and learning how these two additional sections would aid the efficiency of the service to gas consumers in Victoria.

The new retort and gasometer, of which a description recently appeared in the "Colonist", will greatly supplement the capacity of the company's plant to give service. The members were much interested in the construction details of the new holder, some of which are new to gasometers in this section of the world.

Quebec Branch

Louis Beaudry, S.E.I.C., Secretary-Treasurer.

Aerial Photography Applied to Engineering

On Monday, March 23rd, an evening meeting was held at the Chateau Frontenac. Ellwood Wilson, M.E.I.C., manager of the forestry division, Laurentide Company Limited, addressed the branch on the subject of "Aerial Photography Applied to Engineering". The speaker illustrated his paper with lantern slides.

Mr. Wilson, first made the history of aerial photography, and afterwards explained very clearly the actual process of obtaining topographical maps. He was drawn into many side lines of the subject by questions asked by members, and his ready answers were much appreciated.

Mr. Wilson was introduced to the gathering by our chairman, A. R. Décary, M.E.I.C., and he was accorded a hearty vote of thanks which was moved by F. X. Ahern, A.M.E.I.C.

Mining Deposits of the Northwest of Quebec

On Monday, April 6th, A. O. Dufresne, M.Sc., mining engineer, was the speaker at a luncheon-meeting held at the Chateau Frontenac.

Mr. Dufresne made a very clear and interesting description of our rich mining deposits of the Abitibi and the Temiskaming. He described the geological formation and the topography of the region, the transportation conditions, the works being done by the prospectors.

At the present time, said the speaker, this region is very promising, the geological conditions are favourable, the statement of the prospectors are excellent. The mining possibilities of the Abitibi and the Temiscamingue are not limited to a few cantons. There are many cantons where the prospector has only given a look.

A. O. Dufresne was extended a vote of thanks by A. B. Normandin, A.M.E.I.C., and our chairman, A. R. Decary, M.E.I.C., also added his thanks for his interesting lecture.

Vancouver Branch

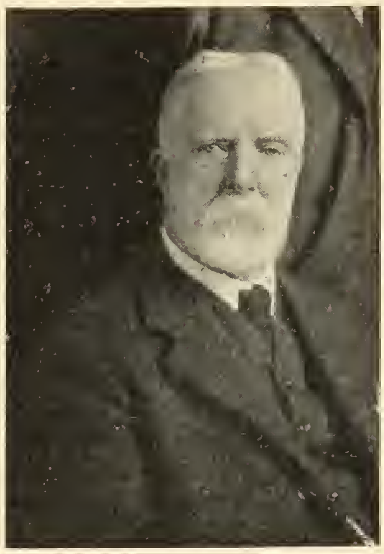
P. H, Buchan, A.M.E.I.C., Secretary-Treasurer.

Presentation of Branch Charter

Sixteen years ago, on April 17th, 1909, the Council of the Canadian Society of Civil Engineers granted authority to twenty-three corporate members of the Society resident in Vancouver, to form themselves into the Vancouver Branch.

It was inevitable that some of the elderly members of that little band of enthusiasts would have passed into "The Great Beyond" in the lapse of time since that memorable occasion: but there is no gain saying that the survivors are proud of their part in the inception of the branch and that they are now happy in the knowledge of a job well done, — for have they not tangible evidence of the efficacy of their labours in the present strength of the branch which has increased over nine fold since its establishment, and which has in addition a non-resident membership of nearly one hundred.

To-day the Vancouver Branch is one of the most powerful units in *The Institute*, and has held its place as leader in the engineering life of British Columbia. The ever increasing interest of its members in the activities of the branch, as indicated by the substantial growth of attendance at our meetings, has been a source of inspiration and encouragement to the officers; and it would seem fitting at this time to state that the executive has undertaken to denote a large portion of its energy to the initiation of a concerted movement amongst all the engineering bodies in British Columbia towards closer relationship. One of the principal stumbling blocks in the way of progressive legislation for the engineering profession in this province, is the divergence in views on certain important details, held by different sections of the



H. J. CAMBIE, M.E.I.C.

profession. The executive of the Vancouver Branch, believing that this difficulty has arisen through lack of a comprehensive understanding in each section of the troubles of the other sections, has set itself the task of promoting a sympathetic exchange of views among the members of the various sections in order that complete unanimity may prevail on all points at issue. In this movement the executive is aiming to carry on the work of the twenty-three members of *The Institute* whose names are inscribed on the branch charter, fac simile of which may be found on page 22 of the *Engineering Journal* for January 1925. That this work has been undertaken by the executive of the branch at a time almost coincident with the presentation of the charter, is significant proof of the existence of the same desire for the advancement of the engineering profession that possessed the original twenty-three members of the Vancouver Branch sixteen years ago.

It is a matter of no small regret that Major Geo. A. Walkem, M.E.I.C., M.L.A., did not have an opportunity to present the charter to the Vancouver Branch while in office as western vice-president of *The Institute*. A suitable occasion was not forthcoming until the evening of Thursday, March 26th, 1925, but the applause accorded him at the conclusion of his address could not have been more hearty had he still been clothed with the authority of his lately relinquished office.

Perhaps the most conspicuous figure at the presentation was H. J. Cambie, M.E.I.C., senior life member of *The Institute*, who honoured the Branch by receiving, on its behalf, the charter from the hands of Major Walkem. Mr. Cambie's name is inscribed on the charter as one of the twenty-three original members of the branch. At the time the branch was authorized by the council, he was in his seventy-third year, an age which would have justified any man of less energy to seek a well earned retirement from professional activities. The realization of that fact coupled with the presence of Mr. Cambie himself, standing erect and proudly before them, having nearly eighty-nine years to his lasting credit, so caught the imagination of the eighty members and visitors at the meeting that to a man they stood and cheered. Great moments are the reward of those who achieve by dint of perseverance and devotion. Mr. Cambie's achievements as pioneer, empire-builder and engineer are our common heritage, and we can all rejoice with him in the great moments that have been his; but those of us who saw the glint in his eye as he arose to receive the charter of the Vancouver Branch, while the auditorium echoed with cheers of men who cheered because they appreciated the significance of his long career in the destiny of British Columbia, will comprehend more fully the real meaning of a great moment in a life well lived.

General Meetings

Two very successful general meetings of the Vancouver Branch were held in the Auditorium of the Board of Trade on March 26th and April 2nd.

Highway Bridges in British Columbia

The first meeting was addressed by A. L. Carruthers, M.E.I.C., bridge engineer of the Department of Public Works, Victoria, B. C., on "Highway Bridges in British Columbia". The speaker read this paper before the Victoria Branch recently. Two or three members of the Vancouver Branch who were present on that occasion, were so impressed with the merits of the paper that they lost no time in urging the Executive of the Vancouver Branch to arrange with Mr. Carruthers to read his paper in Vancouver.

Over eighty members and visitors gathered on Thursday, March 26th, to hear this address. Mr. Carruthers exhibited a fine series of lantern slides which he explained in considerable detail, and the hour and a half passed very quickly. The discussion, though brief, was instructive, and the generous applause which marked the vote of thanks showed that Mr. Carruthers' address was very sincerely appreciated by everyone.

Standard Specification for Structural Steel

The general meeting held on Thursday, April 2nd, was called somewhat hurriedly in order to give the members of the branch an opportunity to hear an address on "The Standard Specification for Structural Steel" by Lee H. Miller, chief engineer, American Institute of Steel Construction, who was expected to pass through Vancouver about that date. The meeting was open to visitors interested in the subject, and coming so closely on the heels of the former meeting, the officers of the branch were highly pleased with an attendance of about seventy.

Mr. Miller spoke at considerable length, and amplified his remarks with blackboard illustrations. The discussion was varied and unusually interesting. A vote of thanks to the speaker, moved by Professor Duckering of the University of British Columbia, and seconded by J. R. Grant, M.E.I.C., was heartily endorsed.

Toronto Branch

C. B. Ferris, Jr.E.I.C., Secretary-Treasurer.

Thursday evening, March 19th, closed the season's activity for the Toronto Branch. The year's business was closed up and the new executives were installed. The chairman for the year 1925-26 being Professor T. R. Loudon, M.E.I.C., vice-chairman, J. G. R. Wainwright, A.M.E.I.C., secretary-treasurer, C. Bruce Ferris, Jr.E.I.C., committee: Messrs. A. C. Oxley, A.M.E.I.C., R. B. Young, M.E.I.C., and J. A. Knight, A.M.E.I.C.

The meetings held during the month were as follows:

More about Steel

A joint meeting, held with the American Society of Mechanical Engineers and the American Society of Steel Treating on Friday February 27th. Dr. Jay Jefferies, head of the research department of the Aluminum Company of America, gave an illustrated paper entitled "More about Steel". Dr. Jefferies spoke on the metallography of iron and steel dealing particularly with the influence of critical cooling temperature and heat treatment in microstructure, crystalline formation and physical properties.

Recent Developments of the Ontario Hydro

T. H. Hogg, chief hydraulic engineer, Hydro-Electric Power Commission, addressed the branch, on Thursday, March 5th. His subject being "Recent Developments of the Hydro-Electric Power Commission of Ontario". Mr. Hogg described a number of the small plants built by the commission, with special reference to remote control, citing the plant at dam No. 8 on the Trent river as being the largest plant in operation entirely under remote control, the installation being three units of 2,200 horsepower, each under 32-foot head. He traced the developments in runner design, showing some of the new propeller type wheels. The address was profusely illustrated and showed how the small plants can be just as interesting as the large developments. Mr. Hogg also described the method of connecting up numerous plants for the exchange of surplus power by means of trunk lines.

Relative Value of Mining to our Industrial Life

On Thursday, March 12th, G. C. Bateman, B.Sc., secretary, Ontario Mining Association, gave an illustrated lecture on "The Relative Value of Mining to our Industrial Life."

Niagara Peninsula Branch

R. W. Downie, A.M.E.I.C., Secretary-Treasurer.
C. G. Moon, A.M.E.I.C., Branch News Editor.

March Dinner Meeting

The March dinner meeting of the branch was held at the Lafayette hotel, Niagara Falls, on March 24th. Unfortunately, many who had expressed their intentions of being present at the meeting failed to make an appearance. The result was a rather small gathering and a consequent unfair drain on the resources of the branch to meet the hotel bill. Members should not forget that the hotel charges for the number they are asked to provide for and not on the actual attendance. Not only did the absentees leave uneaten a very fine dinner, but they also missed an address of much interest and value.

Contract and Expert Evidence

The address was presented by Col. N. R. Robertson, member of the legal firm of Chisholm, McQuesten and Robertson, of Hamilton. Col. Robertson graduated first in engineering and then in law, a fact which made him peculiarly well fitted to discuss "Contracts and Expert Evidence" from the engineers point of view. He asked, at the outset, that his audience stamp their feet if he should become too dry and technical, also that if anyone wished to ask a question while he was speaking, he would welcome such interruptions. He was under a constant fire of questions but there was no stamping of feet.

Recent Additions to the Library

Transactions, Proceedings, etc.

Presented by the Societies:

- Year Book of the American Institute of Electrical Engineers, 1925.
- Year Book of the American Society of Civil Engineers, 1925.
- Year Book of the American Society of Mechanical Engineers, 1925.
- Transactions of the American Society of Mechanical Engineers, 1923.
- Proceedings of the American Society for Testing Materials, 1924.
- Transactions of the Society of Engineers, London, 1924.

Reports

Presented by the Fuel Board, Department of Mines, Canada.

- Coke as a Household Fuel in Central Canada, by J. L. Landt.
- The Smoky River Coal Field, by J. McEvoy.

Presented by the Universidad Nacional de la Plata.

- Anuario, 1924.

Technical Books

Presented by Chapman & Hall.

- History of the Telephone in the United Kingdom, by F. C. C. Baldwin.

Special Gift

The following old records have been presented to the library of *The Institute* by Mr. W. Bell Dawson, M.E.I.C., and are gratefully acknowledged:—

- By-laws of the Corporation of Land Surveyors of Quebec, 1890.
- The Channel Tunnel, 1882.
- Notice sur le modèle des Barrages de la Meuse. 1876.
- Copies of old Acts respecting Land Surveyors, 1876.
- Two volumes of plates relative to the Forth Bridge.
- Les chemins de fer en Amérique, par E. Lavoinne et E. Pontzen. 1880 letterpress and plates.

As an indication of the generally improving conditions the report received from Vickers and Combustion Engineering Limited, of which Mr. A. J. T. Taylor, M.E.I.C., is president, is interesting in the variety of work being undertaken, which includes the following:—

McColl Bros., Limited, Toronto, three Vapor Separators and Reflux towers, and two class 1013 219 h. p. Kidwell boilers for their Toronto refinery.

British Canadian Mines Limited, Toronto, two Vickers Petter standard semi-Diesel stationary engines, 120 h.h.p. 275 r.p.m.

Price Brothers & Company, Limited, Ruths Steam Accumulator for their plant at Lake St. John. The accumulator has a volume of 7,500 cubic feet and a capacity of 37,000 lbs., and two type "E" stokers, class 9, size 10'10" for the Lake St. John plant.

David Spencer Limited, Vancouver, two Kidwell boilers class 1015, 253 h.p., one Coxe stoker and one type "E" stoker, class 6 heavy size 7' 4.

Imperial Oil Refineries Limited, Sarnia, two 288 h. p. Kidwell boilers, one type "E" stoker, class 7, size 7'1"1, two type "E" stokers, class 9, size 8'6" and including soot blowers, preheaters, forced and induced draft fans, etc.

Preliminary Notice

of Applications for Admission and for Transfer

April 20th, 1925.

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in May 1925.

FRASER S. KEITH, Secretary.

*The professional requirements are as follows:—

A Member shall be at least thirty-five years of age, and shall have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office, or a term of instruction in a school of engineering recognized by the council. The term of twelve years may, at the discretion of the council, be reduced to ten years in the case of a candidate for election who has graduated from a school of engineering recognized by the council. In every case the candidate shall have held a position in which he had responsible charge for at least five years as an engineer qualified to design, direct or report on engineering projects. The occupancy of a chair as a professor in a faculty of applied science or engineering, after the candidate has attained the age of thirty years, shall be considered as responsible charge.

An Associate Member shall be at least twenty-seven years of age, and shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years. The occupancy of a chair as an assistant professor or associate professor in a faculty of applied science of engineering, after the candidate has attained the age of twenty-seven years, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council, shall be required to pass an examination before a board of examiners appointed by the council. The candidate shall be examined on the theory and practice of engineering with special reference to the branch of engineering in which he has been engaged. This examination may be waived at the discretion of the council if the candidate has held a position of professional responsibility for five or more years.

A Junior shall be at least twenty-one years of age, and shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the council, if the candidate for election has graduated from a school of engineering recognized by the council. He shall not remain in the class of Junior after he has attained the age of thirty-three years.

Every candidate who has not graduated from a school of engineering recognized by the council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects: geography, history, (that of Canada in particular), arithmetic, geometry, euclid (books I, IV and VI), trigonometry, algebra up to and including quadratic equations.

A Student shall be at least seventeen years of age, and shall present a certificate of having passed successfully an examination equivalent to the final examination of a high school or the matriculation of an arts or science course. He shall either be pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall not remain in the class of student for more than two years after graduation; or he shall be receiving a practical training in the profession, in which case he shall pass an examination equal to that prescribed for admission to the grade of Junior in the foregoing section and he shall not remain in the class of Student after he has attained the age of twenty-seven years.

An Affiliate shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience, qualify him to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

BROWN—HARRY CLEOPHAS, of Cornerbrook, Nfld. Born at Amherst, N.S. July 2nd, 1890; Educ., B.Sc., McGill Univ., 1917; 1906, Murray Contracting Co.; 1907-10, elec. constrn., Intercolonial Rly.; 1910-17, Montreal Electric Co.; 1917-20, light and power constrn. work, H.E.P.C. of Ontario; 1920, elec. substation and mill design, Wayagamack Pulp & Paper Co.; 1921-23, electrical engr., responsible for design, constrn. and operation, 20,000 h.p. substations and mill equipment, etc., Belgo Canadian Pulp & Paper Co.; 1924-25, (dual position), electr'l. engr. responsible for design and purchase of equipment for 100,000 h.p. substation and 400 ton paper mill, for Newfoundland Power & Paper Co., and in charge of elect'l constrn. of above plant for Sir W. G. Armstrong Whitworth Co., General Contractors. On completion of this plant will be in charge of operation of same, and 100,000 h.p. power house and hydro-electric system being constructed to supply power to above plant.

References: L. A. Herdt, C. V. Christie, E. Brown, A. R. Roberts.

GEMMILL—JAMES DUNLOP, of 17 DeBary Apts., Wardlaw Avenue, Winnipeg, Man. Born at Ottawa, Ont., Dec. 14th, 1885; Educ., Diploma (with Honours), Gold Medal, R.M.C., Kingston, 1906. 1906-08, School of Military Engrg., Chatham, England; 1908 (6 mos.), School of Defense Electric Lighting, Gosport; 1909, fortress defense work, Plymouth; 1910-14, barracks and fortifications, road constrn., telephones, searchlights, etc., Gibraltar; 1915, Calais, France. Camps and workshops, water supply, etc.; 1916 (3 mos.), Army Troops Co., R.E., France (in command); 1916-18, commanded 70th Field Co., R.E. Awarded M.C. & Bar.; 1918-19, in charge of supply of all engr. stores to Rhine Army (Tempy. Lt.-Col.); 1920-21, employed on disposal of all surplus army stores in France; 1921, staff officer to chief engr., London District and on War Office staff; 1922, garrison engr., India. Barrack and road constrn.; 3 mos. N. W. Frontier-fortifications; Resigned from Army, March 1923, with rank of Lieut.-Col.; 1923, partner in firm of bldg. contractors, North London; Returned to Canada, July 1924. 4 mos. bldg. inspr. under Winnipeg Hydro-Electric System on steam standby plant—transferred to head office. At present statistician to Winnipeg Hydro-Electric System, Winnipeg, Man.

References: E. P. Fetherstonhaugh, N. M. Hall, J. W. Sanger, J. M. Morton, A. T. Appleton.

GRAHAM—GORDON THOMAS, of 670 Willard Avenue, Toronto, Ont. Born at Toronto, Dec. 21st, 1897; Educ., Diploma, Mech. Engrg., I.C.S., 1925; 1915 (Mar.-Dec.), machinist, Canada Foundry Co.; 1916-18, foreman, Can. Kodak Co.; 1919-20, factory supt., Toronto Feather & Down Co.; 1920 (Mar.-Nov.), sewing mach. adjuster and mtce., Simmons, Ltd.; 1921, (Feb.-July), assembler, Willys Overland, Ltd.; 1921 (July-Sept), molder, Gurney Foundry Co.; 1922-24, metal spinner, Ideal Alum. Co.; July 1924 to date, aluminum spinner, Veribest Aluminum Co., Toronto, Ont.

References: J. H. Curzon, F. B. Goedike, O M. Falls, J. L. Brower, W. A. Bucke.

GURNHAM—ROBERT ALLAN, of 415 Notre Dame de Grace Avenue, Montreal, Que. Born at Montreal, Que., May 25th, 1886; 1903-05, junior dftsman., Sleeper Engine Co., Montreal, and C.P.R., Montreal; 1905-1909, dftsman., John McDougall Caledonian Iron Works, Montreal, Hart-Otis Car Co., Montreal, and Canadian Buffalo Forge Co., Montreal; 1909-10, chief dftsman., Century Engrg. Co., Ogdensburg, N.Y.; 1910-15, chief dftsman., 1915-18, works supt., John McDougall Caledonian Iron Works, Montreal; Feb. 1918 to date sales engr., Darling Bros., Montreal, Que.

References: F. B. Brown, J. H. Hunter, J. L. Busfield, J. T. Farmer, J. M. Robertson, F. S. Keith, J. B. Bladon.

LATREILLE—J. RAYMOND, of Quebec, Que. Born at Montreal, Que., Jan. 12th, 1898; Educ., B.Sc., C.E., Ecole Polytechnique, Montreal, 1922; 1923 (May-Nov.), on constrn. of J. B. Baillargeon Express Bldg., for Arthur Surveyer & Co.; Nov. 1923 to Nov. 1924, asst. engr., Messrs. Beaubien & Busfield & Co., on hydro-electric development; Jan. 1925 to date, engr., hydraulic service, prov. govt., Quebec, Que.

References: A. Surveyer, A. Amos, deG. Beaubien, J. L. Busfield, W. H. Abbott, C. M. Morssen, A. S. Dawes, E. W. Wall.

LECLAIRE—JOSEPH PAUL, of 235 Wolseley Avenue, Montreal West, Que. Born at Montreal, Que., May 16th, 1881; Educ., B.A.Sc. C.E., Laval Univ. 1902; After graduation, worked one year in U.S.A., at Johnstown, with Cambria Steel Co., Six months with C.P.R., and in contracting office of Dominion Bridge Company, Montreal, until 1911; 1911, appointed engr. in charge of bldgs., bridges and water service of the Harbour Commissioners of Montreal, 1921, promoted to asst. chief engr., and from 1923 to date, chief engineer.

References: A. Surveyer, O. O. Lefebvre, F. W. Cowie, T. W. Harvie, F. P. Shearwood, E. S. Mattice.

MARCHAND—EUGENE FRANCOIS, of 90 St. James Street, Montreal, Que. Born at Ottawa, Ont., May 28th, 1897; Educ., Matric., Ottawa Collegiate, 1915. D.L.S. Served 6 years with P. E. Marchand, elec. engr.; Designed, built, and put into successful and paying operation first plant of Rockland Electric Light Co. (1000 h.p. hydro electric) in 1922. Also in same year rebuilt town of Thurso waterworks system; June 1924, appointed gen. supt. engr., Laurentian Hydro Electric Ltd. (Works at Mont Rolland, P. Q.), and in Sept. of same year promoted to gen. mgr., and at present gen. mgr. and elect'l., engr., to above company.

References: F. B. Brown, R. deB. Corriveau, J. E. St. Laurent, J. E. Woods, H. B. Fisk.

SHANKS—GRAHAM LAWSON, of Winnipeg, Man. Born at Pettapiece, Man., Nov. 15th, 1889; Educ., B.Sc. (Agric.), Univ. of Man., 1912; 1913-17, lecturer in farm engrg., Vermilion Alberta School of Agriculture; 1917-20, lecturer, 1920 to date, professor, agricultural engrg., Manitoba Agricultural College, University of Manitoba, Winnipeg, Man.

References: A. R. Greig, E. P. Fetherstonhaugh, L. G. VanTuyl, T. Kipp, R. W. Moffat.

TOUZIN—THOMAS, of 550 Parc Lafontaine, Montreal, Que. Born at Lanoraie, Que., Oct. 31st, 1897; Educ., B.Sc. (C.E.), Ecole Polytechnique, Montreal, 1923; 1922, asst. geol. survey party, Dept. of Mines; At present, engr., Montreal Water Board, Montreal, Que.

References: C. J. Desbaillets, F. Y. Dorrance, A. Frigon, J. F. Brett, J. A. Lacouture.

FOR TRANSFER FROM CLASS OF ASSOCIATE MEMBER TO MEMBER

CAMPBELL—JOHN GEORGE WILLIAM, of Truro, N.S. Born at Dartmouth, N.S., July 31st, 1870; Educ , C. E. Ohio Northern Univ., 1914; 1900-02, sewage constrn., town of North Sydney; 1903, rly. constrn., Mabou & Gulf Rly. & Mining Co.; 1904-12, town engr., Sydney Mines, N.S.; Part 1914-15, land surveying, Nova Scotia; 1916, with R.C.E., in charge of constrn. work (militia); 1917, Nova Scotia Tramways & Power Co., Halifax, design and constrn. work; Part 1917-18, city engr's. staff, Halifax; 1919 to date, town engr., Truro, N.S.

References: W. P. Morrison, J. L. Allan, K. L. Dawson, C. A. D. Fowler, O. S. Cox.

JETTE—JOSEPH ARTHUR, of 123 rue Darling, Montreal, Que. Born at St. Paul of Joliette, Que. March 11th, 1883; Educ., C.E. and B.A.Sc., Laval Univ. 1908; 1908-09, transitman, T.C.N.Ry.; 1909, asst. engr., St. Boniface, Man.; 1909-11, in charge of Dominion land surveying; 1912, Town of Maisonneuve; 1913, road, dept., city of Montreal, 1914-20, city of Montreal—Aqueduct; 1920 to date, asst. engr. Montreal Water Board, Montreal, Que.

References: C. J. Desbaillets, F. C. Laberge, W. Dickson, R. Rinfret, T. W. Lesage, F. E. Field, C. C. Leluau.

VIENS—EPHREM, of Britannia Heights, Ont. Born at Ange Gardien, Rouville Co. Que., Jan. 19th, 1876; Educ., B. A. McMaster Univ. 1905. Part course, Master of Arts, 1905-06. Civil engr. course, I.C.S.; 1906-07 (5 mos.), with International Portland Cement Co., Hull, Que.; in April 1907 entered Civil Service as analytical chemist and physcist, Lab. for Testing Materials, Dept. Public Works, 1915-16, acting director, and from May 1916 to date, director of laboratory.

References: L. H. Cole, J. L. Rannie, J. E. St. Laurent, E. W. Stedman, A. F. Macallum.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

SHEPHERD—HUGH WALLIS ROBERTSON, of Edmonton, Alta. Born at Montreal, Que. March 4th, 1887; Educ., Matric. to McGill Univ.; 1905-07, rodman, 1907-09, instr'man. and transitman, 1909-10, res. engr., G.T.P. Rly.; 1911-12, res. engr C.N.R., constrn., west of Edmonton; 1912-14, contracting, (Shepherd & Stephen), built 10 miles of C.N.R. grade at Jasper, Alta.; 1914-19, overseas, Can. Engrs.; 1919-20, owner's engr. on constrn. of match factory, Berthierville, Que.; 1920 (Mar.-Oct.), asst. engr., C.P.R., mtce. of way, Laurentian Divn.; 1920-21, engr. on dam constrn. for Fraser Brace & Co.; 1921 (May-Sept.), engr. for North Western Oil Company; 1921-22, instr'man. on constrn., A. & G. W. Rly; 1922 (Apr.-Dec.), res. engr. on constrn., L. & N. W. Rly.; 1922-23, timber inspr., for O'Hanton & Ferguson; 1923-24, res. engr. on constrn. E. D. & B. C. Rly.; At present, res. engr., Highway Dept., Province of Alberta, Edmonton, Alta.

References: F. L. C. Bond, R. W. Jones, M. Murphy, A. J. Gayfer.

THEAKSTON—HAROLD RAYMOND, of No. 1 Commodore Apts., Halifax, N.S. Born at Monkton, Vt., U.S.A., May 11th, 1895; Educ., B.Sc. (Mining), Nova Scotia Tech. Coll., 1921; Summers: 1919, constrn. dept., Dom. Steel Corpn., Sydney; 1920, asst. to res. engr., N.S. Steel & Coal Co., Wabana, Nfld.; 1921, statistics dept., Stone & Webster, Boston, Mass.; Sept. 1921 to date, asst. professor of engr., and engr. in charge of bldgs. and grounds, Dalhousie University, Halifax, N.S.

References: W. P. Copp, F. R. Faulkner, W. F. McKnight, F. A Bowman, C. B. Archibald, A. R. Chambers.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

EATON—MILTON, of 35 George Street, Shawinigan Falls, Que. Born at Whitewater, Man., Aug. 24th, 1892. Educ., B.Sc. McGill Univ., 1921; 1920-21 (summers), foreman on constrn., Shawinigan Water & Power Co's., transmission lines, Nos. 7 and 8; 1921-22, engrg. staff, Shawinigan Engineering Company; Oct. 1922 to date, elect'l. engr., in charge of elect'l dept.. Electro Products Co. Ltd., Shawinigan Falls, Que.

References: L. A. Herdt, C. V. Christie, C. S. Saunders, C. Luscombe, J. Morse, P. Ackerman.

NORMAND—EDMOND, of 218 Addington Avenue, Montreal, Que. Born at Montreal, June 5th, 1900; Educ., B.Sc. (C. E.), Ecole Polytech., Montreal, 1921; 1917-18, asst. on geol. survey parties, Ont. & B. C., Dept. of Mines; 1921 to date, engr., Montreal Water Board, Montreal, Que.

References: C. J. Desbaillets, F. Y. Dorrance, J. A. Duchastel, A. Frigon, F. E. Field, J. A. Lacouture.

ROBERTSON—DONALD GRANGE, of Drummondville, Que. Born at Kingston, Ont., Nov. 17th, 1899; Educ., B.Sc. (Civil), Queen's Univ., 1924; Summers: 1921, rodman at Gananoque, 1922, concrete inspr., at Kingston, with Dept. Public Highways Ontario; 1923, instr'man., on mtce., C.P.R., Smiths Falls; From graduation to date, dftsman., Southern Canada Power Co., on constrn. of 30,000 h.p. power development, Hemming's Falls, Drummondville, Que.

References: W. P. Wilgar, J. S. H. Wurtele, F. F. Griffin, T. C. Connell, J. H. Forbes.

Engineering Index

This Index is prepared by the American Society of Mechanical Engineers.

In this department will be published from month to month the titles of current engineering papers with the authors and source and a brief extract of the more important. It is designed to give the members of The Institute a survey of all important articles relating to every branch of engineering profession.

PHOTOSTATIC PRINTS

Photostatic copies of the articles listed in this section, or others on engineering subjects, may be obtained from the Engineering Societies Library.

Price of each print (up to 11 by 14 in. size) 25 cents, plus postage. Where possible, two pages, up to 7 by 9 in. size, will be photographed on one print. Larger magazines require a print per page. Bills will be mailed with the prints.

The Library is also prepared to translate articles, to compile lists of references on engineering subjects and render assistance in similar ways Charges are made, sufficient to cover the cost of this work. Correspondence is invited. Information concerning the charge for any specific service will be given those interested. In asking for information please be definite, so that the investigator may understand clearly what is desired.

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A

AERODYNAMICS

Movements of Airplanes. The Movements of Airplanes and the Resistance Opposed to These Movements (Om aeroplaners baereevne og motstanden mot dores vevaegelse), V. Bjerknes. Ingeniören, vol. 33, no. 48, Nov. 29, 1924, pp. 549-556, 11 figs. Describes analogies between hydrodynamic, electrodynamic, and aerodynamic phenomena; analyzes forces acting upon a rotating cylinder immersed in a flow of gas or liquid; describes and illustrates bodies offering least resistance and best shape for airplane wings.

AIR COMPRESSORS

Piston. Auxiliary Equipment for Oil Burning, K. Miller. Fuels & Furnaces, vol. 3, no. 2, Feb. 1925, pp. 139-146, 15 figs. Deals with the various features of piston compressors, also their regulation.

AIR CONDITIONING

Temperature and Humidity, Effects of. Work Tests Conducted in Atmospheres of High Temperatures and Various Humidities in Still and Moving Air, W. J. McConnell and C. P. Yagloglou. Am. Soc. Heat. & Vent. Engrs.—Jl., vol. 31, no. 1, Jan. 1925, pp. 35-57, 12 figs. Results of experiments conducted with subjects doing measurable amounts of work at constant rate in still and moving air of various temperatures and humidities.

AIR FILTERS

Types. Air Washers and Air Filters, H. W. S. Martin. Domestic Eng. (Lond.), vol. 45, no. 1, Jan. 1925, pp. 3-15, 18 figs. Describes different types of dry air filters and air washers.

AIRPLANE ENGINES

Jaguar. Handbook on the 325 H.P. Jaguar III. Aero Engine. Air Ministry (Great Britain), Air Publication 1082, 1924, 63 pp., 22 figs. partly on supp. plates. A 14-cylinder air-cooled radial engine, of which cylinders are arranged in two rows of 7; stripping and assembling of engine; list of clearances.

AIRPLANES

Accelerations in Flight. Accelerations in Flight, J. H. Doolittle. Nat. Advisory Committee for Aeronautics—Report, no. 203, 1925, 18 pp., 42 figs. Work on accelerometry done at McCook Field for purpose of continuing work done by other investigators and obtaining accelerations which occur when modern highspeed pursuit airplane is subjected to more common maneuvers.

Specifications. American Airplane Specifications. Automotive Industries, vol. 52, no. 9, Feb. 26, 1925, pp. 422-423. Tabular data alphabetically arranged according to makers. See also American and British specifications for light airplanes, p. 424.

AIRSHIPS

Possibilities. Possibilities of the Giant Rigid Dirigible, A. Klemin. Sci. Am., vol. 132, nos. 1, 2 and 3, Jan., Feb. and Mar., 1925, pp. 18-21, 94-96 and 166-168, 23 figs. Jan.: Difficulties of landing and getting airship in and out of its hangar; author points out that strength in air and at mast, control in flight and on handling, in good or bad weather, are already definitely achieved. Feb.: Possibilities of helium as prevention of fires; gas loss and its sources. Mar.: Future leviathans of the sky.

ALLOYS

Aluminum. *See Aluminum Alloys.*
Bearing Metals. *See Bearing Metals.*

Equilibrium Diagram. The Practical Importance of the Equilibrium Diagram, D. Hanson. Metallurgist (Supp. to Engineer), Feb. 27, 1925, pp. 18-22, 5 figs. Examination of significance of equilibrium diagrams, of their scientific and industrial applications, and of their limitations.

Internal Structure. The Inner Structure of Alloys, W. Rosenhain. Engineering, vol. 119, no. 3089, Mar. 13, 1925, pp. 311-312. Abstract of third Cantor lecture on this subject delivered at Royal Society of Arts.

Iron. *See Iron Alloys.*

Low-Melting-Point. Low Melting Point Alloys, N. F. Budgen. Metal Industry (Lond.), vol. 26, nos. 1 and 2, Jan. 2 and 9, 1925, pp. 1-3 and 33-35, 2 figs. Discusses properties, preparatiou, and uses of lead, bismuth, tin, and cadmium low-melting-point alloys and amalgams, thereof, giving data of investigations into their melting and freezing temperatures and their mechanical properties.

Magnesium. *See Magnesium Alloys.*

ALUMINUM

Thermal Expansion. Thermal Expansion of Aluminum and Various Important Aluminum Alloys, P. Hidnert. U. S. Bur. Standards—Scientific Papers, vol. 19, no. 497, Jan. 9, 1925, pp. 697-731, 21 figs. Data on linear thermal expansion of 4 samples of aluminum and 51 samples of alloys; preparation, chemical composition, heat treatment, etc., are included; apparatus used in research, and review of available information obtained by previous observers ou thermal expansion of aluminum.

ALUMINUM ALLOYS

Alpax. A New Aluminum Alloy—Alpax, L. Guillet. Foundry Trade Jl., vol. 31, nos. 444 and 445, Feb. 19 and 26, 1925, pp. 161-165 and 177-180, 9 figs. Preparation of alpax which is characterized not only by its silicon content but also by modifying process which is necessary in order to confer upon it desired properties; nature of refining process; mechanical properties. (Abstract.) Paper read before Am. Foundrymen's Assn.

Castings. A Method of Improving the Properties of Aluminum Alloy Castings, S. L. Archbutt. Inst. Metals—advance paper, no. 2, for mtg. Mar. 11-12, 1925, 13 pp., 5 figs. Describes experiments on methods of improving properties of aluminum alloy castings. See also (abridgement) in Engineering, vol. 19, no. 3089, Mar. 13, 1925, pp. 336-338, 5 figs.

Founding and Properties. The Founding and Properties of Aluminum Silicon Alloys, D. Basch and M. F. Sayre. Metal Iudustry (Lond.), vol. 26, nos. 5, 6, 7 and 8, Jan. 30, Feb. 6, 13 and 20, 1925, pp. 105-106 and 109, 134-136, 156-158 and 181-183, 12 figs. Survey of properties of sand-cast alloys, application of these factors in design of castings, foundry methods in casting and refining of these alloys, and discussion of main theoretical factors involved. (Abstract.) Paper read before Am. Foundrymen's Assn.

AMMONIA

Oxidation. Temperature Control in Ammonia Oxidation, G. A. Perley and R. P. Smith. Indus. & Eng. Chem., vol. 17, no. 3, Mar. 1925, pp. 258-260, 2 figs. Operation of ammonia oxidation process from consideration of gauze temperature is said to be misleading; high ammonia content (above 11 per cent by volume) favours high gauze temperature, yet gives low conversion; recording pyrometer located near catalyst intake and calibrated for given equipment is most advantageous; preheating gas to between 460 and 500 deg. cent. favours greater capacities for given oxidation efficiency.

AMMONIA COMPRESSORS

Two-Stage. Development of Two-Stage Ammonia Compressor in the U. S., N. H. Hiller. Ice & Refrigeration, vol. 68, no. 2, Feb. 1925, pp. 149-152, 6 figs. Describes progress made by this type of ammonia-compression machine and points out its advantages over single-stage machines in low and also comparatively high-temperature work. Paper read before Fourth Int. Congress of Refrigeration.

APPRENTICES, TRAINING OF

Employer's Points of View. How Employers' Associations View Apprenticeship Training, G. F. Meyne. Am. Mach., vol. 62, no. 10, Mar. 5, 1925, p. 379. Address delivered before Vocational Educational Assn.

Improved Methods, Necessity for. Replacement Troops for Our Industrial Army, H. S. Hall. Am. Mach., vol. 62, no. 9, Feb. 26, 1925, pp. 349-350. High degree of specialization in industry increases demand for experts; old apprenticeship system inadequate to meet situation

ARCHES

Concrete. Design of Symmetrical Concrete Arches. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 3, Mar. 1925, pp. 422-433, 4 figs. Discussion of paper by Chas. S. Whitney, published in Nov. 1924 issue of Proceedings.

Progress Report of the Special Committee ou Concrete and Reinforced Concrete Arches. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 3, Mar. 1925, pp. 129-134, 1 fig.

AUTOMOBILE ENGINES

Air-Cleaner Tests. Final Report on the 1924 California Air-Cleaner Tests, A. H. Hoffman. Soc. Automotive Engrs.—Jl., vol. 16, no. 3, Mar. 1925, pp. 367-371 and 378, 5 figs. Results of studies to end of 1924; includes data from tests of 12 new makes or models of air-cleaner not previously tested or not fully tested.

Cooling. Thermo-syphon Cooling, B. Joy. Motor Transport (Lond.), vol. 40, no. 1041, Feb. 9, 1925, pp. 161-162, 5 figs. Remarks on action of natural-water circulation in internal-combustion engine cooling.

Fuels. *See Automobile Fuels.*

Michell Crankless. The Michell Crankless Engine, E. C. Moyle. Automobile Engr., vol. 15, no. 199, Feb. 1925, pp. 41-43, 3 figs. Notes on its dynamic balance; inertia forces and torques due to reciprocating masses; inertia couple due to swash plate.

Sleeve-Valve. The Manufacture of Sleeve Valve Engines, J. Younger. Am. Mach., vol. 62, no. 10, Mar. 5, 1925, pp. 385-387, 7 figs. Machining sleeves 3-32 in. in thickness; lapping or honing operations; operations on aluminum piston. Methods in use in Stearns factory, Cleveland.

Specifications, American. American Passenger Car Engine Specifications. Automotive Industries, vol. 52, no. 9, Feb. 26, 1925, pp. 362-365. Tabular data alphabetically arranged according to makers.

AUTOMOBILE FUELS

Atomization. Atomization of Liquid Fuels (Ueber die Zerstäubung flüssiger Brennstoffe, R. Kuehn. Motorwagen, vol. 28, nos. 2 and 4, Jan. 20 and Feb. 10, 1925, pp. 21-27 and 67-70, 2 figs. Mixture of spraying drops with air. Report from Machine Laboratory of Technical High School, Danzig.

AUTOMOBILES

Body and Equipment Specifications. Body and Equipment Specifications of 1925 Cars. Automotive Industries, vol. 52, no. 9, Feb. 26, 1925, pp. 356-357. Tabular data alphabetically arranged according to makers.

Brakes. New Device Equalizes Braking Torque on Opposite Sides of Car. Automotive Industries, vol. 52, no. 7, Feb. 12, 1925, pp. 266-267, 2 figs Gless brake differential applies equalizing action to reaction on anchoring point rather than to force of application; tends to prevent skidding and insure equal wear; for cars and trucks.

The Automotive Airbrake—Why and How, H. D. Hukill. Soc. Automotive Engrs.—Jl., vol. 16, no. 3, Mar. 1925, pp. 283-296, 24 figs. Investigation as to what actually causes car to stop when brakes are applied; discusses variations of coefficient of friction of different kinds of brake lining under varying conditions, develops formulas to sbow forces necessary to lock wheels of car under given conditions, and determines amount of push of pedal or pull of lever that would be necessary to produce this effect with various arcs of contact between brakeshoe and drum; describes Westingbouse automotive air brake.

Lubricating System, Chassis. The Central-Point Chassis-Lubrication System, Jos. Bijur. Soc. Automotive Engrs.—Jl., vol. 16, no. 3, Mar. 1925, pp. 335-341, 11 figs. In this system 50 or more lubrication points on cbassis are supplied with oil from central lubricator or oil reservoir on dasb under bood; hand-operated pump or gun supplies approximately 50 lb. of pressure to force oil through all parts of copper-tube pipe line to control outlets located at points requiring oil supply. See also Automotive Industries, vol. 52, no. 7, Feb. 12, 1925, pp. 262-264, 12 figs.

Rating. A Review of the Rating Question, A. E. Berriman. Automobile Engr., vol. 15, no. 199, Feb. 1925, pp. 55-61, 1 fig. Interrelation of political, commercial and technical aspects of subject; equitable basis of taxation; technical justification of present system of taxation in Britain; summary of power rating systems.

Standardization and Repair. Automobile Repair and Standardization (Automobilreparatur und Normung), Grodschinski. Motorwagen, vol. 28, no. 2, Jan. 20, 1925, pp. 27-28. Effect of standardization on automobile repair.

Triumph. The 10-H.P. Triumph Motor Car. Engineering, vol. 119, no. 3086, Feb. 20, 1925, p. 223, 12 figs. partly on supp. plate. Engine is 4-cylinder model witb detachable bead and side-by-side valves, special feature of latter being that they are masked with view to minimizing wire-drawing effects; crank-sbaft is of two-bearing type; lubrication is by splash throughout.

B

BEARING METALS

Melting. Melting White Bearing Alloys Foundry Trade Jl., vol. 31, no. 444, Feb. 19, 1925, p. 165. Economical metbods of manufacture.

BEARINGS

Anti-Friction. Anti-friction Bearing Applications for Heavy Duty, J. B. Dahlerus. Engineering, vol. 119, nos. 3085 and 3086, Feb. 13 and 20, 1925, pp. 208-210 and 239-240, 15 figs.; also Engineer, vol. 139, no. 3067, Feb. 13, 1925, pp. 197-198, 8 figs. Development of antifriction bearings for beavy duty; railway work; street-car work; rolling mills. (Abridged.) Paper read before Instn. Mech. Engrs.; see also (discussion) in Engineering, Feb. 13, 1925, pp. 184-186.

BEARINGS, ROLLER

Paper Industry. Advantages of Roller Bearings in Paper Industry, D. E. Batesole. Belting, vol. 26, no. 1, Jan. 1925, pp. 17-22, 12 figs Three important points to be taken into consideration in selection of bearings; design and proper care after assembly most essential.

BELT DRIVE

Pendulum Motor Drive. Mechanical Power Transmission by Means of Pendulum Motor Drive (Die mechanische Kraftübertragung durch Pendelmotorantrieb), W. Wiedemann. Maschinenbau, vol. 4, no. 2, Jan. 29, 1925, pp. 59-61, 5 figs. Describes Adko belt drive in wbich motor is arranged in an oscillating position; gives examples of application.

BLAST FURNACES

Air Preheaters for. Suggestion for Improved Tubular Air Prebeater for Swedish Charcoal Blast Furnaces (Förslag till en förbättrad rörvarmapparat för svenska träkolsmasugnar), M. Tigerschiöld. Jernkontorets Annaler, vol. 109, no. 1, 1925, pp. 1-38, 8 figs. Detailed analysis of process of combustion and heat balance; describes extensive experiments, on whicb design is based, and gives calculation of necessary dimensions; design of preheater; estimates that device will pay for itself in less than one year's time.

BOILER FEEDWATER

Treatment. A System of Boiler Water Treatment Based on Chemical Equilibrium, R. E. Hall. Indus. & Eng. Chem., vol. 17, no. 3, Mar. 1925, pp. 283-290, 4 figs. From results obtained in extended tests at two power plants, one using sulphate and other bicarbonate water, conclusion was drawn that formation of adherent scale is due mainly to crystallization in situ; general formula was deduced for preventing growth of bard adherent scale on evaporating surfaces; at high operating pressure it becomes impossible to use soda ash for treatment, unless sulphate concentration is maintained extremely low; for bigh-pressure conditions, therefore, use of phosphate in place of carbonate is advisable.

The Scientific Treatment of Boiler Feed Water, Introducing the Colloidal Aspect, W. B. Lewis. South Wales Inst. Engrs.—Proc., vol. 40, no. 6, Jan. 7, 1925, pp. 403-415 and (discussion) 415-421, 5 figs. Deals with results of extensive research, showing advantages of colloidal treatment, with comments on hydrological chemistry in general.

BOILER FURNACES

Air Preheaters. Air Prebeaters, C. W. E. Clarke. Mech. Eng., vol. 47, no. 3, Mar. 1925, pp. 175-178 and (discussion) 178-183, 8 figs. Historical development and present status; data on erected and proposed installations.

Pre-Heated Air in Modern Boiler Plant, C. Erith. Elec. Rev., vol. 96, no. 2462, Jan. 30, 1925, pp. 164-166, 4 figs. Discusses preheating in hand- and mechanically-fired marine boilers, and examples of flue-gas air preheaters.

Clinker Adhesion on Walls. The Bernitz Method of Eliminating Clinker Adhesion on Boiler Furnace Walls, B. H. Snow. Universal Engr., vol. 41, no. 2, Feb. 1925, pp. 35-38, 6 figs. Outline of origin and characteristics of clinkers; troubles encountered from clinkers; details of Bernitz method, which is a construction applied to furnace walls for purpose of increasing their life, eliminating clinker adhesion and associated troubles, and assuring high furnace efficiencies and more continuous operation.

Coal and Wood Refuse. Furnace Designs for Coal and Wood Refuse, C. M. Garland. Power, vol. 61, no. 1, Mar. 17, 1925, pp. 406-409, 6 figs. Furnaces for moist or dry fuels in which throat is restricted just enough to insure satisfactory ignition; mixing of gases is effected by throat contraction and nozzles properly directed, which discharge preferably products of combustion.

Water-Cooled. Water-Cooled Furnaces, H. D. Savage. Mech. Eng., vol. 47, no. 3, Mar. 1925, pp. 197-199 and (discussions) 199-200, 5 figs. Describes several installations of fin-wall furnaces, pointing out their advantages.

BOILER PLANTS

Instruments. Operating Control in Boiler Plants (Beitrag zur Frage der Betriebskontrolle in Kesselanlagen), M. Quack. Zeit. des Bayersichen Revisions-Vereins, vol. 29, no. 1, Jan. 15, 1925, pp. 2-8, 17 figs. Discusses design and manipulation of boiler-room instruments which are absolutely essential, namely, steam meter, flue-gas tester and draft indicator; cost of maintaining instruments; advantages of simple instruments.

The Why of Boiler Plant Instruments, R. E. Cramer. Combustion, vol. 12, no. 3, Mar. 1925, pp. 193-195. Important things to be kept in mind wben using engineering instruments in boiler plants which produce steam for general industrial purposes.

BOILER TUBES

Heat Transmission. Heat Transmission and Efficiency in Steam Boiler Tubes, E. A. Fessenden. Pa. State College Bul., Sept. 1924, 48 pp., 28 figs. Results of investigations upon transfer of heat from products of combustion passing over heating surface to water in boiler. Inadequacy of various formulas for heat transfer, sucb as Perry's, U. S. Bur. Mines, Kent's, and Babcock & Wilcox Co.'s is sbown by their failure to check each other or to fit test data accurately. Gives formula developed by author expressing law of fall of temperature of gases along beating surface according to exponential formula for a damping-out process, which fits experimental data in very satisfactory manner.

BOILERS

Burning Fuels in Suspension. A Proposed Boiler Design for Burning Fuels in Suspension, H. H. Baumgartner. Nat. Engr., vol. 29, no. 3, Mar. 1925, pp. 123-125, 2 figs. Describes a boiler design adapted to burning of liquid, gaseous, colloidal and pulverized fuels, which incorporates features radically different from conventional designs advantages.

Electrically Heated. Automatically Controlled Electric Boilers, W. S. Guthrie. Elec. World, vol. 85, no. 11, Mar. 14, 1925, p. 568, 1 fig. Describes automatic-control system whicb has been found to work out very successfully and has been applied to station and shop heating for period of more than two years.

Heat Transfer and Combustion. Heat Transference and Combustion Tests in Small Domestic Boiler, H. W. Brooks, M. L. Orr, W. M. Myler and C. A. Herbert. Am. Soc. Heat. & Vent. Engrs.—Jl., vol. 31, no. 1, Jan. 1925, pp. 89-118, 17 figs. Report of series of tests made with various fuels to determine beat absorption and other characteristics of sectional boiler construction.

Internal-Combustion. Tbe "Internal-Combustion" Boiler, F. J. Drover. Power Engr., vol. 20, no. 228, Mar. 1925, pp 86-87, 1 fig. Describes Brunler boiler in whicb steam is generated by means of fire burning in water: steam generator consists of generator, steel burner, reservoir for water and steam, connection valve between water reservoir and steam generator, regulating valve for fuel and air, and ignition lamp.

Lancashire vs. Water-Tube for Coal Mines. Efficient Steam Generation, D. Brownlie. Colliery Eng., vol. 2, no. 12, Feb. 1925, pp. 70-72. Consideration of Lancasbire versus water-tube boiler for coal mines.

Mercury-Vapor. *See Mercury-Vapor System.*

Tests. Evaporative Tests at River Rouge. Power Plant Eng., vol. 29, no. 5, Mar. 1, 1925, pp. 275-278, 3 figs. Results of five tests, using pulverized coal for sustained boiler loads up to 285 per cent of normal rating.

Steam Boiler Testing, Chas. F Wade. Elec. Times, vol. 67, nos. 1734 and 1738, Jan. 8 and Feb. 5, 1925, pp. 29-31 and 125-159, 3 figs. Jan. 8: Acceptance trial. Feb. 5: Heat-balance records.

Waste-Heat. A Problem In Waste Heat, G. H. Heine. Fuels & Furnaces, vol. 3, no. 2, Feb. 1925, pp. 149-150 and 153. Discusses question of when waste-beat boiler should be installed.

Water-Chamberless. A New Type of Steam Boiler Without Water Chamber (Ein neuartiger Dampfkessel ohne Wasserraum), Berner. Wärme, vol. 48, no. 2, Jan. 9, 1925, pp. 15-16, 1 fig. Describes new boiler for rapid generation of steam, designed as portable boiler; but so many advantages are claimed for it tbat its use for other purposes is recommended.

BOILERS, WATER-TUBE

Large. The Large Water-Tube Boiler, P. W. Robson. Instn. Civ. Engrs.—Sessional Notices, no. 3, Feb. 1925, pp. 69-72. General aspects of problem; author draws attention to disparity between present size of turbine units and that of boiler units for large powers; technical problems of large boiler, tubes of boilers suitable for large units; use of pulverized fuel.

Pulverized-Coal-Fired. Existing Boilers Converted for Pulverized Fuel. Power Engr., vol. 20, no. 228, Mar. 1925, pp. 89-93, 7 figs. Describes bow battery of water-tube boilers at coal mine bas been converted for firing with pulverized fuel on unit system.

Tube Surfaces Exposed to Flame. Exposing Water Tube Surfaces to Flame, J. G. Coutant. Combustion, vol. 12, no. 3, Mar. 1925, pp. 191-192, 2 figs. Tests conducted in plant of Mines de Bruay, France, to determine effect of water-tube surfaces directly exposed to flame.

BRIDGE DESIGN

Stresses, Secondary. Secondary Stresses in Bridges. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 3, Mar. 1925, pp. 406-421, 4 figs. Discussion on paper by C. Vivian von Abo, published in previous issue of Proceedings.

BRIDGES, HIGHWAY

Hydraulic Surveys as Design Basis. Hydraulic Surveys Aid Design of Highway Bridges, P. K. Schuyler. Eng. News-Rec., vol. 94, no. 3, Feb. 19, 1925, pp. 312-314, 4 figs. Exhaustive field investigations, reports, and photographs basis for design of water-course crossings in North Carolina.

BRIDGES, RAILWAY

WOODEN. Wooden Bridges and Trestles. Am. Ry. Eng. Assn.—Bul., vol. 26, no. 273, Jan. 1925, pp. 515-552, 2 figs. Useful strength of new, old and treated timber when used in railway trestles, including critical examination of present theories of stresses when applied to timber under railway load conditions; classification of uses of timber and lumber under Am. Ry. Eng. Assn. specifications; relative merits of open and ballast deck timber trestles.

BROACHING MACHINES

INTERCHANGEABLE, FOR KEYWAYS. Interchangeable Broaches for Keyways, Chas. G. Pfeffer. Machy. (N.Y.), vol. 31, no. 7, Mar. 1925, pp. 549-552, 2 figs., 2 tables. Describes method of designing cutters that will permit broaching of one size keyway in bores of different size with one cutter.

BRONZE

CASTINGS, LARGE. Making South Africa's Largest Bronze Castings, F. W. Hobbs. Foundry Trade Jl., vol. 31, no. 442, Feb. 5, 1925, pp. 113-115, 8 figs. Describes manufacture of casting which has chamber of 60,000-gal. per hr. Sulzer pump and weighed 5340 lb.; this, together with suction-delivery-end castings, totaled 7691 lb.; molding the chamber; arrangements of center core; preparing metal.

CASTINGS, MANGANESE-BRONZE. The Production of Manganese Bronze Castings. Metal Industry (Lond.), vol. 26, nos. 3 and 9, Jan. 16 and Feb. 27, 1925, pp. 55-57, 17 figs. Jan. 16: Manufacture of type of marine-propeller cone caps used on smaller vessels, and of casings. Feb. 27: Production of special air cylinder used for charging air containers on units operated by compressed air such as torpedoes.

C

CABLES, ELECTRIC

HIGH-TENSION. Extra High-Tension Cables. (Câbles électriques à "surface équipotentielles" pour hautes tensions). Génie Civil, vol. 26, no. 4, Jan. 24, 1925, p. 93, 1 fig. Describes and reproduces section of 3 by 150 sq. mm. 60,000-volt 3-core cable as made by Ateliers de Jeumont; each of three cores is paper-insulated, and covered with sheet of metallized aluminum paper; cores are then laid together, interstices being filled with packing so as to produce circular section; metallized tape is wound round whole, and cable is then lead-sheated and steel-armored.

SINGLE-CORE, ON A. C. CIRCUITS. The Current Rating of Single-Conductor, Lead-Covered, Low-Tension Cables on Single-Phase Alternating Current Circuits, S. W. Melsom. Instn. Elec. Engrs.—Jl., vol. 63, no. 338, Feb. 1925, pp. 190-203 and (discussion) 203-206, 14 figs. Theoretical considerations of losses of energy occurring in single-core cables on a.c. current circuits and their effect on line characteristics; results of measurements carried out on single-phase system in air to determine loadings for given temperature rise.

TEMPERATURE DETECTOR FOR. Use of Temperature Detector for Cables, H. B. Dwight. Elec. World, vol. 85, no. 10, Mar. 7, 1925, pp. 506-507. Points out that measurement of a.c. conductivity of large conductors is difficult; relation of conductivity to Watts lost; effect of core on cable conductivity; position of detectors.

CARBON DIOXIDE

JOULE-EFFECT MEASUREMENTS. Recent Measurements of the Joule Effect for CO_2, F. G. Keyes and F. W. Sears. Nat. Acad. Sci.—Proc., vol. 2, no. 1, Jan. 1925, pp. 38-41, 1 fig. Apparatus employed and results of measurements.

CARS

INSPECTION. Specialized Inspection Reduces Pull-Ins on Kansas City Railways. Elec. Ry. Jl., vol. 65, no. 9, Feb. 28, 1925, pp. 329-332, 5 figs. Designation of certain trained men to do inspection work exclusively has resulted in eliminating many street failures; cars are inspected both before and after work is done and each man is held responsible for group of cars assigned to him; graphic records help to check performance.

SPRINGS, MAINTENANCE OF. Maintaining Car Springs in Twin Cities. Elec. Ry. Jl., vol. 65, no. 9, Feb. 28, 1925, pp. 325-327, 4 figs. Equipment and methods developed at shops of Twin City Rapid Transit Co., Minneapolis, Minn., for proper maintenance of car springs.

CAST IRON

GRAPHITIZATION. The Mechanism for the Graphitization of White Cast Iron and Its Application to the Malleablization Process, A. Hayes and W. J. Diederichs. Ia. State College of Agriculture & Mech. Arts—Official Publication, vol. 23, no. 14, bul. 71, Sept. 3, 1924, 45 pp., 29 figs. Report of work resulting in theory for mechanism of complete graphitization of white iron and also results of application of this theory to problems of shortening annealing cycle and production of intermediate products.

GRAY, CONTROLLING QUALITIES. Controlling Gray Iron Qualities, Jas. Ward. Foundry, vol. 53, no. 5, Mar. 1, 1925, pp. 186-188, 5 figs. It is said that average chemist and metallurgist when speaking of research work in metallography are apt to use scientific terms more or less confusing to practical foundrymen; author has simplified such scientific terms by use and description of them.

MACHINEABILITY, FACTORS INFLUENCING. Factors Influencing the Machineability of Cast Iron, J. W. Bolton Machy (N.Y.) vol. 31, no. 7, Mar. 1925, pp. 533-535, 10 figs. Shows how structure, that is, crystalline make-up of cast iron controls abrasive action and is responsible for peculiar cutting action.

NICKEL, INFLUENCE OF. The Influence of Nickel and Chromium upon Grey and Malleable Cast Iron, L. Northcott. Brit. Cast Iron Research Assn.—Bul., no. 7, Jan. 1925, pp. 8-10. Deals with published works on cast irons containing nickel.

PROPERTIES, MECHANICAL. The Distribution of Graphite in Cast Iron and the Influence of other Elements on Its Strength, M. Hamasumi. Tohoku Imperial Univ.—Sci. Reports, vol. 13, no. 2, Nov. 1924, pp. 133-178, 54 figs. partly on supp. plates. Investigation of mechanical properties of cast iron in all its bearings viz., effect of cooling velocity, distribution of graphite, effect of common impurities such as silicon, phosphorus, sulphur manganese, copper, nickel, chromium and tin.

RESEARCH. The Future Improvement of Cast Iron, J. G. Pearce. Foundry Trade Jl., vol. 31, no. 445, Feb. 26, 1925, pp. 181-182 and (discussion) 182-184. Deals with work of British Cast Irou Research Association, a national, government-aided body, founded to give assistance to producers and users of pig, gray and malleable iron, and to conduct investigations on these materials; researches in progress.

STRUCTURAL COMPOSITION. The Structural Composition of Cast Iron, A. Logan. Foundry Trade Jl., vol. 31, no. 444, Feb. 19, 1925, pp. 155-160, 14 figs. Author seeks to explain why slight differences of chemical composition can have so large an influence on iron; how elements exist in cast iron; effect of cupola melting; relation between composition and structure. See also (discussion), vol. 31, no. 445, Feb. 26, 1925, pp. 186-187.

TESTING FOR LIFE. Testing Cast Iron for "Life", Chas. Cury. Foundry Trade Jl., vol. 31, no. 439, Jan. 15, 1925, pp. 52-55, 1 fig. Definition of term "life" (coulabilité), as property which metal possesses of filling mold more or less completely; results of various experiments and modifications in test bars resulting from them. Translated from paper read before Assn. Technique de Fonderie.

CASTING

PAPER-MAKING MACHINERY PARTS. Casting Pulp and Paper Making Machinery Parts, W. Eversley. Can. Foundryman, vol. 16, no. 16, no. 1, Jan. 1925, pp. 17-19, 4 figs. Method in use in plant of Chas. Walmsley & Co. at Longueuil a small city in Quebec, in building up molds for 15-ton rolls, a departure from standard practice.

CASTINGS

DIESEL-ENGINE. Diesel Engine Castings. Shipbldg. & Shipg. Rec., vol. 25, no. 5, Jan. 29, 1925, pp. 127-129, 3 figs. Temperature stresses; characteristics of cast iron; design of oil engines. Abstract of discussion resulting from joint meeting of metallurgists, marine engineers, and foundrymen held in Glasgow. See also Mar. Engr., vol. 48, no. 569, Feb. 1925, pp. 45-47, 3 figs.

POROUS, CAUSE OF. Are Porous Castings Caused by Gates and Risers? H. Miller. Foundry, vol. 53, no. 5, Mar. 1, 1925, p. 180. Points out that release of absorbed gases during pouring may be accomplished by pouring from bottom with no feed gates or risers.

CEMENT, PORTLAND

RAPID-HARDENING. Rapid Hardening Portland Cement. Concrete and Constr. Eng., vol. 20, no. 1, Jan 1925, pp. 4-9, 4 figs. Results of practical tests on concrete beams made with ferrocrete (rapid-hardening) Portland cement.

SPECIFICATIONS AND TESTS. French and American Specifications and Tests for Portland Cement, Duff A Abrams. Eng. World, vol. 26, no. 2, Feb. 1925, pp. 97-98. Points out fundamental differences between French and American specifications and tests for portland cement.

CENTRAL STATIONS

COAL AND STEEL INDUSTRY. Ebbw Vale Power Plant. Power Engr., vol. 20, no. 227, Feb. 1925, pp. 56-65, 16 figs. Account of electrical generating plant and turbo-blowers of Ebbw Vale Steel, Iron & Coal Co., with special reference to recent extension of main plant at Victoria.

SUPERPOWER. Super-Power Stations in Europe and America, J. B. C. Kershaw. Power Engr., vol. 20, no. 227, Feb. 1925, pp. 47-52, 7 figs. Comparative figures relating to several of largest generating plants in world.

CHIMNEYS

DRAFT CALCULATION. Stack Draft Calculation, P. J. Fogarty. Gas Age-Rec., vol. 55, no. 7, Feb. 14, 1925, pp. 217-218, 2 figs. Includes charts that are designed to quickly determine stack drafts under any conditions.

CIRCUIT BREAKERS

OIL TYPE. The Rupturing Capacity of Oil-immersed Circuit-Breakers, G. L. E. Metz. Elec. Rev., vol. 96, no. 2460, Jan. 16, 1925, pp. 87-88, 2 figs. Determination of rupturing capacity of oil-immersed circuit breakers for operation in a power station and for operation some distance away from station. Cruves and chart.

CITY PLANNING

PROGRESS. A Synopsis of the Advantages of Town Planning and Zoning, F. E. Buck. Eng. & Contracting (Buildings), vol. 63, no. 2, Feb. 25, 1925, pp. 412-416. Progress of movement and classification of citizens and their requirements in relation to living conditions. From Jl. of Town Planning Inst. Can.

ZONING. Factors in the Zoning of Cities. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 3, Mar. 1925, pp. 434-446. Discussion of symposium published in Feb. issue of Proceedings.

COAL

FACTORS DETERMINING SELECTION. Coal as an Industrial Fuel, D. J. Demorest. Chem. & Met. Eng., vol. 32, no. 7, Feb. 16, 1925, pp. 274-276. Factors determining choice of coal for boilers, producers, coke ovens, gas works and pulverized-coal installations.

MICROSCOPICAL STRUCTURE. Microscopical Structure of Anthracite, H. G. Turner. Am. Inst. Min. & Met. Engrs.—Trans., no. 1409-I, Feb. 1925, 21 pp., 21 figs. Results of investigations show that anthracite is composed of same kinds of organisms and materials found in bituminous coal; that these organisms and their parts are in same proportions as in bituminous coal; and that they are in similar state of preservation, except for greater abundance of structureless bands.

COAL HANDLING

LOADING MACHINES. Coloder, Used by Pocahontas Fuel Co., A. F. Brosky. Coal Age, vol. 27, no. 6, Feb. 5, 1925, pp 215-218, 4 figs. Loading machine, invented by Jas. E. Jones, has been in process of development since 1893; its action while loading is similar to that of arcwall machine making cut; employs five-man crew.

TOWERS. High-speed Coal Towers at the Brooklyn Edison Company's Hudson Avenue Station. Gen Elec. Rev., vol. 28, no. 2, Feb. 1925, Mechanical Features, by C. D. Bray, pp. 76-79, 2 figs.; and Generator Voltage Control by E. D. Harrington, pp. 8085, 8 figs.

COAL MINING

HYDRAULIC STOWAGE. Hydraulic Stowage, H. M. Hudspeth Colliery Guardian, vol. 129, no. 3344, Jan. 30, 1925, pp. 272-274. Effect of hydraulic storage; methods employed; conditions governing successful employment; extra cost incurred; it is concluded that hydraulic stowage does not prevent, but generally reduces, surface subsidence and consequent damages. Extract of evidenee given before Roy. Commission on Mining Subsidence.

COMBUSTION

CONTROL. Combustion Control, T. A. Peebles. Mech. Eng., vol. 47, no. 3, Mar. 1925, pp. 193-194 and (discussion) 194-196. Difficulty of controlling air-fuel ratio; advantages of combustiou control; control of steam and air pressures; feedwater control; savings effected.

PULVERIZED, LIQUID, AND GASEOUS FUELS. The Combustion of Pulverized, Liquid, and Gaseous Fuels, J. B. C. Kershaw. World Power, vol. 3, no. 14, Feb. 1925, pp. 78-85, 10 figs. Discusses different types of pulverizers, including roller type, impactor type, "atritor" and "lopulco" pulverizers; liquid fuel and gas firing.

SPONTANEOUS. The How and Why of Spontaneous Combustion, R. Szymanowitz. Fire & Water Eng., vol. 77, no. 6, Feb. 11, 1925, pp. 263-264 and 296, 2 figs. Explanation of phenomenon; conditions in which it occurs; rate increased by air exposure; drying oils accelerate oxidation.

COMPASSES

GYROSCOPIC. A Gyro Compass Incorporating Two Gyroscopes, Jas. B. Henderson. Lond., Edinburgh, & Dublin Philosophical Mag. & Jl. Sci., vol. 49, no. 289, Jan. 1925, pp. 273-283, 4 figs. It is shown how two periods of oscillation of structure carrying two gyroscopes such as gyro-compass may be calculated; also conditions for their mutual damping.

CONCRETE

PROPORTIONING. How to Proportion Concrete for a Specified Strength, R. R. Litehiser. Elec. Traction, vol. 21, no. 2, Feb. 1925, pp 95-97, 2 figs. Shows how to make corrections in proportions for a concrete mix to produce a specified strength.

CONDENSERS, STEAM

Tubes. Methods of Preventing Corrosion of Condenser Tubes, J. Austin. Mech. World, vol. 77, nos. 1990 and 1991, Feb. 20 and 27, 1925, pp. 123-124 and 135. Deals with problem principally from marine point of view; effects of corrosion are classified as loss in efficiency and in reliability of propelling machinery, and increase in costs of operating ship. (Reprinted from Trans. Liverpool Eng. Soc.

CONVEYORS

Belt, Bearings for. Comparison of Roller and Plain Bearings for Belt Conveyors, V. C. Genn. Belting, vol. 26, no. 1, Jan. 1925, pp. 35-38 and 40, 9 figs. Anti-friction type effects so many economies that it calls for serious consideration of all striving to reduce production cost.

COOLING TOWERS

Reinforced-Concrete. Ferro-Concrete Cooling Towers, H. A. Rickwood. Iron & Coal Trades Rev., vol. 110, no. 2970, Jan. 30, 1925, p. 179, 4 figs. Details of towers built in accordance with principles evolved by Prof. van Iterson, of Dutch State Mines at Heerlen; circular towers are 100 ft. in diameter; at top of cooling stack 8 radiating troughs carry water toward shell, and in their turn feed 11 subsidiary gutters; results obtained on towers erected at two pits in Heerlen.

CORES

Ovens for. Core Oven Uses Forced Draft. Foundry, vol. 53, no. 6, Mar. 15, 1925, pp. 242-243, 3 figs. Describes special core ovens installed in plant of Elyria Foundry Co., Elyria, O., which requires cores of various siz s; to accommodate all types of work, four ovens of car type and one of rolling-drawer type were installed; forced-draft principle is used.

COST ACCOUNTING

Departmental-Burden Distribution. A Suggestion for Cost Accounting, P. K. Guillow. Indus. Mgt. (N. Y.), vol. 69, no. 3, Mar. 1925, pp. 174-176, 3 figs. Method of distributing departmental burden on basis of actual process hours.

Functional Services. Cost Accounting Increases Profits, G. M. Pelton. Mgt. & Administration, vol. 9, no. 3, Mar. 1925, pp. 271-274. Author emphasizes that cost accounting should be service to aid in operation; gives elements of departmental statement on financial, manufacturing and merchandising costs, stating that both accountants and executives should understand problems of other group and co-operate for best final results.

Cost Products Sized in Series. New Cost Formulas for Firebrick, Geo. W. Greenwood. Mgt. & Administration, vol. 9, no. 3, Mar. 1925, pp. 261-264, 3 figs. Describes method of costing which is applicable to any product having series of sizes.

COUPLINGS

Flexible. Flexible Couplings, Chas. H. Clark. Machy (N.Y.), vol. 31, no. 7, Mar. 1925, pp. 509-517, 29 figs. Review of various commercial types, their characteristics and general applications.

CRANES

Electric. Austrian Examples of Conveying (Einige österreichische Ausführungen auf dem Gebiete der Fördertechnik), F. List. Zeit. des Oesterr. Ingenieur-u. Architekten-Vereines, vol. 76, no. 49-50, Dec. 12, 1924, pp. 438-440, 8 figs. Details of crane park of Donau Steamship Co., conveying equipment of Keller Partington Paper Pulp Co., etc.

Locomotive Coaling. Coaling Locomotives by Crane and Grab. Indus. Mgt. (Lond.), vol. 12, no. 2, Feb. 1925, p. 150, 2 figs. Crane constructed for German State Railway, which has undercarriage for standard rails and is collapsible, so that it can be taken by rail as unit in any freight train; it is able to travel, slew, lift or lower, with full grab without requiring any subsidiary supports.

CRANKPINS

Facing and Turning Machine. Crank Pin Machining Time Cut in Half, L. S. Love. Iron Age, vol. 115, no. 10, Mar. 5, 1925, pp. 681-683, 4 figs. Webs and pins of oil-engine shafts faced and turned on special machine; noteworthy accuracy is obtained; novel features in design.

CRANKSHAFTS

Diesel-Engine. Crank and Line Shafts for Double Acting Oil Engines, J. Hecking. Mar. Eng. & Shipbldg. Age, vol. 30, nos. 2 and 3, Feb. and Mar. 1925, pp. 97-102 and 167-171, 15 figs. Formulas derived for determining size of crankshafts for two and four-cycle double-acting Diesel engines.

CULVERTS

Design. Practical Pointers on Bridges and Culverts. Contract Rec., vol. 39, no. 9, Mar. 4, 1925, pp. 214-217. A group of three papers presented at conference of Ontario Road Supts. & Engrs. dealing with factors that should be considered in building small structures, viz.: Importance of Proper Culvert Design and Construction, A. Sedgwick; Selection of Proper Type of Drainage Structure, D. J. Kean; Problems in Culvert Location, H. McNichol.

CUPOLAS

Charging. The Roots' Hoist for Charging Foundry Cupolas. Indus. Mgt. (Lond.), vol. 12, no. 2, Feb. 1925, pp. 152-153, 1 fig. It is claimed for Roots' method of charging that it affords economy, speed and certainty of mechanical charging without faults of hand-dumping methods; machine proper is of well-known man-telpher type.

CURVES

Inertia. The Inertia Curve, W. S. Cooper. Sibley Jl. of Eng., vol. 39, no. 2, Feb. 1925, pp. 261-264, 7 figs. Describes a very convenient and more direct method of constructing inertia curve which takes advantage of some mathematical properties of curve.

CUTTING METALS

Research. Research in the Art of Cutting Metals, O. W. Boston. Mich. Technic, vol. 38, no. 2, Jan. 1925, pp. 11-14 and 28, 5 figs. Reviews some of the more important researches which have been made in art of cutting metals, and discusses research work which is being undertaken at Univ. of Mich. along this line.

CUTTING-OFF MACHINES

Plate. Progress in Construction of Plate Cutting Machines (Fortschritte im Bau von Tafelscheren), H. Becker. Maschinenbau, vol. 4, no. 1, Jan. 15, 1925, pp. 18-21, 4 figs. Discusses practical arrangement for guiding plates in cutting-off machines, and advantages of electric control.

CUTTING TOOLS

Cutting Angle. Scientific Design of Tools (Wissenschaftliche Gestaltung der Werkzeuge), W. Hippler. Zeit. des Vereines deutscher Ingenieure, vol. 69, no. 8, Feb. 21, 1925, pp. 227-233, 34 figs. Points out that lathe tool has most perfect cutting angle of all tools and should therefore serve as example for other cutting tools.

CYANIDES

Recovery from Waste Solutions. The Arthur L. Halvorsen Process for Recovering Cyanide from Waste Solutions, H. A. Burk and E. S. Pettis. Min. & Metallurgy, vol. 6, no. 219, Mar. 1925, pp. 136-143, 2 figs. Improvements and distinct features of process are: applying high vacuum to increase fractionation at less initial temperature and using steam instead of air; chemical, heat, water and labor consumption; cost of operation; saving of cyanide; scope of adaptability; future possibilities.

D

DAMS

Concrete-Arch. Building the Lake Humphreys Concrete Arch Dam, C. A. Gould. Eng. News-Rec., vol. 94, no. 8, Feb. 19, 1925, pp. 315-319, 6 figs. Work carried on during winter despite high altitude; cost of protecting concrete estimated; deflection of arch under load measured.

Hydraulic Filling. Sand Dams Built by Hydraulic Fill in Northern New York. Eng. News-Rec., vol. 94, no. 5, Jan. 29, 1925, pp. 180-183, 6 figs. Hydraulic development on Beaver River near Watertown calls for 860,000 cu. yd. of sand fill in two dams; all material sluiced in closed pipes.

Storage. Storage Dams on the Metis Lakes, W. L. Reford Stewart. Contract Rec., vol. 39, no. 5, Feb. 4, 1925, pp. 92-94, 5 figs. Description of large timber construction stone-filled dam, with earth embankments and three cut-off dykes; methods used by contractor.

DIE CASTING

Production Cost Lowering by. Die Casting and Lowering Cost of Production (Die Verbilligung des Erzeugnisses und das Spritzgussverfahren), H. P. Otto. Maschinenbau, vol. 4, no. 1, Jan. 15, 1925, pp. 11-14, 11 figs. Shows by examples and cost calculation that by specialized operation expenses can be reduced; discusses application of die-cast parts.

DIESEL ENGINES

Application as Prime Mover. The Diesel Engine as a Prime Mover, L. H. Morrison. Nat. Engr., vol. 29, no. 3, Mar. 1925, pp. 117-121, 5 figs. Practical discussion on application of Diesel engine as a prime mover in industrial and power-station field. Comparative operating costs and fixed charges on Diesel engine and steam power plants. Paper read before Nat. Assn. Stationary Engrs.

Central Stations. Diesels for Operation of Small Utility, Geo. E. Silver. Elec. World, vol. 85, no. 10, Mar. 7, 1925, pp. 507-508. 12 years' experience shows points which must be carefully looked after to insure successful performance and long life; factors determining cost of Diesel engines in comparison with steam.

Compressorless. Compressorless Diesel Engines, O. Gunther. Mar. Eng. & Shipg. Age, vol. 30, no. 3, Mar. 1925, p. 141. Characteristic feature of ante-chamber engines is that ante-chamber, or retort, is connected with combustion chamber proper by only number of narrow ducts which cause rise in pressure over that prevailing in combustion chamber proper when partial combustion takes place; jet-vaporization engines—Vickers type; Deutz engines of these two types. Translated from Technische Rundschau.

Double-Acting. The Sliding Cylinder Double-Acting Two-Cycle Diesel Engine, J. C. M. Maclagan. Inst. Mar. Engrs.—Trans., vol. 36, Feb. 1925, pp. 665-746 and (discussion) 746-758, 55 figs., 14 tables. Describes engine in which piston rod is dispensed with, principally in order to improve lower end of cylinder and to obtain equal power from up-and-down strokes; engine is installed in M. S. Swanley, single-screw vessel of shelter-deck cargo type. In supplement, author gives experiences on voyage of motorship.

Operation. Operation of Diesel Engines, R. Hildebrand. Power, vol. 61, nos. 9 and 11, Mar. 3, and 17, 1925, pp. 339-340, 3 figs., and 414-416, 4 figs. Mar. 3: Oil-purifying systems and their advantages. Mar. 17: How to buy and handle Diesel fuel oils.

Solid-Injection. Features of New Fairbanks, Morse Diesel Engine. Oil Engine Power, vol. 3, no. 2, Feb. 1925, pp. 81-89, 20 figs. New Type designed and manufactured to meet Diesel requirements is based on experience with preceding model coupled with exhaustive experimental and development work: auxiliary combustion chamber and airless injection are utilized for carrying out Diesel cycle. See also description in Power Plant Eng., vol. 29, no. 5, Mar. 1, 1925, pp. 310-312, 4 figs.

Submarine. Submarine Engines and Heavy-Oil Engine Electric Generating Sets, P. A. Holliday. Engineering, vol. 119, no. 3087, Feb. 27, 1925, p. 276. Describes M. A. N. engines having six cylinders with air injection of fuel; air compressor is driven at forward end of crankshaft and has either 3 or 4 stages of compression. (Abstract.) Paper read at Diesel Engine Users Assn.

Thermal Stresses in Liner. The Temperature Distribution and the Thermal Stresses in a Diesel Engine Liner, H. E. G. Letson. Instn. Mech. Engrs.—Proc., no. 1, Jan. 1925, pp. 19-52, 13 figs. Method adopted of estimating stresses is to compute them by what is termed approximate methods from ascertained temperature distribution. Includes appendix by E. H. Lamb, on theory of thermal stresses so far as it is applicable to present problem.

E

EARTH

Pressure. A Modification of Rankine's Theory o Earth Pressures on Retaining Walls, Wm. J. Walker. Lond., Edinburgh, & Dublin Philosophical Mag. & Jl., Sci., vol. 49, no. 290, Feb. 1925, pp. 476-480 It is shown that Rankine's theory, fundamental as it is in character is perfectly capable, when modified in manner indicated, of giving results closely approximate to those to be expected in practice.

EDUCATION, ENGINEERING

Co-operative Plan. The New Co-operative Options in the Engineering Courses at New York University, J. W. Roe. Jl. Eng. Education, vol. 15, no. 5, Jan. 1925, pp. 342-347, 2 figs. Experience with co-operative plan for 4-year course in industrial engineering has been so favorable that it has been decided to extend plan to all of other courses in College of Engineering; it was felt necessary that this should be done on optional basis; describes form which was adopted.

Manufacturer's Viewpoint. The Value of an Engineering Education from a Manufacturer's Viewpoint, W. M. Cruthers. Eng. Jl., vol. 8, no. 3, Mar. 1925, pp. 116-118. Describes work of training students carried on in Canadian General Electric Co. at Peterborough and Toronto; suggestions for consideration of those who have charge of laying out engineering curricula of colleges.

Problems. Engineering Education, C. J. Mackenzie. Eng. Jl., vol. 8, no. 3, Mar. 1925, pp. 110-113. Influence affecting problem; engineers as executives and public leaders; gradual change necessary in training system; trend towards merit promotion in industry; suggested functional division.

Some Thoughts Regarding Engineering Education, H. M. MacKay. Eng. Jl., vol. 8, no. 3, Mar. 1925, pp. 113-116. Writer thinks that present curricula properly handled are capable of giving good results, and that they do so in case of abler students; it is urgent, however, that average man should obtain more thorough grip of fundamentals, and broader cultural opportunities are eminently desirable for those who can profit thereby.

Refrigeration. Instruction in Refrigeration Engineering in United States, J. F. Nickerson. Ice & Refrigeration, vol. 68, no. 2, Feb. 1925, pp. 164-167. Discussion of extension of education in this branch of engineering. List of educational institutions giving full or partial courses in refrigeration engineering. Paper read before Fourth Int. Congress of Refrigeration.

ELECTRIC DISTRIBUTION SYSTEMS

Transients, Analysis of. Polar System Transients, V. Bush and R. D. Booth. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 3, Mar. 1925, pp. 229-240, 18 figs. Presents methods for analysis of power systems under transient conditions; gives qualitative discussion of problem followed by outline of point-by-point scheme of analysis which takes into account inertia of machines, field transients, etc. (Abridged.)

ELECTRIC FURNACES

Hardening and Tempering Wire. Electric Heat Employed for Continuous Hardening and Tempering Wire for Shade Roller Springs, R. H. MacGillivray. Universal Engr., vol. 41, no. 1, Jan. 1925, pp. 29-30, 2 figs. Electric furnace for hardening and tempering under positive heating control conditions.

Heat-Treating. A New High Temperature Electric Furnace Complete with Automatic Temperature Control. Machy. (Lond.), vol. 25, no. 647, Feb. 19, 1925, pp. 654-655, 2 figs. Resistance furnace specially designed for heat treatment of high-speed and alloy steel.

High-Frequency. Melting with High Frequency, D. Willcox. Iron Trade Rev., vol. 76, no. 9, Feb. 26, 1925, pp. 567-568, 4 figs. Induction furnace designed to meet special problems.

ELECTRIC GENERATORS, D. C.

Load Characteristic. The Load Characteristic of a Dynamo Giving Constant Current Over a Large Range of Speed, J. C. Prescott. Instn. Elec. Engrs.—Jl., vol. 63, no. 338, Feb. 1925, pp. 206-210, 9 figs. Graphical method of predicting characteristics of constant-current dynamo, such as Rosenberg or Brolt; formula derived by late Dr. Kapp has been extended to determine maximum current flowing in short-circuited paths of armature, and steady value of load current; shows also that maximum value of short-circuit current occurs when load current reaches half its final value.

ELECTRIC LAMPS, INCANDESCENT

Neon Glow. On Some Properties of Neon Tubes, B. N. Chose. Physical Rev., vol. 25, no. 1, Jan. 1925, pp. 66-68. Attempt is made to determine law of variation of effective resistance of Osglim neon glow lamp with current passing through it; to investigate relation between intensity of light from lamp and current passing through it; and to determine method of measuring very high resistance by help of above two investigations.

ELECTRIC LOCOMOTIVES

Switching and Freight. Freight Locomotives for the New York Central. Ry. Elec. Engr., vol. 16, no. 2, Feb. 1925, pp. 51-53, 3 figs. Orders have been placed with General Electric Co. for seven 100-ton electric switching locomotives and two 170-ton electric road freight locomotives for service on electric division in New York City and vicinity.

2-8-2. 2-8-2 Electric Locomotives on the Pennsylvania Railroad. Engineering, vol. 119, nos. 3083 and 3085, Jan. 30 and Feb. 13, 1925, pp. 125-128 and 138 and 186-189, 86 figs. partly on supp. plates. Details of locomotives of side-rod class built and equipped at company's Altoona Works, electrical equipment being supplied by Westinghouse Elec. & Mfg. Co.

ELECTRIC MEASURING INSTRUMENTS

Power Measurement in Industrial Plants. The Measurement of Electricity as Applied to Industrial Plants, H. P. Pratt. Iron & Steel Engr., vol. 2, no. 2, Feb. 1925, pp. 94-97 and (discussion) 97-100. Measurement of power in d.c. and a.c. circuits.

ELECTRIC MOTORS, A. C.

Control. Automatic Control of Auxiliaries, F. M. Billhimer. Elec. World, vol. 85, no. 11, Mar. 14, 1925, pp. 551-554, 7 figs. Methods adopted in modern power stations to keep motors in operation under adverse conditions; analysis of operations and details of new developments.

Exciter Machine for. Three-Phase Exciter Machine (Drehstrom-Erregermaschine mit Fremderregung), J. Kozisek. Elektrotechnische Zeit., vol. 46, no. 5, Jan. 29, 1925, pp. 142-145, 7 figs. Describes new, externally excited and directly driven exciting machine consisting of d.c. armature with commutator and three compensating phases; special arrangement of this compensating stator winding results in very satisfactory commutation, giving unusually long life to commutator and brushes; this new type of compensator fulfills its purpose automatically under any load condition.

Induction. The Pulling into Step of a Synchronous Induction Motor, H. Cotton. Instn. Elec. Engrs.—Jl., vol. 63, no. 338, Feb. 1925, pp. 211-230, 7 figs. When studying phenomenon of pulling into step of synchronous induction motor from mathematical point of view, it is usually assumed that synchronizing torque is sinusoidal function of angular distance between stator and rotor fields; this research points out that this is erroneous for several reasons, most important of which is effect of armature reaction; experimental investigation carried out on small induction motor run as synchronous motor.

Testing. Testing Alternating-Current Motors, J. E. Housley. Power, vol. 61, no. 8, Feb. 24, 1925, pp. 300-302, 5 figs. Kinds of tests to be made; instrument to use in making tests; use of meters and securing data; working up test data; methods of making motor connections so that tests can be made with least interference to operation.

ELECTRIC TRANSMISSION LINES

Relay System. Balanced Relay System for 220-Kv. Lines, E. R. Stauffacher and F. H. Mayer. Elec. World, vol. 80, nos. 7 and 8, Feb. 14 and 21, 1925, pp. 341-343, 2 figs.; and 400-402, 3 figs. Relay and automatic flashover control equipment on Big Greek trunk transmission lines; experience cited shows satisfactory functioning of protective system. Describes necessary equipment at each of generating plants and substations.

ELECTRIC WELDING, ARC

Generators for. The Latest Type of Self-excited Generator for Arc Welding, H. R. McKean. Gen. Elec. Rev., vol. 28, no. 2, Feb. 1925, pp. 86-90, 8 figs. A new form of generator having a split field has been devised, to avoid cost and complication of separate excitation; by using armature reaction on this field, and installing a third brush, a constant voltage for self-excitation is obtained, thus making possible necessary drooping voltage-current characteristic at main brushes. Gives exact theory of generator and points out its value in building a compact, inexpensive, portable arc-welding set.

Metallic Electrodes, with. Arc Welding with Metallic Electrodes, W. L. Warner. Chem. & Met. Eng., vol. 32, no. 5, Feb. 2, 1925, pp. 206-208, 3 figs. Discussion of fundamentals.

Power-Plant Application. Arc Welding in Power Plants, W. L. Warner. Power, vol. 61, no. 9, Mar. 3, 1925, pp. 336-338, 9 figs. Examples of applying electric-arc welding in steam and oil engines and hydro-electric power plants, also application of this method of welding to structural-steel framework.

ELECTROMAGNETIC WAVES

Process of Transmission. The Guiding Wire in Electromagnetic Transmission. O. B. Blackwell Franklin Inst. — Jl., vol. 199, no. 2, Feb. 1925, pp. 221-233, 2 figs. Gives brief picture of process of electromagnetic transmission, avoiding mathematical or quantitative discussion of subject.

ELEMENTS

Atomic Weights. International Atomic Weights, 1925. Am. Chem. Soc.—Jl., vol. 47, no. 3, Mar. 1925, pp. 597-610. Report of International Committee on Chemical Elements; explanation of table. Annual report of Committee on Atomic Weights; determinations published during 1924, by G. P. Baxter.

ELEVATORS

Alternating-Current Operation. Elevator Operation with Alternating-current Power Supply, C. C. Clymer. Gen. Elec. Rev., vol. 28, no. 2, Feb. 1925, pp. 109-120, 9 figs. Capabilities and limitations of motors especially adapted to the purpose, including motors of single-winding and double-winding types, double-motor sets, and single-phase and polyphase commutator motors.

Loading of Cables and Bearings. Loading of Elevator Cables and Bearings, Chas. A. Armstrong. Power, vol. 61, no. 10, Mar. 10, 1925, pp. 371-373, 10 figs. How arrangement of counterweights and location of elevator machine affect loading on cables, bearings and overhead work.

EMPLOYEES

College Graduates, Selecting. Selecting and Placing College Graduates. J. Mills. Iron Age, vol. 115, no. 11, Mar. 12, 1925, pp. 757-759. Outlines definite method of procedure determining whether applicant is up to specifications; method of determining aptitudes; impatience of college men explained.

Motives of. Motives of Employees, S. F. Fannon. Soc. Indus. Engrs.—Bul., vol. 7, no. 2, Feb. 1925, pp. 7-10. Points to importance of studying motives of employees and states that by fostering co-operation rather than competition between management and wage earner, real worth-while work-together spirit can be established with substantial gains to both employer and employee.

Personal Data and Vocational Fitness. Personal Data and Vocational Fitness, D. A. Laird. Indus. Mgt. (N. Y.), vol. 69, no. 3, Mar. 1925, pp. 163-172, 13 figs. How to analyze relationship between fitness and specific traits, characteristics, and mental equipment.

Selection. Judging and Selecting Men, Wm. Davenport. Am. Mach., vol. 62, no. 10, Mar. 5, 1925, pp. 377-378. Simple rules that will help foreman or superintendent in hiring men: kind of record needed.

EMPLOYMENT MANAGEMENT

Employee Suggestion Plan. Let Your Workmen Think—It Pays, W. E. Onion. Mgt. & Administration, vol. 9, no. 3, Mar. 1925, pp. 259-260, 1 fig. Basing action on conviction that the man on the job is the logical man to suggest improved methods for doing his work, officials of General Electric Co. decided to stimulate employees' interest in their work by making it financially worth while for them to devise better and more rapid ways of performing their tasks.

ENGINEERS

Graduate in Industry. The Engineering Graduate in Industry, A. C. Jewett. Jl. Eng. Education, vol. 15, no. 6, Feb. 1925, pp. 424-433. Data showing to what extent industry uses technically trained men, what positions they hold, how industry absorbs them and what further training it provides for them; kind of technical training at college which will better qualify graduates for executive and administrative, as well as technical positions in industry; deductions regarding what is necessary to ensure closer relationship between technical education and industry.

EXHAUST STEAM

Heating by. Heating by Exhaust Steam. Engineering, vol. 119, no. 3088, Mar. 6, 1925, pp. 287-288, 3 figs. Describes installation at Halifax Royal Infirmary; plant of which exhaust is used for heating is 75-b. hp. steam turbo-alternator of de Laval simple impulse geared type; turbine is of firm's standard design.

EXTRUSION OF METALS

Problems. Discussion on Mr. Lambert's Paper "Extruded Metal: a Dip into Pandora's Box." Foundry Trade Jl., vol. 31, no. 442, Feb. 5, 1925, pp. 125-126. Question of discard; casting and other temperature conditions; homogeneous rod; continuous extrusion; extrusion dies: temperature data; treatment of dies; time intervals; etc.

F

FILTRATION

Research. Studies in Filtration, B. W. Clarke, S. G. M. Ure and J. W. Hinchley. Chem. Age (Lond.), vol. 12, nos. 294 and 295, Jan. 31 and Feb. 7, 1925, pp. 106-107, and (discussion) 132-133. Account of a portion of preliminary work on this subject carried out in 1924 in Chemical engineering laboratories of Imper. College Sci. & Technology, Lond. Summary of paper read before Inst. Chem. Engrs.

FILTRATION PLANTS

Buffalo, N. Y. Substructure Plan and Design: Buffalo Filter Plant. Eng. News-Rec., vol. 94, no. 8 and 9, Feb. 19 and 26, 1925, pp. 322-324, and 358-362, 11 figs. Layout and design problems and operating plan; present capacity 160,000-000 gallons; future extension to 400,000,000 gallons capacity is planned. Feb. 26: Construction methods; water-bearing foundations made safe by French drains.

St. Catharines, Ont. Canada. Proposed Filtration Plant, St. Catharines, Ont. Can. Engr., vol. 48, no. 6, Feb. 10, 1925, pp. 206-208, 3 figs. Designed for capacity of ten million gallons per day; filtered water storage reservoir of five million gallons capacity; six pairs of mechanical filters and five motor-driven centrifugal pumps will be installed.

FLAME PROPAGATION

Gas-Air Mixtures. Limits for the Propagation of Flame in Inflammable Gas-Air Mixtures, A. G. White. Chem. Soc.—Jl., vol 127, Jan. 1925, pp. 48-61, 4 figs. Deals with mixtures of more than one gas and air; results tend to show that in most cases fair approximation to value of limit for binary mixture can be obtained from limits for separate gases by use of Le Chatelier's rule.

FLOW OF FLUIDS

Circulation Round Cylindrical Obstacles. Fluid Circulation Round Cylindrical Obstacles, D. M. Wrinch. Lond., Edinburgh, & Dublin Philosophical Mag. & Jl. Sci., vol. 49, no. 289, Jan. 1925, pp. 240-250. Treats of motion of fluid circulating round fixed cylindrical obstacle in presence of one or more line sources or sinks; problem when there is a source as well as a sink is also discussed.

Eddies Generated by Cylinders. On the Frequency of the Eddies generated by the Motion of Circular Cylinders through a Fluid, E. F. Relf and L. F. G. Simmons. Lond., Edinburgh, & Dublin Philosophical Mag. & Jl., Sci., vol. 49, no. 290, Feb. 1925, pp. 509-511, 1 fig. Describes measurements of eddy frequency which reveal interesting connection between frequency and drag coefficient, which is shown by accompanying diagram.

FLOW OF LIQUIDS

PIPES. The Flow of Liquids. W. H. McAdams. Refrig. Eng., vol. 11, no. 8, Feb. 1925, pp. 279-288 and (discussion) 288 and 296-297, 8 figs. Some factors influencing friction, velocity distribution and heat transmission, for fluids flowing inside pipes. Bibliography.

FLOW OF STEAM

PIPES. Progress Report on the Critical Velocity of the Flow of Steam in Two Pipe Systems, M. Ingels. Am. Soc. Heat. & Vent. Engrs.—Jl., vol. 31, no. 2, Feb. 1925, pp. 119-128, 10 figs. Investigation started by L. Ebin and carried on by G. Eisenhart until interrupted by his death. Results obtained from 627 tests on flow of steam in vertical, horizontal and inclined pipes of several diameters.

FLOW OF WATER

CHANNELS. Charts for Flow of Water in Channels, C. Higgins. Commonwealth Engr., vol. 12, no. 5, Dec. 1, 1924, pp. 163-176, 9 charts. Gives charts prepared by author with object of lightening arithmetical labor involved in calculations based upon hydraulic formulas in general; based upon Bazin's formula for channels, which is not only simpler than Kutter's, but embodies results of more recent and more extended research.

PIPES. Calculation of the Pressure Losses in Elbow Pipe Connections (Over de berekening der drukverliezen in bochtstukken), J. Zorn. Waterstaats-Ingenieur, vol. 12, no. 12, Dec. 1924, pp. 343-347, 6 figs. on supp. plates. Old Formulas of von Weisbach have proven unreliable and a method based on later investigations by Fuller are given for calculation of pressure losses in a fluid passing through an elbow. Table giving actually measured pressure losses at power plant of Tyssadal (Norway), proves greater accuracy of Fuller formulas. Gives charts for calculation of losses according to both methods.

FLUE-GAS ANALYSIS

METHODS. How to Make Flue-Gas Analysis, W. E. Biggs and W. R. Woolrich. Nat. Engr., vol. 29, no. 3, Mar. 1925, pp. 126-128, 1 fig. Practical instructions on how to make flue-gas analyses and use of instruments.

FOUNDATIONS

SOIL, SUPPORTING VALUE OF. The Supporting Value of Soil as Influenced by the Bearing Area, A. T. Goldbeck and M. J. Bussard. Pub. Roads, vol. 5, no. 11, Jan. 1925, pp. 1-4, and 8, 9 figs. Shows that depth of penetration is directly proportional to square root of area over which load is applied; this relation is applicable to design of roads and particularly to design of footings of bridges and other structures. Gives penetration curves for various soils; discusses permanent and elastic compression.

FOUNDRIES

BRASS, SCIENTIFIC METHODS. Science in the Brass Foundry, G. S. Bell. Metal Industry (Lond.), vol. 26, no. 2, Jan. 9, 1925, pp. 35-36. Survey of certain aspects of application of science to brass-foundry practice; author advocates, as soundest economic measure, application of scientific method to all phases of production; improvement in brass foundry mixtures; brass melting furnaces; melting practice. (Abstract.) Paper presented before Lincoln Eng. Soc.

GRAY-IRON. Farms Depend on Castings Shop, P. Dwyer. Foundry, vol. 53, no. 5, Mar. 1, 1925, pp. 193-195, 3 figs. Methods and equipment of gray-iron foundry of Massey-Harris Co., manufacturers of agricultural implements.

MAINTENANCE. Foundry Maintenance and Flask Storage. Iron Age, vol. 115, no. 10, Mar. 5, 1925, pp. 691-692, 2 figs. Importance of attention to details; which results in low labor turnover and increased output; building maintenance; cleaning foundry floor; maintenance of equipment; flask storage.

MATERIALS HANDLING. Conveyance of Material in the Foundry, J. M. Primrose. Foundry Trade Jl., vol. 31, no. 445, Feb. 26, 1925, pp. 188-189. With special reference to production of light castings.

FUELS

OIL VS. COAL. The Significance of the Cost of a Horse-Power Hour, J. Hackford. Oil Eng. & Finance, vol. 6, no. 105, Jan. 1925, pp. 34-38. Discusses use of liquid fuel for steam raising and for internal-combustion engines; how coal should be used to place it on equality with oil, so that manipulation shall be as easy, and cost of horsepower-hour shall be, if possible, less.

WASTE ELIMINATION. Methods of Checking Fuel Waste, C. Longenecker. Pit & Quarry, vol. 9, no. 9, Feb. 1, 1925, pp. 59-61. Discusses actual fuel losses (in raw state), and fuel losses resulting from heat waste; matter is treated from standpoint of a plant for which coal is to be purchased and in which it will be burned in furnaces, or kilns of any type whatsoever.

[See also *Coal; Oil Fuel, Pulverized Coal.*]

FURNACES, CRUCIBLE

STEEL MANUFACTURE, FOR. A New Type of Crucible Melting Plant. Foundry Trade Jl., vol. 31, no. 445, Feb. 26, 1925, p. 190, 1 fig. New type of crucible furnace for steel making, installed at Battersea works of Morgan Crucible Co., which takes four 80-lb. graphite crucibles, and is driven by forced draft supplied by motor and fan.

FURNACES, HEAT-TREATING

GAS-FIRED. Gas Furnaces Applied to the Steel Industry, S. A. Sears. Engineering, vol. 119, no. 3087, Feb. 27, 1925, pp. 275-276. Principles of heat transference and combustion; properties of fuels and forms in which they are supplied to furnaces; means for controlling supply of gas and air; author considers that only system which definitely ensures constant and instantaneously correct proportions of gas and air under any conditions is system known as unit control valve, furnace design and typical examples of furnaces for heat treatment. (Abstract.) Lecture before Sheffield Soc. Engrs. & Metallurgists.

LARGE CASTINGS. Heat Treating Large Castings, G. Ellerton, Jr. Fuels & Furnaces, vol. 3, no. 2, Feb. 1925, pp. 121-124, 3 figs. Particulars of four new oil-fired furnaces of Marion Steam Shovel Co. of Marion, Ohio, for heat treating of large manganese-steel parts in connection with manufacture of steam shovels, viz., two large car-type furnaces, a car and ball-type furnace and a portable furnace. Two tiers of burners in combustion chambers on both sides of furnaces give uniform high temperatures necessary.

FURNACES, HEATING

CONSTRUCTION AND OPERATION. Some Observations On Heating And Annealing Furnaces, W. De Fries. Fuels & Furnaces, vol. 3, no. 2, Feb. 1925, pp. 159-160 and 172. Discusses construction, fuel application, control of temperature and atmosphere, recuperation and refractories.

FURNACES, HOT-AIR

RATING. Rating the Warm-Air Furnace, A. C. Willard. Heat. & Vent. Mag., vol. 22, no. 2, Feb. 1925, pp. 79-81, 3 figs. A simplified approximate method based on extensive research work and adapted to practical use. Paper read before Nat. Warm-Air Heat. & Vent. Assn.

G

GAGES

VACUUM. A Laboratory Vacuum Gage, M. L. Hamlin. Am. Chem. Soc.—Jl., vol. 47, no. 3, Mar. 1925, pp. 709-712, 2 figs. Describes construction and calibration of new type of gage designed for laboratory use; in accuracy and range it stands between simple U-tube manometer and McLeod gage.

GAS ENGINES

STARTING GEAR. Friction Starting Gear for Vertical Gas Engines. Engineering, vol. 19, no. 3088, Mar. 5, 1925, pp. 284, 285. Friction starting gear, utilized by National Gas Engine Co., consists essentially of small auxiliary engine which rotates main engine flywheel through medium of friction pulley.

GASES

COMBUSTIBLE, GASOMETRIC DETERMINATION. Gasometric Determinations by Means of Combustion with Copper Oxide, Jos. Svéda. Chem. News, vol. 130, no. 3377, Jan. 2, 1925, pp. 1-5, Gasometric method has been worked out by which combustible gases can be burned in closed space by electrically heating small porous crucible filled with cupric oxide placed in eudiometer; describes preparation of crucible; method proved to work accurately for hydrogen combustions.

MASS-ACTION LAW FOR. Equilibrium Pressures of Individual Gases in Mixtures and the Mass-Action Law for Gases, L. J. Gillespie. Am. Chem. Soc.—Jl., vol. 47, no. 2, Feb. 1925, pp. 305-312. Discusses mass-action law for real gases; no proposed exact equations permit calculation of equilibrium concentration from equations of state of pure gases.

GASOLINE

ETHYL. Exhaust Gases from Engines Using Ethyl Gasoline, R. R. Sayers, A. C. Fieldner, W. P. Yant, B. G. H. Thomas and W. J. McConnell. U. S. Bur. Mines—Reports of Investigations, no. 2661, Dec. 1924, 24 pp., 3 figs. Results of investigation to determine whether any public health hazards, especially lead poisoning, will result from use of ethyl gasoline.

GEARS

DESIGN TABLES. Gear Designing Tables. Machy. (Lond.), vol. 25, no. 645, Feb. 5, 1925, pp. 585-587. Presents tables which provide simple and direct method of determining relation between pitch and power-transmitting capacity of either spur gearing or bevel gearing.

INVOLUTE. Calculation of Involute Gears (Die Berechnung von Evolventenzahnrädern), H. Fischer. Maschinenbau, vol. 4, no. 2, Jan. 29, 1925, pp. 64-68, 11 figs. Gives simplifications and more exact methods of calculation.

TOOTH CONTACT IN HELICAL. Tooth Contact in Helical Gears, A. H. Candee. Am. Mach., vol. 62, no. 12, Mar. 19, 1925, pp. 457-461, 10 figs. Effective length of line of action in spur gears; zone of contact in case of helical gears of different diametral pitch.

GIRDERS

INFLUENCE-LINE DIAGRAMS. Influence Line Diagrams for Shearing Force, Bending Moment, Slope, and Deflection for Single-Span Girders, W. N. Thomas. Concrete & Constr. Eng., vol. 20, no. 2, Feb. 1925, pp. 70-80, 11 figs. Influence lines for slope and deflection.

PLATE. Some Features of Plate Girder Design, R. Fleming. Can. Engr., vol. 48, no. 4, Jan. 27, 1925, pp. 161-164, 3 figs. Moment of resistance; buckling of compression flanges; sloping flanges; net section of tension flanges; web thickness and stiffener spacing; rivet pitch in flanges; redistribution of stresses; web splices.

GRINDING

HARDENED WORK. Some Causes of Cracks and Soft Spots in Hardened Work, J. C. Spence. Mech. World, vol. 77, no. 1987, Jan. 30, 1925, p. 68. Cites a few cases showing where trouble in grinding hardened work really originates, and how facts may be proved.

PRACTICE. Grinding Practice, H. A. Dean. Eng. Production, vol. 8, no. 150, Mar. 1925, pp. 67-75, 14 figs. Notes on cylindrical, centerless, cam, internal grinding, cylinder, gear and surface grinding; automobile and railway work; grinding rolls; semi-precision grinding; miscellaneous work.

GRINDING MACHINES

CENTERLESS. Motor-Drive One Feature of New Detroit Centerless Grinder. Automotive Industries, vol. 52, no. 11, Mar. 12, 1925, pp. 500-501, 3 figs. Machine as redesigned also has almost infinitely variable feed for stock, combined antifriction and plain bearings on wheel spindle, and swiveling feed wheel and work guides.

CYLINDRICAL. Grinding Machines and Abrasive Wheels, E. F. Creager. Am. Mach., vol. 62, no. 12, Mar. 19, 1925, pp. 461-462, 1 fig. Deals particularly with cylindrical grinders.

INTERNAL. Repetition Internal Grinding. Brit. Machine Tool Eng., vol. 3, no. 31, Jan.-Feb. 1925, pp. 200-202, 3 figs. Describes two new internal grinding machines, which are essentially manufacturing machines, in order to convey idea of possibilities of internal grinder for repetition work.

GYPSUM

ONTARIO. Gypsum in Ontario, Geo. E. Cole. Can. Inst. Min. & Metallurgy—Bul., no. 154, Feb. 1925, pp. 148-162. Geology and nature of deposits; uses; plants in Ontario.

ROTARY CALCINING. Rotary Calciners for Gypsum, F. A. Wilder. Am. Inst. Min. & Met. Engrs.—Trans., no. 1424-H. Feb. 1925, 5 pp. Discusses uses of calcined gypsum and peculiar properties desired in connection with these uses; development of rotary calcining and its possibilities.

STRUCTOLITE. A New Structural Gypsum. Pit & Quarry, vol. 9, no. 6, Dec. 15, 1924, pp. 67-69. Particulars regarding a special gypsum cement, manufactured by U. S. Gypsum Co., used in either precast or monolithic work giving a light and moderately strong wall conspicuous for its fireproof quality. See also Eng & Contracting (Buildings), vol. 63, no. 2, Feb. 25, 1925, pp. 403-406, 2 figs.

H

HEAT TREATMENT

ELECTRIC. Why Electric Energy Is Economical for Heat Treating, E. F. Collins. Elec. Light & Power vol. 3, no. 2, Feb. 1925, pp. 15-17, 48, 50 and 52, 3 figs. In author's belief, it is matter of no distant time when use of electric heat for important thermal and metallurgical processes will be adopted with no more hesitation that householder decides in favor of electric light; outline and summary of more important features of electric heating which distinguish it from fuel-fired equipment.

HEATING, STEAM

AIR-TUBE COPPER HEATERS. Characteristics of an Air-Tube Type Copper Heater, L'Roche G. Bousquet and Geo. A. Foisy. Am. Soc. Heat. & Vent. Engrs.—Jl., vol. 31, no. 2, Feb. 1925, pp. 129-147, 15 figs. Data on such heaters for most efficient utilization in indirect heating systems; includes curves showing frictional resistance, rate of heat transfer, rate of condensation of steam, and temperature rise of air.

CENTRAL. Design and Operation of Central Steam Heating Plants, H. A. Woodworth. Nat. Engr., vol. 29, no. 3, Mar. 1925, pp. 109-115, 3 figs. Factors to be considered in design and installation of this type of plant.

Winnipeg's New District Heating System. Heat & Vent. Mag., vol. 22, no. 2, Feb. 1925, pp. 54-56 and 62, 7 figs. How necessity for a stand-by power plant furnished opportunity for its operation as a heating station; possible effect of powdered-fuel combustion on use of Canada's vast lignite resources; data on equipment.

HYDRAULIC TURBINES

CONNECTING TWO ALTERNATORS TO SAME. Connecting Two Alternators to the Same Waterwheel, N. L. Rea. Power, vol. 61, no. 11, Mar. 17, 1925, pp. 417-418, 4 figs. Describes number of methods for connecting two a.c. generators to same prime mover and have them in correct phase relation.

LARGE. Record Size Hydraulic Turbines. Power, vol. 61, no. 11, Mar. 17, 1925, p. 409, 1 fig. Type being installed at Chancy-Pougny on Rhone River near Geneva, Switzerland, has outside diameter of 17 ft. 7 in. and weighs 24 tons; it is made of two parts and has 18 vanes.

HYDRAULICS

LAW OF SIMILARITY. Experiences with the Hydro-dynamic Law of Similarity (Expériences sur la similitude hydrodynamique), G. Camichel and L. Escande. Génie Civil, vol. 86, nos. 3 and 4, Jan. 17 and 24, 1925 pp. 60-63 and 80-82, 6 figs. Application of law of similarity to design of hydraulic works; study of circular orifices; flow of water in pipes, tanks, and weirs.

HYDRO-ELECTRIC DEVELOPMENTS

CALIFORNIA. Developing a 14,000-Hp. Water Power 9,000 Ft. Above Sea Level, Rob. R. Benson. Power, vol. 61, no. 8, Feb. 24, 1925, pp. 288-289, 7 figs. Construction details of Plant No. 1 Leevining Creek on eastern slope of Sierra Nevada Mountains in California; difficulties in transporting machinery.

DAVIS BRIDGE, VT. The New England Power Company Davis Bridge Development, A. C. Eaton. Boston Soc. Civ. Engrs.—Jl., vol. 12, no. 1, Jan. 1925, pp. 1-33 and (discussion) 33-48, 19 figs. Outlines briefly growth of New England Power-System. Construction and design details of Davis Bridge development, including dam, spillway, outlet tunnel, power house and equipment, etc.; cost data; capacity 60,000 hp.

HYDRO-ELECTRIC PLANTS

NIAGARA FALLS. Hydro-Electric Plant Has 452,500 Hp. Installed Nominal Capacity. Power, vol. 61, no. 9, Mar. 3, 1925, pp. 324-330, 10 figs. Niagara Falls Power Co. has completed 210,000-hp. extension to its hydraulic plant no. 3, which gives this station largest available operating capacity of any plant in world; extension consists of concrete-lined horseshoe-shaped tunnel 4300 ft. long by 32 ft. inside diam., 3 concrete-lined penstocks 21 ft. inside diam., 3 butterfly valves, 3 Johnson valves and three 70,000-hp. vertical-shaft single-runner turbine units; all these are largest ever constructed engineering features of projects.

Three 70,000-Hp. Turbines Installed at Niagara Falls. Eng. News-Rec., vol. 94, no. 8, Feb. 19, 1925, pp. 304-310, 13 figs. New units made 90,000 more horsepower available without additional draft on river; hydraulic canal repaired and enlarged; intake deepened and new ice fenders built.

SMALL WATER POWERS. Small Water Powers. Power Engr., vol. 20, nos. 226 and 227, Jan. and Feb. 1925, pp. 24-26 and 53-54, 6 figs. Jan.: Propeller-type runners; turbines for very low falls; draft tube; high-head turbines. Feb.: Arrangement and testing in varied conditions.

I

ICE PLANTS

HANDLING EQUIPMENT. Ice Handling Machinery, J. E. Moul. Refrig. Eng., vol. 11, no. 8, Feb. 1925, pp. 289-292, 4 figs. Discusses different types of conveyors, benching machines, lowering machines, and elevators, giving general ideas of possibilities of each. See also Ice & Refrigeration, vol. 68, no. 2, Feb. 1925, pp. 142-144, 4 figs.

IGNITION

GAS, BY ELECTRIC SPARK. The Thermal Theory of Gas Ignition by Electric Sparks, J. D. Morgan. Lond., Edinburgh, & Dublin Philosophical Mag. & Jl. Sci., vol. 49, no. 290, Feb. 1925, pp. 323-336. Examination of thermal theory of gas ignition in light of experimental results.

IMPACT TESTING

NOTCHED-BAR TESTS. Interpretation of the Results of Notched Bar Impact Tests. Metallurgist (Supp. to Engineer), Feb. 27, 1925, pp. 23-24, 2 figs. Review of papers by Moser and by Goerens, in Stahl u. Eisen, vol. 43, 1923, p. 935, and vol. 44, 1924, p. 1648, respectively.

INDICATORS

DIAGRAMS. Indicator Diagrams and Lessons to be derived therefrom, G. J. Wells. Inst. Mar. Engrs.— Trans., vol. 36, Jan. 1925, pp. 569-586 and (discussion) 586—601, 31 figs. Reviews more common defects of indicator and errors they produce in resulting diagrams, and more usual faults in engine that may be detected by means of indicator card.

HIGH-SPEED GASOLINE ENGINES. The Dalby-Watson Indicator for High-Speed Petrol Engines, H. Wright Baker. Engineering, vol. 119, no. 3087, Feb. 27, 1925, pp. 257-260, 5 figs. Outlines investigation of problems; results of tests on single-cylinder Armstrong-Siddeley unit; indicator mechanism; examination of diagrams. Includes discussion.

TESTS OF ENGINE. Notes on Engine Indicators, H. Moss and W. J. Stern. Instn. Mech. Engrs.—Proc., no. 1, Jan. 1925, pp. 9-17, 10 figs. Notes of tests conducted in connection with improved model of optical indicator for internal-combustion engines. (Abridged.)

INDUSTRIAL MANAGEMENT

COST ACCOUNTING. *See Cost Accounting.*

CURRICULUM FOR. The Content of Courses in Management, Jos. W. Roe and N. C. Burleigh. Taylor Soc.—Bul., vol. 10, no. 1, part 1, Feb. 1925, pp. 5-9, and (discussion) 9-17. Important educational problem considered from points of view of school of engineering and school of commerce.

EFFICIENCY CHECKING BY DAILY RETURNS. Factory Process Returns and Their Use as a Check on Plant Efficiency, J. A. Watson. Chem. & Industry, vol. 44, no. 5, Jan. 30, 1925, pp. 101-105, 1 fig. Demonstrates value of complete daily returns of output of any manufacturing plant from point of view of checking manner in which plant is working, and of discovering incidence of unavoidable losses in any class of manufacture, but particularly chemical manufacture.

FOLLOW-UP SYSTEM FOR PURCHASES. Follow-up System for Purchases, Wm. J. Hiscox. Machy. (N. Y.), vol. 31, no. 7, Mar. 1925, pp. 536-538, 6 figs. Points out that system should be simple example of purchase order register and requisition slip; forms for following up orders; actual follow-up.

MANAGER, FUNCTIONS OF. The Function of Directing, J. E. Marsden. Indus. Mgt. (Lond.), vol. 12, no. 2, Feb. 1925, pp. 160-161. Writer stresses fact that directing is very difficult function, making greater demands upon personality of executive than that of planning or examination of results; it can be made much simpler if functions of planning and costing are carried out efficiently.

TAYLOR SYSTEM. How Taylor Introduced the Scientific Method Into Management of the Shop, Chas. de Fréminville. Taylor Soc.—Bul., vol. 10, no. 1, part 2, Feb. 1925, pp. 30-40. Discusses Taylor's principles from French point of view. Translated from French.

Scientific Management Made Clear, I. Fisher. Taylor Soc.—Bul., vol. 10, no. 1, part 2, Feb. 1925, pp. 41-61. Review of Copley's story of its genesis and development; review of Taylor system as traced in Copley's book.

TOOLROOM ORGANIZATION. Planning a Small Tool Organization. Indus. Mgt. (Lond.), vol. 11, no. 18, Dec. 1924, pp. 514 and 516, and vol. 12, no. 2, Feb. 1925, pp. 169-170, 2 figs. Practical advice regarding efficient organization of small tool store; describes simple system whereby close check is kept upon all tools issued to operatives, thus obviating loss of time and money.

WAR PREPAREDNESS. Industrial Management in War Preparedness, R. F. Melin. Soc. Indus. Engrs.— Bul., vol. 7, no. 2, Feb. 1925, pp. 3-4. Broad outline of what War Department is doing showing great need for proper management.

INDUSTRIAL ORGANIZATION

REORGANIZATION IN NEW FACTORY. Reorganization in the New Factory. Eng. Production, vol. 8 no. 150, Mar. 1925, pp. 75-76. Detailed consideration of problem; labor problem; adjusting piece-work rates; assembly.

INDUSTRIAL PLANTS

MOTOR-TRUCK, PLANNING AND BUILDING. Planning and Building a Large Motor Vehicle Plant, E. M. Chance. Eng. News-Rec., vol. 94, no. 9, Feb. 26, 1925, pp. 344-349, 11 figs. Methods of approach to technical problems and solution of these problems in layout and construction of motor-vehicle assembly plant of International Harvester Co., at Fort Wayne, Ind.

POWER-COST REDUCTION. "How We Reduced Our Power Costs." Indus. Mgt. (N.Y.), vol. 69, no. 3, Mar. 1925, pp. 183-188. Experience in cost reduction as revealed by this journal's prize contest.

INDUSTRIAL RELATIONS

ARBITRATION, COMPULSORY. Compulsory Arbitration in Norway, J. Castberg. Int. Labour Rev., vol. 11, no. 1, Jan. 1925, pp. 15-38. Describes attitude of political parties and of employers and workers showing how their policy varied with changes in economic situation.

HUMAN RELATIONS. Human Relationship in Industry, H. C. Meserve. Engrs. & Eng., vol. 42, no. 2, Feb. 1925, pp. 34-37. Early efforts for improvement; the Lowell scheme; points out that first principle in application of human relations to industry is that it be established on personal basis; lessons from world-war experience.

RAILWAYS. Human Relations in Railroading, S. O. Dunn, Ry. Age, vol. 78, no. 7, Feb. 14, 1925, pp. 427-428. Discusses requirements of railway officer in successfully solving problems presented by human factors in railroading; his methods must convince men that he thoroughly knows his business; he must convince them that he means to be fair in all respects and sincerely desires to promote their welfare; employees must be given elementary but correct information which will convince them that they are not being exploited for benefit of so-called capitalist class.

INSPECTION

POWER PLANTS. Plant Inspection and Maintenance Schedule, Geo. E. Gaster. Power, vol. 61, no. 10, Mar. 10, 1925, pp. 373-374, 1 fig. Presents inspection and maintenance schedule which has been successfully applied in steam division of large power plant; factors considered in determining time between inspection periods.

INSULATORS, ELECTRIC

TEST SPECIFICATIONS. Insulator Test Specifications. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 3, Mar. 1925, pp. 300-303. Report on insulator test specification standards.

INTERNAL-COMBUSTION ENGINES

LUBRICATION. Lubrication of Engines for Land and Water Transportation (Zur Schmierung der Motoren für Land-und Wasserfahrzeuge), K. R. H. Praetorius. Motorwagen, vol. 28, nos. 1 and 2, Jan. 10 and 20, 1925, pp. 8-13 and 29-32, 22 figs. Details of numerous systems, representing most important makes of internal-combustion engines. (Conclusion of serial begun in 1924.)

STEAM-COOLING SYSTEMS. Principles of Steam-Cooling Systems, N. S. Diamant. Soc. Automotive Engrs.—Jl., vol. 16, no. 3, Mar. 1925, pp. 330-334, 5 figs. Describes layout or disposition of jackets, steam-chest or dome, radiator or condenser and pump or other means for returning liquid to jackets and maintaining pressure under which the several systems operate; various dispositions of elements of systems are summarized briefly.

[See also *Airplane Engines; Automobile Engine; Diesel Engines; Gas Engines; Oil Engines.*]

IRON ALLOYS

IRON-SILICON. The Alloys of Iron and Silicon, G. Phragmén. Metallurgist (Supp. to Engineer), Feb. 27, 1925, pp. 22-23, 1 fig. Investigation of constitution of iron-silicon system carried out by X-ray measurements made by method of Debye and Scherrer. Translated from Jernkontorets Annaler, no. 108, 1924.

IRON CASTINGS

GRAY-IRON. Making Grey Iron Castings in Metal Dies, S. M. Udale. Can. Foundryman, vol. 16, no. 2, Feb. 1925, pp. 17-19 and 22, 12 figs. Describes new method in use at plant of Holley Carburetor Co., Detroit, which utilizes cast-iron molds instead of sand with no chilling effect.

TURBINE EXHAUST-HOOD. Makes Large Turbine Exhaust Hood Castings. Foundry, vol. 53, no. 6, Mar. 15, 1925, pp. 223-226 and 236, 9 figs. Methods, and equipment used in making casting for 40,000-kw. tandem-compound Curtis steam turbine at plant of General Electric Co., Schenectady.

WHITE DEPOSITS ON. White Deposits on Castings, I. Lamoureux. Foundry Trade Jl., vol. 31, no. 439, Jan. 15, 1925, pp. 45-47, 7 figs. Deposits referred to appear on upper and horizontal faces of massive portions of castings poured in dry sand; effect of deposits composition and origin; remedies; practical examples; Translated from Revue de Fonderie.

IRRIGATION

HYDRAULICS. Progress Report of Special Committee on Irrigation Hydraulics. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 3, Mar. 1925, pp. 137-140. See also Report on the Silt Problem, F. D. Pyle and F. Thomas, pp. 141-147; and Bibliography on Subjects Selected for Research by the Special Committee on Irrigation Hydraulics, pp. 147-160.

L

LABORATORIES

Hydraulic. Some Impressions of the Development of Hydraulic Laboratories in Europe, J. R. Freeman. Eng. News-Rec., vol. 94, no. 5, Jan. 29, 1925, pp. 185-186. Brief review of development particularly at technical high schools at Charlottenburg, Brunn, Karlsruhe and Dresden.

Research. The Ford Engineering Laboratory, Geo. E. Hagemann. Mgt. & Administration, vol. 9, no. 3, Mar. 1925, pp. 219-222, 2 figs. Features of new building at Dearborn, Mich., for research and experimental work; layout of main laboratory; heating and ventilation; location of departments; research procedure; chemical and metallurgical research.

LATHES

Poppet Valves, for Machining. How Forged Nickel Steel Poppet Valves Are Machined on Turret Lathes in England, T. H. Hargrave. Automotive Industries, vol. 52, no. 7, Feb. 12, 1925, pp. 268-269, 2 figs. Drop-forged blanks have large fillet under head which is finished by means of radius tool; machining done on lathe with special equipment at rate of one valve per six minutes.

LIGHTING

Street. A Survey of Street Lighting Practice in the United States, J. F. Meyer. Illuminating Eng. Soc.—Trans., vol. 20, no. 1, Jan. 1925, pp. 20-28 and (discussion) 29-34. Preliminary statement of results obtained from a comprehensive survey made by U. S. Bur. Standards of street lighting practice in United States. Main purpose has been to ascertain present standards of electric street illumination in cities of population between 10,000 and 500,000.

Some Results of the Columbus Street Lighting Tests, F. C. Caldwell. Illuminating Eng. Soc.—Trans., vol. 20, no. 1, Jan. 1925, pp. 35-47 and (discussion) 47-59. Describes origin and procedure of investigation conducted by a Committee of the Chamber of Commerce of Columbus, Ohio; to furnish well-founded advice to city with regard to its future street-lighting policy through elaborate tests conducted under actual operating conditions and at same time provide for its citizens ocular evidence of what good street lighting really is.

LIMESTONE

Production as Mining Problem. Limestone Production as a Mining Problem, J. R. Thoenen. Am. Inst. Min. & Met. Engrs.—Trans., no. 1417-H, Feb. 1925, 6 pp. Author seeks to demonstrate that limestone production is a mining problem.

LIQUIDS

Energy Relation. A New Energy Relation Governing Liquids and Vapors, J. E. Mills. Jl. Physical Chem., vol. 29, no. 1, Jan. 1925, pp. 59-73. New energy relation holding for both liquids and vapors from absolute zero to critical temperature is derived and proved; this relation extends and confirms previous work done by author showing that attractive force between molecules varies directly as constant and inversely as square of distance apart of molecules.

Expansion, Coefficients of. Dependence of the Coefficients of Expansion of Liquids on their Temperature and Chemical Structure (Abhängigkeit des Ausdehnungskoeffizienten der Flüssigkeit von deren Temperatur und chemischer Struktur), J. J. Saslawsky. Zeit. für physikalische Chemie, vol. 113, nos. 1-2, Oct. 18, 1924, pp. 111-130, 7 figs. From experimental data given, it can scarcely be claimed that coefficient of expansion represents individual property of any given liquid; for most liquids it is simple function of critical and observation temperatures, so that, as characteristic of liquid, it is more suitable to consider, not absolute magnitude of its coefficient of expansion at given temperature, but nature and magnitude of deviation of its thermal expansion from normal course.

Surface Tension. The Determination of Surface Tension from the Rise in Capillary Tubes, S. Sugden. Am. Chem. Soc.—Jl., vol. 47, no. 1, Jan. 1925, pp. 60-64, 1 fig. Describes mathematical work of Bashforth and Adams on solution of equation to liquid surface of revolution about vertical axis in equilibrium under action of gravity and surface tension forces, and its significance in connection with methods of measuring surface tension, with special reference to author's modification of method of capillary rise.

LOCOMOTIVES

Diesel-Engined. Diesel Locomotives with Gas and Liquid Drive. Oil Engine Power, vol. 3, no. 2, Feb. 1925, pp. 102-105, 6 figs. Duplication of steam-engine characteristics aimed at in two new designs completed by Berlin Machine Co. (Bemag) for study and experimental purposes; gear ratio of hydraulic transmission is automatically increased with load; common steam cylinders are for driving by compressed gas.

High-Pressure. The "Horatio Allen" a High Pressure Locomotive. Boiler Maker, vol. 25, no. 2, Feb. 1925, pp. 31-36, 11 figs. Water and firetube boiler feature new design; firebox contains 37 per cent of total heating surface.

Improvements in Efficiency. Recent Improvements in the Efficiency of the Steam-Locomotive, E. L. Diamond. Instn. Mech. Engrs.—Proc., no. 1, Jan. 1925, pp. 53-68, 6 figs. Subject is considered under three headings, namely: (1) thermodynamic efficiency; (2) economic efficiency; and (3) traffic efficiency, by which is meant efficiency with which steam locomotive fulfills requirements that it is primarily designed to meet, that is, to haul certain loads at certain speeds.

Valve Gears. Valve Gear for Steam Locomotives (Steuerungen für Dampflokomotiven), Ewald. Hanomag Nachrichten, vol. 11, no. 134, Dec. 1924, pp. 135-208, 6 figs. Hanomag instruction sheet No. 011, dealing with inside and outside valve gear, Stephenson, Allan, Gooch, Hensinger, Baker, Young and Joy valve gears. Bibliography.

LUBRICATING OILS

Oxidizing Tests. Lubricating Oils, J. B. Hoblyn. Automobile Engr., vol. 15, no. 199, Feb. 1925, pp. 51-54, 12 figs. Their behavior under oxidizing tests.

LUMBER

Handling Equipment. Lumber Handling Simplified, Thos. D. Perry. Mgt. & Administration, vol. 9, no. 3, Mar. 1925, pp. 229-232, 10 figs. Describes labor- and money-saving equipment.

LUMINESCENCE

Production and Characteristics. Luminescence or Cold Light, W. S. Andrews. Gen. Elec. Rev., vol. 28, no. 2, Feb. 1925, pp. 103-108, 2 figs. Discusses what it is, how it is produced, and whether it has possibilities of development for practical use; tabulations of the various characteristics of luminescence by class, substance, and nature of exciting radiations.

M

MACHINE SHOPS

Methods. Diversified Activities Are Essential To Success in Commercial Machine Shop Work, H. B. & O. C. Sabin. Iron Trade Rev., vol. 76, nos. 10 and 11, Mar. 5 and 12, 1925, pp. 621-624 and 690-692, 12 figs. Mar. 5: Deals with successful effort of comparatively small establishment, Sabin Machine Co., to cope with post-war problems. Mar. 12: Special plan for distributing work and following order through to completion.

Time-Setting Charts. Time Setting in a Machine Tool Plant, M. A. Lee and D. Vandevate. Indus. Mgt. (N. Y.), vol. 69, no. 3, Mar. 1925, pp. 152-156, 5 figs. Methods devised and used with success in Gleason Works, where wide variety and small quantities make individual time studies impracticable; gives specific case of setting time for hobbing spur and helical gears.

MACHINE TOOLS

Large, Design of. Aims and Improvements in the Design of Large Machine Tools (Bestrebungen und Fortschritte des Grosswerkzeugmaschinenbaues), Weil. Zeit. des Vereines deutscher Ingenieure, vol. 69, no. 8, Feb. 21, 1925, pp. 249-256, 5 figs. Points out advisability of substituting electric for mechanical work on machine tools when possible, giving practical examples for purpose of demonstration; review of number of models showing what is required of large-machine-tool industry and progress which has been made.

MACHINERY

Safety. Safety Against Fracture in Machine Construction (Bruchsicherheit im Maschinenbau), P. Ludwik. Zeit. des Oesterr. Ingenieur- u. Architekten-Vereines, vol. 76, no. 49-50, Dec. 12, 1924, pp. 440-444, 3 figs. Discusses increased strength required of materials to withstand increased loads; advantages and disadvantages of referring fracture safety to yield point in place of strength; tests applicable; rupture due to fatigue; etc.

Size Grading, Preferred Number System for. The Possibility of Preferred Numbers in Civil Engineering, S. Wilmot. Eng. & Contracting (Buildings), vol. 63, no. 2, Feb. 25, 1925, pp. 407-411. A system for grading sizes of machines and materials for maximum convenience and economy.

MAGNESIUM ALLOYS

Electron Metal. Electron Metal (Elektronmetall), G. Schreiber and R. Neuwahl. Maschinenbau, vol. 4, no. 1, Jan. 15, 1925, pp. 7-10, 2 figs. Electron metal is not more inflammable than other technical materials; discusses increased use due to technical suitability and economy; tensile strength data; etc.

MALLEABLE CASTINGS

Cleaning. Cleaning Small Malleable Castings, F. B. Jacobs. Foundry, vol. 53, no. 6, Mar. 15, 1925, pp. 239-241, 5 figs. Cleaning and inspection methods employed at Belmont works of Link-Belt Co., Indianapolis.

MALLEABLE IRON

Nature and Manufacture. Malleable Cast Iron, Metal Industry (Lond.), vol. 25, nos. 23, 24, 25 and 26, Dec. 5, 12, 19 and 26, 1924, pp. 551-553, 575-577, 595-597 and 617-618, and vol. 26, nos. 1 and 2, Jan. 2 and 9, 1925, pp. 11-12 and 39, 10 figs. Its nature and development; technical factors in manufacture; types of pig iron suitable for this work, both from point of view of fracture and chemical composition, and changes brought about by remelting and annealing; annealing temperature, etc.

MAPPING

Aerial. Equipment Used for Aerial Surveying, E. Robinson. Mech. Eng., vol. 47, no. 3, Mar. 1925, pp. 170-174, 7 figs. Describes various types of cameras and auxiliary equipment employed in aerial mapping.

MEASUREMENTS

Physical, Effects of Atmosphere on. Some Effects of the Atmosphere upon Physical Measurements, E. W. Washburn. Science, vol. 61, no. 1568, Jan. 16, 1925, pp. 49-56. Presence of atmosphere in contact with substance or system subjected to quantitative investigation affects situation in two ways, namely: (1) direct-pressure effect, and (2) air-solubility effect.

MEASURING INSTRUMENTS

Extensometers for Longitudinal Strains. Roller Extensometers for Longitudinal and Lateral Strains. Engineering, vol. 119, no. 3085, Feb. 13, 1925, pp. 207-208, 3 figs. Evolution of instrument, described in previous issue, to apply to measurement of very small lateral expansions and contractions of test piece under longitudinal strain.

MECHANICS

Section Modulus. Section Modulus of Unsymmetrical Sections, E. Latshaw. Machy, (N. Y.), vol. 31, no. 7, Mar. 1925, p. 518, 6 figs. Derives simple formula which gives approximate section modulus of such sections; most important application of these formulas is in determining strength of castings, forgings, pressed parts and structural angles sheared to sizes other than given in handbooks.

MERCURY-VAPOR SYSTEM

Heating System. A Mercury Heating System, Jos. Moosebrugger. Tech. Eng. News, vol. 5, no. 7, Feb. 1925, pp. 244-245 and 264, 3 figs. New development which, it is claimed, will prove invaluable in heat transfer at constant temperature; describes simple form of mercury heating system.

METALS

Conductivity. The Thermal and Electrical Conductivities of Some Pure Metals, F. H. Schofield. Roy. Soc.—Proc., vol. 107, no. A742, Feb. 2, 1925, pp. 206-227, 7 figs. Results of experiments to measure thermal and electrical conductivities of number of metals of highest purity obtainable commercially.

Deformation. Criticism of Theories on Changing of Forms From the Point of View of X-ray Research (Kritik der Formänderungstheorien vom Standpunkt der Röntgenforschung). Mitteilungen aus dem Materialprüfungsamt, vol. 42, nos. 1-2, 1924, pp. 7-11. Discusses the various theories advanced on cold deformation and endeavors to bring into one sequence hypothesis on cold working and strain hardness.

Fatigue. Design of Specimens for Short-Time "Fatigue" Tests. L. B. Tuckerman and C. S. Aitchison. U. S. Bur. Standards—Technologic Papers, vol. 19, no. 275, Dec. 22, 1924, pp. 47-55, 3 figs. Discusses controlling factors in design of short-time fatigue test specimens, which differ from those of endurance-run type of fatigue test; it is possible to design short-time fatigue specimen with maximum stresses uniform over large portion of material, thus securing greater sensibility; specimen shapes are shown suitable for different types of short-time fatigue tests; Sondericker type of machine is considered best suited for these tests.

Microstructure, Use in Specifications. The Use of Microstructure in Specifications. Metallurgist (Supp. to Engineer), Feb. 27, 1925, pp. 27-28. Points out advantages of use of microstructures for specification purposes.

Recrystallization and Grain Growth. Recrystallization and Grain Growth in Soft Metals, M. Cook and U. R. Evans. Min. & Metallurgy, vol. 6, no. 219, Mar. 1925, p. 159. Describes procedure of obtaining specimens of lead, tin, and cadmium with moderately equiaxed structure and smooth surface suitable for etching without grinding and polishing; advantages of general oblique illumination (as opposed to vertical illumination) in photomicrography of pure metals; using these methods, statistical study of changes brought about in deformed lead, on annealing, has been made. (Abstract.)

Solidification, Volume Change During. On the Measurement of the Change of Volume in Metals during Solidification, H. Endô. Tôhoku Imperial Univ.—Sci. Reports, vol. 13, no. 2, Nov. 1924, pp. 193-218, 17 figs. partly on supp. plates. Results of measurements of change of volume during solidification or melting for a number of metals having low melting point up to 1100 deg. cent.

Thermal Analysis. The Chevenard Recording Dilatometer (Le dilatomètre enregistreur Chevenard), M. Chauvierre. Technique Automobile et Aérienne, vol. 15, no. 127, 1924, pp. 119-123, 4 figs. Design and operation of dilatometer for thermal analysis of metals or alloys and study of allotropic transformations and anomalies in expansion.

Thermal Conductivity. Some New Methods for the Measurement of Thermal Conductivity, T. Barratt and R. M. Winter. Lond., Edinburgh, & Dublin Philosophical Mag. & Jl. Sci., vol. 49, no. 290, Feb. 1925, pp. 313-322, 1 fig. Measurement of emissivity; expressions for thermal conductivity; examples.

MINERALS

Radioactive. Recent Discoveries of Radioactive Minerals in Ontario, H. V. Ellsworth. Canada Dept. Mines, Geol. Surv., no. 2041, 1924, pp. 6-20. Describes general and economic geology.

Radio-Detector. Radio-Detector Minerals, E. T. Wherry. Am. Mineralogist, vol. 10, no. 2, Feb. 1925, pp. 28-31. About 75 minerals which have been found to possess radio-detector properties are tabulated with respect to their compositions. Theory of Roberts and Adams that sensitive spots on crystals are merely layers composed wholly of one kind of atom is shown to be insufficient, and a modification is suggested.

MOTOR BUSES

Body Design. Developments in Motor-Body Design. Soc. Automotive Engrs.—Jl., vol. 16, no. 3, Mar. 1925, pp. 310-312. Discussion of paper by H. G. Bersie, printed in Oct. 1924 issue of Journal.

Developments 1924. Bus Design Develops Rapidly During 1924, H. Chase. Automotive Industries, vol. 52, no. 9, Feb. 26, 1925, pp. 378-384. Graphic illustration of trend in important features of bus design. Tabular data on American and British gasoline motor bus specifications.

Maintenance-Control System. System for Controlling Motorbus Maintenance, R. E. Fielder. Soc. Automotive Engrs.—Jl. vol. 16, no. 3, Mar. 1925, pp. 345-354, 20 figs. Describes system developed by Fifth Avenue Coach Co.

MOTOR TRUCKS

Running Costs. Considerations Affecting Running Costs of Modern Commercial Road Vehicles, Jos Nall. Inst. Transport—Jl., vol. 6, no. 3, Jan. 1925, pp. 194-204. Notes on loading and unloading; design of body; tipping and movable bodies; trailers; standardization; design of chassis and vehicle; providing capable and experienced drivers; repair organization; keeping and using costing statistics; running costs.

Service Records. Utilizing Motor-Truck Service-Records, S. V. Norton. Soc. Automotive Engrs.—Jl., vol. 16, no. 3, Mar. 1925, pp. 372-378, 14 figs. General Motors Co., Pontiac, Mich., maintains manufacturing committee composed of heads of principal departments, meetings being held at stated intervals under direction of general manager; service engineer attached to technical division follows up complaints recorded and develops practicable remedies; bulletins are then issued to field organization, notifying service stations of improvements in parts or in methods of service.

N

NON-FERROUS METALS

Metallography. Metallography of Non-Ferrous Metals, Jos. K. Wood. Am. Mach., vol. 62, no. 11, Mar. 12, 1925, pp. 433-436, 4 figs. Heat treatment of non-ferrous metals; constitutional diagrams of zinc-copper and copper-aluminum alloys; characteristics of duralumin in copper-aluminum group; lists of leading alloys.

O

OIL

Cracking. The Cross Oil-Cracking Plant. Engineering, vol. 119, nos. 3087 and 3089, Feb. 27 and Mar. 13, 1925, pp. 247-249, and 312-316 and 324, 14 figs. partly on supp. plates. Details of plant of Medway Oil & Storage Co., using Cross cracking process.

OIL ENGINES

Operation. Operation of Oil Engines, H. E. Chambers, Jr. South. Engr., vol. 43, no. 1, Mar. 1925, pp. 56-59. Adaptability of oil engine to ice and refrigeration plants, together with numerous practical operating hints.

Solid-Injection. Typical Airless Injection Systems. Oil Engine Power, vol. 3, no. 2, Feb. 1925, pp. 106-110, 12 figs. Considerations which have led to adoption of airless spray as recognized method by engine builders and users; principles involved are discussed and illustrated by representative examples.

Unbalanced Force and Moment. Unbalanced Force and Moment in Three-cylinder Engines. Thos. Petty. Mech. World, vol. 77, nos. 1983, 1985 and 1987, Jan. 2, 16 and 30, 1925, pp. 8-9, 37-38 and 69-70, 15 figs. Describes convenient method of setting out work in connection with investigation of condition as regards balance in 3-cylinder engines.

OIL FUEL

Atomizing, Cost of. Cost of Atomizing Fuel Oil, C. Tyler. Chem. & Met. Eng., vol. 32, no. 8, Feb. 23, 1925, p. 323, 1 fig. Comparison of cost of atomizing fuel oil with five types of apparatus.

Heaters. Fuel Oil Heaters—Their Care and Operation, A. F. Brewer. Combustion, vol. 12, no. 3, Mar. 1925, pp. 200-204, 5 figs. Various types of heaters and their advantages.

Resources. Fuel Oil Resources of the Future, A. W. Nash and H. G. Shatwell. Instn. Petroleum Technologists—Jl., vol. 10, no. 47, Dec. 1924, pp. 854-871. Discusses oil resources of present and future resources. Berginisation of coal and oil.

OIL SHALES

Industry in 1924. Oil Shale in 1924, V. C. Alderson. Min. Congress Jl., vol. 11, no. 2, Feb. 1925, pp. 71-77, 3 figs. Review of progress in oil shale matters in the different countries during 1924. Outstanding events are interest of government in developing an oil reserve, competition of Elko plant, Trumble process for distillation and Sacramento meeting.

OIL WELLS

Behavior. Scientists Aid to Petroleum Engineer, S. C. Herold. Oil & Gas Jl., vol. 23, no. 39 and 41, Feb. 19 and Mar. 5, 1925, pp. 54, 62, 64, 66 and 70 and 51, 74, 76, 78, 80 and 82, 12 figs. Discusses most important scientific laws which seem to have most direct bearing on behavior of reservoirs, and applies principles to the three classes of oil and gas wells, viz., hydraulic, volumetric and capillary control.

OXY-ACETYLENE CUTTING

Rail Reconditioning. Another Use for the Acetylene Torch. Ry. Eng. & Maintenance, vol. 21, no 3, Mar. 1925, pp. 101-102, 6 figs. Rail relayed after burning off battered ends gives good service on light-traffic main line of Int.-Great Northern, Texas.

Steel Plate. Effect of the Heat of Oxy-Acetylene Torch in Cutting Steel Plate, C. H. Crowe. Can. Chem. & Metallurgy, vol. 9, no. 2, Feb. 1925, p. 37, 7 figs. Results of investigation carried out to determine depth and in what manner plate is affected by torch.

OXY-ACETYLENE WELDING

Applications. Applications of the Oxy-Acetylene Process in the Hawthorne, Illinois, Works of the Western Electric Company, E. L. Swangren. Acetylene Jl., vol. 26, no. 7, Jan. 1925, pp. 325-328. Experiences with oxy-acetylene welding and cutting in one of the largest industrial plants in America.

Construction Field. Gas Welded Structures and Cutting Torch in Engineering, D. C. McGeihan. Eng. World, vol. 26, no. 1, Jan. 1925, pp. 7-12, 11 figs. Discusses possibilities of oxy-acetylene applications in construction field.

P

PAPER MACHINERY

Driers. Alexander's Electric Paper Dryer, J. E Alexander. Paper, vol. 35, no. 17, Feb. 12, 1925, pp. 114, 116 and 118, 2 figs. Description of invention which marks great advance in drying of paper as it leaves Fourdrinier wire. See also Engineering Features of Electric Dryer, S. A. Staege, on pp. 118, 120 and 122.

PAPER MANUFACTURE

Beating. Power Economy in Beating, F. Paul. Paper, vol. 35, no. 16, Feb. 5, 1925, pp. 675-680, 8 figs. Proposed system of beater control with description of tests employed in manufacture of print paper. Translated from Papier, vol. 27, Oct. 1924, pp. 1131-1146.

Groundwood Manufacture. Artificial Pulpstones, W. W. Greenwood. Paper, vol. 35, no. 17, Feb. 12, 1925, pp. 78, 80 and 82. Discusses Norton segmental pulpstone, composed of abrasive carborundum, said to surpass sandstone in manufacturing efficiency for groundwood. See also Paper Grade C.J. vol. 80, no. 6, Feb. 5, 1925, pp. 169, 171, 173 and 175, 4 figs.

Woodpulp, Testing of. Testing Chemical Woodpulp, G. P. Genberg. Paper, vol. 35, no. 17, Feb. 12, 1925, pp. 84, 86, 88, 90, 92 and 94. Methods of determining strength of pulp with ball mill, sheet making and pressure, as well as use of Ashcroft tester.

PAPER MILLS

Ventilation. Ventilation of Paper Machine Rooms, R. Skagerberg. Paper Trade Jl., vol. 80, no. 6, Feb. 5, 1925, pp. 139-144, 6 figs. Discusses to methods of ventilation, no-hood system and overhead exhaust hood system; describes Sirocco system, and results obtained.

PAVEMENTS, ASPHALT

Amiesite. An Asphalt Pavement that is Laid Cold, Chas. A. Mullen. Contract Rec., vol. 39, nos. 4 and 5, Jan. 28 and Feb. 4, 1925, pp. 70-71 and 95-96, 2 figs. Definition of "amiesite"; asphalt cement is kept plastic long enough for laying by means of solvent called liquefier; how amiesite is made and laid; a type of pavement that eliminates detours and can be opened to traffic without delay.

PILES

Composite. Composite Wood and Concrete Pile Rises Above Water Line. Eng. News-Rec., vol. 94, no. 5, Jan. 29, 1925, pp. 186-188, 3 figs. Costly and difficult foundation work avoided by concrete pile heads carrying footings above water-bearing soil.

PISTONS

Machining. Simple Equipment Used to Machine Pistons Accurately, W. L. Carver. Automotive Industries, vol. 52, no. 11, Mar. 12, 1925, pp. 502-505, 12 figs. Describes permanent-mold process for casting iron pistons employed at plant of Holley Carburetor Co., Detroit; permanent-mold casting eliminates need for aging and for providing balancing lugs; production line at plant makes it easy to shift from one size or type to another.

PLATES

Iron Cold Working of. Cold Working Iron Plates by Cutting and Punching (Die Kaltbearbeitung durch Schneiden und Lochen an dicken Eisenblechen), W. Schürmann. Maschinenbau, vol. 4, no. 1, Jan. 15, 1925, pp. 14-18, 10 figs. Physical, metallographic and thermic examination of changes due to cutting and stamping; increase of hardness and brittleness at surfaces of cuts and depth of penetration.

Riveted, Leakage Resistance of. Some Tests to Determine Resistance Against Leakage of Riveted Plates Supported on Beams or Columns, G. T. Horton. Contract Rec., vol. 39, no. 7, Feb. 18, 1925, pp. 152-155, 4 figs. Results of experiments on a flat-bottomed tank to determine what depth of water bottom would carry under varying arrangements of support.

POWER

Purchased vs. Generated. What Is Revealed by Our Power Questionnaire. Indus. Mgt. (N. Y.), vol. 69, no. 3, Mar. 1925, pp. 177-178. Deals with sources of power used in average American industrial plants; answers to questions which throw light on question of whether it is better to buy or to generate current for load requirements; conclusions and observations, made from study of these statistics, follow presentation of statistics themselves.

POWER FACTOR

Correction. Benefits of Power-Factor Correction, A. M. Perry and H. C. Anderson. Elec. World, vol. 85, no. 7, Feb. 14, 1925, pp. 345-349, 3 figs. Experiences with Fynn-Weichsel motors; advantages by which they justify expense from economic viewpoint; operating experience obtained and benefits realized.

Low Detrimental Effects of. The Dollars and Cents of Low Power Factor, O. H. Henschel. Indus. Mgt. (N. Y.), vol. 69, no. 3, Mar. 1925, pp. 138-144, 8 figs. Practical attack on important source of power waste; detrimental effects of low power factor and corrective measures.

POWER TRANSMISSION

Fluid Transmission Gears. Fluid Transmission Gears, H. G. Bouly. Junior Instn. Engrs.—Jl., vol. 30, part 4, Jan. 1925, pp. 157-173, 18 figs. Describes three types, namely, Hele-Shaw, Williams-Janney and Lentz gear; advantages to be gained by use of these machines.

PROSPECTING

ELECTRICAL. Electrical Prospecting, G. Bergström. Chem. Met. & Min. Soc. of South Africa—Jl., vol. 25, no. 5, Nov. 1925, pp. 138-140 and (discussion) 146-148, 13 figs. Discusses methods and results obtained.

The Eötvös Torsion Balance and Its Application to the Location of Minerals, H. Shaw and E. Lancaster-Jones. Min. Mag., vol. 32, nos. 1 and 2, Jan. and Feb. 1925, pp. 18-25 and 86-92, 13 figs. Deals with gravitational method of prospecting; description of balance; method of survey; examples of use of balance from actual surveys; application to oil; salt and heavy ore deposits; interpretation of results.

PULLEYS

CONE. Curious Application of a Cone-pulley Drive, A. Marchandise. Machy. (Lond.), vol. 25, no. 648, Feb. 26, 1925, pp. 689-690, 1 fig. Problem which arose in construction of wire-winding machine.

PULVERIZED COAL

FINENESS OF SIEVED FRACTIONS. Powdered Anthracite, D. J. W. Kreulen. Fuel, vol. 4, no. 2, Feb. 1925, pp. 81-83, 1 fig. Continuation of work on composition and fineness of coal samples; fineness of sieved fractions. Translated from Brennstoff-Chemie.

TRANSPORTATION. Loading and Transportation of Pulverized Coal (Kohlenstaub-Förderung), Walther. Fördertechnik u. Frachtverkehr, vol. 18, no. 2, Jan. 18, 1925, pp. 12-13, 10 figs. Pulverized coal is transported in closed containers or pipes and should not be exposed to air more than necessary. Describes a number of designs of screws for moving of coal and special car designs for its transportation.

UNIT PULVERIZERS. The Unit Coal-Pulverizing Plant and Its Operation, L. G. Coutant. Mech. Eng., vol. 47, no. 3, Mar. 1925, pp. 183-185, 3 figs. Describes number of installations in France; advantages of unit system. (Abridged.)

PUMPING ENGINES

TYPES. Power Production for Water Supply Purposes, F. J. Garland. Power Engr., vol. 20, no. 228, Mar. 1925, pp. 95-99, 4 figs. Discusses modern methods, with particular reference to recently erected plants.

PUMPS, CENTRIFUGAL

DEEP-LEVEL. Solution of a Problem in Pump Construction (Lösung eines bisher offenen Problemes der Pumpentechnik), K. Strasser. Zeit. des Oesterr. Ingenieur- u. Architekten-Vereines, vol. 76, no. 49-50, Dec. 12, 1924, pp. 459-464, 9 figs. Details of design and operation of Arutünoffs Reda-Electropump for oil wells, artesian wells, etc.

TEST CODE. Test Code for Centrifugal and Rotary Pumps. Mech. Eng., vol. 47, no. 3, Mar. 1925, pp. 214-218, 13 figs. Tentative draft of code in series of 19 being formulated by A. S. M. E. Committee on power test codes.

PUNCHING MACHINES

ANGLE-BAR. A New Punching and Cropping Machine for Angle Bars. Brit. Machine Tool Eng., vol. 3, no. 31, Jan.-Feb. 1925, pp. 208-209, 1 fig. Machine, made by Jas. Bennie & Sons, Glasgow, that can be quickly and cheaply set to simultaneously pierce and crop bars of various lengths with differently disposed holes.

R

RADIATION

NON-LUMINOUS FLAMES. Radiation from Non-luminous Flames, R. T. Haslam, W. G. Lovell and R. D. Hunneman. Indus. & Eng. Chem., vol. 17, no. 3, Mar. 1925, pp. 272-277, 5 figs. From consideration of data presented and from critical interpretation of other data, it is seen that radiation which accompanies non-luminous flame, although of definite amounts, varies greatly with condition of flame; view is put forth that radiation from flame is matter intimately connected with chemical reactions taking place there rather than with temperature, and that in spectroscopic study of flame radiation there exists powerful tool for investigation of complex chemical reactions.

RADIOTELEGRAPHY

RECEPTION, AERIAL AND EARTH SYSTEMS. Some Experiments with Aerial and Earth Systems for Reception, R. L. S. Rose and F. M. Colebrook. Experimental Wireless, vol. 2, no. 16, Jan. 1925, pp. 207-217, 10 figs. Description of measurements carried out at Nat. Physical Laboratory, Teddington, Eng., with view to determining most efficient aerial and earthing systems for short wave reception, with particular reference to use of an earth-screen for reception.

SHORT-WAVE. Using Short Electric Waves in Radiotelegraphy and Radiotelephony (Zur Frage der Verwendung kurser elektrischer Wellen in der drahtlosen Telegraphie und Telephonie), A. Esau. Zeit. für Technische Physik, vol. 5, no. 12, 1924, pp. 538-547, 16 figs. Surveys development of short waves, their characteristics and possible uses in radio communication; sending and receiving.

RADIOTELEPHONY

LOUD SPEAKERS. A New Loud Speaker (Vorführung eines neuen Lautsprechers). Zeit. für Technische Physik, vol. 5, no. 12, 1924, pp. 574-577. Two articles, one by W. Schottky and other by E. Gerlach, discussing Gerlach film loud speaker and film microphone, developed in Siemens & Halske laboratory.

RAILS

WEAR-TESTING MACHINE. New Machine for Testing Wear, Lubricating Oil and Tools (Neue Prüfmaschine für Abnutzings-, Schmieröl- und Werkzeugprüfung), Spindel. Zeit. des Oesterr. Ingenieur- u. Architekten-Vereines, vol. 76, no. 49-50, Dec. 12, 1924, pp. 454-456, 5 figs. Design and operation of Spindel machine for testing resistance of rails to wear, lubricating capacity of oils, and quality of tools.

RAILWAY ELECTRIFICATION

ECONOMIES OVER STEAM. St. Paul's Electrification Shows Economies Over Steam. Ry. Age, vol. 78, no. 9, Feb. 28, 1925, pp. 514-518, 1 fig. Study of comparative costs on 648 miles of line indicates saving for electric operation. See laso Ry. Rev., vol. 76, no. 9, Feb. 28, 1925, pp. 378-387, 11 figs.

VIRGINIA. The Virginian Railway Electrification, Homer K. Smith. Ry. Rev., vol. 76, no. 8, Feb. 21, 1925, pp. 335-341, 15 figs. Electrification of mountain section handling large coal tonnage over heavy grades and sharp curves.

RAILWAY MANAGEMENT

RATE MAKING. Principles Governing Railway Rates, R. Gibbs. Inst. Transport—Jl., vol. 6, no. 4, Feb. 1925, pp. 239-254 and (discussion) 254-258. Points out futility of charging what traffic will bear; classification of goods as foundation of rate making; importance of good loading conditions; speed; need for inclusion of substantial charge not varying with distance; dividing traffic according to rate-bearing capacity; exceptional rates.

RAILWAY MOTOR CARS

BRANCH LINES. The Gasoline Railroad-Car for Branch Lines. Soc. Automotive Engrs.—Jl., vol. 16, no. 3, Mar. 1925, pp. 318-321. Discussion of paper by W. L. Bean published in Oct. 1924 issue of Journal.

CANADIAN NATIONAL RY. SERVICE. Self-Propelled Car Service on Canadian National Railways. Ry. Rev., vol. 76, no. 8, Feb. 21, 1925, pp. 348-353, 8 figs. Summary of service established and maintained by various types of self-propelled cars; review of equipment used and its performance.

FOUR-WHEEL-DRIVE. Petrol-Driven Rail Motor Vehicles for the Norwegian State Railways. Ry. Gaz., vol. 42, no. 7, Feb. 13, 1925, pp. 198-200, 5 figs. Vehicle is of 4-wheel-drive passenger type, but of shorter length and wheelbase, and is intended as repair car for overhead wires on electric railways.

TWO-CAR GASOLINE. Two-Car Gasoline Motor Train for Local Service on Main Line. Ry. Age., vol. 78, no. 7, Feb. 14, 1925, pp. 401-402, 5 figs. Big Four acquires combination baggage and mail motor car and 60-passenger trailer.

RAILWAY OPERATION

ECONOMICS. Economics of Railway Operation. Am. Ry. Eng. Assn.—Bul., vol. 26, no. 274, Feb. 1925, pp. 859-927, 21 figs. Effect of speed of trains upon cost of transportation: methods of increasing traffic capacity of a railway; methods of analyzing costs for solution of special problems, including study of costs of starting and stopping trains; economy resulting from operation of trains against current of traffic on multiple track lines; method for determination of proper allowances for maintenance of way expenses due to increased use and increased investment; utilization of locomotives.

ELECTRIC VS. STEAM. Electrical Railway Operation (Elektrisk Järnvägsdrift), C. Wijkborn. Ingeniören, vol. 34, no. 6, Feb. 7, 1925, pp. 73-77, 4 figs. Comparison of operating expenses of steam and electric railways, showing that cost of operation of electric trains decreases much faster with intensity of traffic than cost of operation of steam-driven trains.

FORD RAILWAY PRACTICE. Ford Railroad Has Unique Operating Practices. Ry. Age. vol. 78, no. 9, Feb. 28, 1925, pp. 501-506, 9 figs. Among worth-while innovations of Detroit, Toledo & Ironton R. R. are mentioned; Operation with simplest possible administration; wage payment commensurate with character of service rendered and sufficiently high to attract desirable men; maintenance of neatness and orderliness; avoidance of waste of every form; instilling safety into every operation; etc.

TRAIN CONTROL. The Fundamentals of Automatic Train Control. Ry. Rev., vol. 76, nos. 5, 6, 7 and 9, Jan. 31, Feb. 7, 14 and 28, 1925, pp. 237-241, 282-284, 310-311 and 393-395. Jan. 31: History and classification of various types of train control and principles underlying them. Feb. 7: Advantages and disadvantages of various classes and types. Feb. 14: Signal and operating problems involved in application of train control to railroad, automatic stop and speed control. Feb. 28: Locomotive equipment, devices to translate track condition, to control and apply air brake.

RAILWAY REPAIR SHOPS

LOCOMOTIVE-FRAMES BOILING VATS. Hanomag Vat for Boiling Locomotive Frames (Hanomag-Kochbottich zum Reinigen von Lokomotivrahmen), B. Frederking. Hanomag Nachrichten, vol. 11, no. 134, Dec. 1924, pp. 201-206, 8 figs. Details of vat 14 by 3.1 by 3.2 m. for boiling underframes and boilers to, free them from dirt, oil and paint before repairing.

MAINTENANCE PRACTICE. Maintenance of Rolling Stock on New England Railroads, E. Sheldon. Am. Mach., vol. 62, no. 9, Feb. 26, 1925, pp. 351-355, 12 figs. Pouring bronze facings on driving boxes; car-wheel and axle work; head-light and car-lighting generators; air-brake department. Practice of Waterville shops of Maine Central R. R.

METHODS AND EQUIPMENT. Sayre Shops of the Lehigh Valley Railroad, Rob. G. Skerrett. Compressed Air Mag., vol. 30, no. 1, Jan. 1925, pp. 1101-1108, 25 figs. Time- and money-saving methods and facilities in shops at Sayre, Pa.

ROUTING LOCOMOTIVES FOR HEAVY REPAIRS. Routing Mountain Type Locomotives Through Shops for Heavy Repairs, S. W. Mullinix. Ry. Rev., vol. 76, no. 9, Feb. 28, 1925, pp. 395-397. Methods employed in Silvis shops, Moline, Ill., of C. R. I. & P. Ry. for making general repairs; outline of steps and operations involved.

RAILWAY SHOPS

SCRAP RECLAMATION. Reclaiming Scrap on the Santa Fé, R. K. Graham. Am. Mach., vol. 62, no. 11, Mar. 12, 1925, pp. 421-423, 5 figs. How discarded materials are saved from scrap pile; rolling scrap into bars; utilizing discarded roofing; repairing valves and air-brake parts, final disposition of scrap.

RAILWAY SIGNALING

A. C. DYNAMIC INDICATION. A New Application of the Induction Motor to Signaling Devices, P. X. Rice. Pa. State College Bul., Eng. Exper. Sta. Bul. No. 31, Jan. 1924, 25 pp., 15 figs. Describes how an alternating-current system of dynamic indication for railway signals and switches may be used with same satisfactory results as are provided by well known direct-current system in general use. Diagrams and drawings.

NORTHERN PACIFIC LINES. Northern Pacific Main Lines 76 Per Cent Signaled, C. A. Christofferson. Ry. Age, vol. 78, no. 10, Mar. 7, 1925, pp. 543-548, 6 figs. 14-year program completes 2225-mi. installation of automatic signals; how program progressed.

RAILWAY TRACK

DOUBLE TRACKING AND RELOCATION. Double-Tracking and Relocation on the Santa Fé Ry. Eng. News-Rec., vol. 94, no. 10, Mar. 5, 1925, pp. 382-385 and 388, 4 figs. Continuous 723-mi. stretch of double track relieves traffic congestion; line revision and grade reduction; heavy rock work; concrete revetment of slopes.

ELEVATION OF. B. & O. R. R. Completes Track Elevation at Pittsburgh, W. M. Ray. Eng. News-Rec., vol. 94, no. 10, Mar. 5, 1925, pp. 397-398, 4 figs. Track elevation ends joint operation of congested tracks by two railroads; changes made possible by highway relocation.

OLD RAILS FOR TIES. Old Rail Used for Ties in Bangor, E. W. Jennison. Elec. Ry. Jl., vol. 65, no. 9, Feb. 28, 1925, pp. 333-334, 6 figs. Particulars of type of track construction employed by Bangor Ry. & Elec. Co. Rigid reinforced-concrete track and paving construction is employed; wood ties are alternated with steel ties, which are welded to base of running rail; joints are thermit welded.

RAILWAY YARDS

A. R. E. A. REPORT. Yards and Terminals. Am. Ry. Eng. Assn.—Bul., vol. 26, no. 274, Feb. 1925, pp. 657-771, 64 figs. Scales; freight-handling at two-level freight houses and team tracks and multiple-story freight houses; freight yard design, arrangement of terminals to reduce preparatory leaving time and terminal arriving of trains; passenger station facilities, proper size and arrangement.

RAINFALL

PRECIPITATION AND RUNOFF. Precipitation and Runoff at the Continental Divide, J. E. Church, Jr. and E. H. Jones. Eng. News-Rec., vol. 94, no. 5, Jan. 29, 1925, pp. 190-195. Discussion of apparent disparity in precipitation and runoff, with analysis of data in light of snow surveying. Includes discussion by H. P. Boardman.

REACTORS

CURRENT-LIMITING. Papers on Current-Limiting Reactors. Am. Inst. Elec. Engrs. —Jl., vol. 4, no. 3, Mar. 1925, pp. 270-276, 7 figs. Discussion of papers by various authors published in 1924 issues of Journal.

CURRENT-LIMITING. The Use of Current Limiting Reactors in Central Stations, W.-H. Gregory. Elec. Engr., vol. 1, no. 9, Dec. 15, 1924, pp. 335-338, 6 figs. Methods of connecting reactors, and calculation of short-circuit currents.

RECTIFIERS

MERCURY-ARC. High-Voltage Rectifier Installations, C. Brynhildsen. Brown Boveri Rev., vol. 12, no. 2, Feb. 1925, pp. 23-28, 12 figs. Particulars of Brown, Boveri & Co. mercury-arc rectifier type GRZ 156 for converting alternating current to high-tension direct current, and their air-pump set type GRLW; describes rectifier sets supplied by Brown, Boveri & Co. to Midi Ry., Paris; tables giving Brown-Boveri high-tension rectifier plants in service, under construction and on order.

REDUCTION GEARS

TYPES. Speed Reducers. West. Machy. World, vol. 16, no. 2, Feb. 1925, pp. 56-57 and 60, 3 figs. Impartial study of gear speed-reduction units determining real value and characteristics of various types.

REFRACTORIES

BOILER FURNACES. Refractory Materials for Boiler Furnaces (Feuerfeste Baustoffe für Dampfkesselfeuerungen), L. Litnsky. Feuerungstechnik, vol. 13, no. 7, Jan. 1, 1925, pp. 70-76, 1 fig. Types of brick for boiler furnaces; differences in qualities; requirements; bricks for fire bridges; influence of fuel components and draft conditions; bricks for locomotive and marine boilers; requirements for pulverized-coal firing; standardization proposals in Germany and France.

RESISTANCE AGAINST TEMPERATURE CHANGES. The Resistance of Refractory Materials against Change of Temperature (Die Widerstandsfähigkeit feuerfester Baustoffe gegen Temperaturwechsel), W. Steger. Stahl u. Eisen, vol. 45, no. 8, Feb. 19, 1925, pp. 249-259, 9 figs. Determination of resistance by means of quenching tests and by measurement of physical properties; results of these methods with fireclay, silica and magnesite brick; description of new apparatus.

REFRIGERATING PLANTS

BRINE COOLERS. Brine and Brine Systems, H. J. Macintire. South. Engr., vol. 42, no. 6, Feb. 1925, pp. 55-57, 3 figs. Discusses corrosion in brine systems and brine cooling, making calculations.

EQUIPMENT. New Equipment, Apparatus, Processes, Etc., in Ice and Refrigerating Plants, H. P. Hill. Refrigeration, vol. 36, no. 1, Jan. 1925, pp. 36-40. Discusses kw-hrs. consumption or fuel cost, condensers, freezing systems, electrical equipment, auxiliaries, graphic wattmeters, etc. Paper read before Nat. Assn. Practical Refrig. Engrs.

EVAPORATING SIDE OF SYSTEM. Three Pressure Refrigerating Temperature Difference Control and Defrosting System, G. Hilger. Refrig. Eng., vol. 11, no. 8, Feb. 1925, pp. 293-296, 6 figs. Considers evaporating side of refrigerating system and a means of more nearly attaining goal of 100 per cent efficiency.

POOR DESIGN. Poor Designing in a Refrigeration Plant, R. L. Tullis. Power, vol. 61, no. 8, Feb. 24, 1925, pp. 298-299. Brine pump suctions not drowned; coils froze up; double-pipe cooler leaks; ammonia charge lost.

RELAYS

POLARIZED TELEGRAPH. Polarized Telegraph Relays, J. R. Fry and L. A. Gardner. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 3, Mar. 1925, pp. 223-228, 10 figs. Discusses two forms of polarized telegraph relays which have been developed by Bell System and applied originally to metallic telegraph system; one was designed primarily for operation under severe and exacting circuit conditions and other for application generally; both are of same general construction except that former is more sensitive than latter and is furnished with auxiliary accelerated winding.

RESEARCH

SCIENTIFIC. The Meaning of Scientific Research, M. I. Pupin. Science, vol. 61, no. 1567, Jan. 9, 1925, pp. 26-30. Points out that co-operation between scientific work in universities and in industries has already produced wonderful results, and it will produce more and more, and some day achievements from this co-operation will prove that best work can be done only by experts who have proper training.

TREND AND PURPOSE. The Trend and Purpose of Modern Research, H. E. Howe. Franklin Inst.—Jl., vol. 199, no. 2, Feb. 1925, pp. 187-202. Points out that trend and purpose is to obtain intimate acquaintance with nature that will permit continued progress in so changing materials as to render them more serviceable to need as they have developed throughout the years.

ROAD CONSTRUCTION

EARTHWORK. Effect of Haul on Cost of Earthwork, J. L. Harrison. Eng. World, vol. 26, no. 2, Feb. 1925, pp. 87-90, 4 figs. Team time as cost-study basis; field work; information developed by study; results of study show that there appears to be no means of handling earth which eliminates factor of distance moved as dominant element in cost.

ROADS

MAINTENANCE. Highway Research Board Report on Highway Maintenance. Mun. & County Eng., vol. 68, no. 1, Jan. 1925, pp. 37-45. Full text of 1924 report of maintenance committee of advisory board on Highway Research. Abstracts of sub-committee reports, on dust prevention and surface treatment of gravel roads, crack fillers for concrete pavements, snow removal and snow removal equipment, guide and danger signs. maintenance accounting, maintenance costs as affected by life of road, coverings for poorly constructed and disintegrating concrete roads, and bituminous treatment of earth, sand clay and top-soil roads; together with recommendations of main committee.

State Wide Road Maintenance, F. T. Sheets. Eng. & Contracting (Roads & Streets), vol. 63, no. 3, Mar. 4, 1925, pp. 471-480, 7 figs. How Illinois maintains 4638 miles of paved roads, 1000 miles of detours and 1400 miles of unpayed roads. Paper read at Am. Rd. Bldrs. Assn. convention.

RESEARCH. Recent Conclusions in Highway Research, A. T. Coldbeck. Pub. Roads, vol. 5, no. 11, Jan. 1925, pp. 9-14. Review of whole field of highway research, considering not only definite conclusions that have been reached, but also including certain well defined indications which may later resolve themselves into conclusions. See also Eng. In contracting (Roads & Streets), vol. 63, No. 3, Mar. 4, 1925, pp. 457-465.

SURFACES, SALVAGING OF OLD. Utilizing the Salvage Value of Old Road Surfaces, A. H. Hinkle. Mun. & County Eng., vol. 68, no. 1, Jan. 1925, pp. 22-32. Describes methods for salvaging old road surfaces which are being used with apparent success where grade and alignment of old road is such as to justify retaining it in its present location. Paper read before Am. Road Bldrs. Assn.

ROADS, ASPHALT

MIXTURES, STABILITY OF. Research Looking to Improvement in Asphalt Mixtures, P. Hubbard. Highway Engr. & Contractor, vol. 12, no. 12, Feb. 1925, pp. 41-45, 8 figs. Results of experimental work which lead to development of a simple laboratory test to determine stability of asphalt paving mixtures, and description of method of test.

ROADS, BITUMINOUS

CONSTRUCTION. Construction of Bituminous Roads, F. N. Rutherford. Can. Engr., vol. 48, no. 9, Mar. 3, 1925, pp. 279-280. Surface treatment of macadam roads; penetration macadam; hot mix pavements. Paper read at Conference on Road Construction.

ROADS, BRICK

DESIGN. The More Economical Design of Brick Pavements, W. D. P. Warren. Am. City, vol. 32, no. 3, Mar. 1925, pp. 256-261. In considering economical design of a brick pavement to meet rigid requirements of present and future traffic, emphasizes certain features which are considered to be of fundamental importance in development of an economical design.

ROADS, CONCRETE

IMPACT TESTS. Study of Impact in Its Relation to Pavement Design, G. W. Hutchinson. Eng. News-Rec., vol. 94, no. 11, Mar. 12, 1925, pp. 439-440, 1 fig. Resistance to impact is affected by thickness of concrete slab, coarseness of aggregate and cement concrete, as shown by results of tests.

ROLLING MILLS

GEAR DRIVE FOR SHEET ROLLS. Gear Drive for Sheet-Rolling Mills. Engineering, vol. 119, no. 3085, Feb. 13, 1925, p. 206, 1 fig. Describes installation of gearing and flywheels which will be used to drive 8 hot-sheet mills with 30-in. rolls.

SOAKING PITS, ELECTRIC. Electrically Heated Soaking Pits, B. G. Bailey. Iron & Steel Engr., vol. 2, Feb. 1925, pp. 111-114, 6 figs. Operation of electric pit at Donner Steel Co. demonstrated that quality of heating is uniformly better, due to accurate control of temperature, uniformity of heating, elimination of scale while in pit, elimination of cutting of ingot, and producing better surface on bloom; peak power demand on mill is reduced, as is also kilowatt-hours required for rolling.

SPREADING FORMULAS. Spreading in Connection with Rolling (Das Breiten beim Walzen), W. Tafel and H. Sedlaczek. Stahl u. Eisen, vol. 45, no. 6, Feb. 5, 1925, pp. 190-193, 2 figs. Older spreading formulas; tests on blooming mill with unvarying ingot size and strength of roll body; pressing tests with varying roll diameter; combination of results of these two tests for formulation of new spreading formulas.

ROPE DRIVE

MULTIPLE-PULLEY. Tension Equalization in Multiple-Pulley Drive (Der Spannungsausgleich für Mehrscheibenantriebe), O. Ohnesorge. Braunkohle, vol. 23, no. 38, Dec. 20, 1924, pp. 705-708, 6 figs. Discusses arrangement by German patent for eliminating differential tensions in multiple-pulley drive.

S

SAND, MOLDING

CLAY CONTENT. Heat Affects Clay Content in Molding Sands, R. F. Harrington, W. L. MacComb and M. A. Hosmer. Foundry, vol. 53, no. 6, Mar. 15, 1925, pp. 221-222 and 248, 3 figs. Discusses data obtained through investigation on clay content of sands samples of sands were heated to varying degrees of temperature to test theory that utility of molding sand depends not only on development of colloidal content in green clay, but to extent to which property is destroyed under various conditions of heat, dye-absorption test being applied; results indicate that when used for molding purposes sands vary in their relative bonding properties.

GERMAN. German Molding Sands, Their Occurrence and Testing (Die deutschen Farmsande, ihre Verbreitung und Prüfung), J. Benr. Giesserei-Zeitung, vol. 22, no. 2, Jan. 15, 1925, pp. 37-43, 2 figs. Regional and stratigraphical occurrence of molding sand: origin; testing methods; guiding rules for evaluation of the natural sands; tables of comparison.

SCREW THREADS

WORM, LATHE TOOLS FOR. Worm-thread Tools, W. Richards. Machy. (Lond.), vol. 25, no. 648, Feb. 26, 1925, pp. 691-693, 5 figs. Supplementary to author's article in previous issue of same journal regarding shape and design of tools required to produce certain worm on lathe; it is shown that approximate method described in first article will give results practically correct, and nearer than it is possible to attain on lathe or milling machine in ordinary practice.

SEMI-DIESEL ENGINES

IMPROVED TYPES. Recent Improvements in Semi-Diesel Engines, F. Johnstone-Taylor. Gas & Oil Power, vol. 20, no. 233, Feb. 5, 1925, pp. 89-91, 4 figs. Advantages and disadvantages of different types.

SEWAGE DISPOSAL

ACTIVATED SLUDGE. Activated-Sludge Experiments on Packing House Wastes, G. L. Fugate. Eng. News-Rec., vol. 94, no. 11, Mar. 12, 1925, pp. 443-445, 4 figs. Studies of surface and diffused-air aeration lead to design of latter type of plant for Houston Packing Co.; company treatment plant preferred to treatment by city.

BIOLOGICAL. Organization and Program of the Sewage Substation and Some Results Obtained, W. Rudolfs. Am. Water Wks. Assn.—Jl., vol. 13, no. 1, Jan. 1925, pp. 73-80. Discusses work carried out at New Jersey sewage substation on sludge digestion and sewage purification.

SOUND

RECORDING AND REPRODUCING. Acoustically Accurate Sound Recording, Amplifying and Reproducing (Ueber klanggetreue Schallaufnahme, Verstärkung und Wiedergabe), Zeit. für Technische Physik, vol. 5, no. 12, 1924, pp. 577-580, 5 figs. Discusses mathematical treatment of sound recording on films, and construction of an electrodynamic loud speaker.

SPARK PLUGS

SPARKING VOLTAGE OF. The Sparking Voltage of Spark Plugs, F. B. Silsbee. Nat. Advisory Committee for Aeronautics—Report, no. 202, 1925, 16 pp., 3 figs. Account of present accepted theory of spark discharge, tabulation of principal variables affecting sparking voltage and detailed discussion of each; application of these facts to standard test gaps, auxiliary series gaps, and safety gaps. Bibliography.

SPECIFIC HEAT

FUSION AT LOW TEMPERATURES. The Specific Heats and Latent Heats of Fusion of Ice and of Several Organic Compounds, O. Maass and L. J. Waldbauer. Am. Chem. Soc.—Jl., vol. 47, no. 1, Jan. 1925, pp. 1-9, 2 figs. Describes method of measurement of specific and latent heats of fusion at low temperatures; further evidence is advanced to prove that atomic heat is highly constitutive property, where specific heat of compound varies greatly with temperature.

SPRINGS

Heat Treatment. Heat Treatment of Automobile Springs, J. W. Urquhart. Mech. World, vol. 77, nos. 1989 and 1991, Feb. 13 and 27, 1925, pp. 101-102 and 136. Reviews various designs used, as form of spring affects design of furnace used for hardening as well as kind of equipment required for quenching and tempering; carbon-steel spring treatment; failures in carbon-steel springs; heating for quenching; operative quenching and tempering; vertical and horizontal quenching; tempering in oil or in salts.

STANDARDIZATION

Industrial. Industrial Standardization, F. L. Rhodes. Soc. Automotive Engrs.—Jl., vol. 16, no. 3, Mar. 1925, pp. 379-380. Requisite nature of standards; specifying performance requirements; mechanical tests and composition requirements; flexibility necessary in standardization.

STATISTICS

Mathematical Theory. On Certain Topics in the Mathematical Theory of Statistics, H. L. Rietz. Am. Math. Soc.—Bul., vol. 30, no. 8, Oct. 1924, pp. 417-453. Discusses generalized frequency curves, correlation, frequency surfaces, and theory of random sampling.

STEAM

Low-Pressure. The Specific Total-Heat of Low-Pressure Steam, C. H. Berry. Power, vol. 61, no. 11, Mar. 17, 1925, pp. 410-411, 2 figs. Shows simple and accurate method for calculating heat quantities for water vapor at low pressure, and discusses origin and accuracy of simple formula for specific total heat of low-pressure steam, that is, heat content per pound.

Research. Discussion of Steam-Research Reports, J. H. Keenan. Mech. Eng., vol. 47, no. 3, Mar. 1925, p. 174. Discussion of reports published in Feb. 1925 issue of same journal.

STEAM ACCUMULATORS

Ruths. Economies of Steam Accumulators, A. J. T. Taylor. Can. Mfr., vol. 45, nos. 1 and 2, Jan. and Feb. 1925, pp. 33-34 and 14-15, 3 figs. Results of study of Ruths accumulator in connection with extensive investigation conducted by author throughout pulp and paper industry of Sweden and Finland with special reference to economical use of steam.

The Ruths Steam Accumulator and Its Applications, A. J. T. Taylor. Paper Trade Jl., vol. 80, no. 5, Jan. 29, 1925, pp. 49-58, 28 figs. Description of Ruths accumulator; benefits of Ruths accumulator; particulars regarding its various applications. Paper to be presented before Tech. Assn. Pulp & Paper Industry convention.

STEAM ENGINES

Development. Development of Steam Engine in Last Fifty Years and Its Present Status (Die Entwicklung der Dampfmaschine in den letzten 50 Jahren und ihr gegenwärtiger Stand). Zeit. des Oesterr. Ingenieur- u. Architekten-Vereines, vol. 76, nos. 49-50, Dec. 12, 1924, pp. 433-435, 3 figs. Discusses progress in design to save steam and increase velocity of pistons, triple-expansion engines, superheated steam, steam consumption, etc.

Diagrams. Determination of Admission and Exhaust Lines in Diagram of Piston Engines by Means of a New Graphic Method for Solving Their Differential Equation (Die Ermittlung der Ein- und Ausströmlinien im Diagram von Kolbenmaschinen mit Hilfe eines neuen zeichnerischen Verfahrens zur Lösung ihrer Differentialgleichung), H. Bonin. Zeit. für Angewandte Mathematik u. Mechanik, vol. 4, no. 6, Dec. 1924, pp. 492-497, 6 figs. Calculation of sequence of pressures in cylinder, reduction to differential equation, and simple graphic solution applicable in practice.

Uniflow. Unaflow Engine Practice of a Century Ago. Power, vol. 61, no. 10, Mar. 10, 1925, pp. 368-370. In 1827 Jacob Perkins operated uniflow engines with 800-lb. steam; invented compound engine of high economy.

Uniflow and Compound. Uniflow and Compound Duoflow Engines, Rob. Cramer. Mech. Eng., vol. 47, no. 3, Mar. 1925, pp. 191-192 and (discussion) pp. 192-193. Review of development and history of these two types of reciprocating engines and discussion of their respective fields of application.

STEAM METERS

Types. The Measurement of Steam (Dampfmessung), M. Schaack. Siemens- Zeit., vol. 5, no. 1, Jan. 1925, pp. 9-17, 13 figs. Points out economic importance of steam-plant control by means of steam meters and gives practical examples of savings effected by use of meters; methods of measurement and types of instruments employed.

STEAM PIPES

High-Pressure and Temperature. Steam Pipes for Extra High Pressure and Temperature, J. A. Aiton. Engineering, vol. 119, no. 2088, Mar. 6, 1925, pp. 306-307. Deals chiefly with deduction drawn from actual experience of pipes working under maximum temperature of 750 deg. fahr. with steam pressure of 400 lb. per sq. in. and not with abnormal conditions. Paper read before Instn. Engrs. & Shipbldrs. in Scotland.

Insulation, Tests of. Tests of Insulation of Underground Steam Pipes, Sawdon. Sibley Jl. of Eng., vol. 39, no. 2, Feb. 1925, pp. 267-271, 4 figs. Summary of report made by writer to Dept. Bldgs. and Grounds on insulation of new steam pipe construction installed during 1922 and 1923 to distribute steam from new boiler plant at East Ithaca to main campus of Cornell Univ. and to campus of N. Y. State College of Agriculture.

STEAM POWER PLANTS

Combined Heating and. Combining Heating and Steam Power Plants (Die Verbindung von Heizung mit Dampfkraftanlagen), Pauer. Gesundheits-Ingenieur, vol. 47, no. 52, Dec. 27, 1924, pp. 619-624, 5 figs. Discusses separate development of power plant and heating plant, combined power and heat production, suitability of heating systems for combining with power plants.

Combined Oil-Engine and. Cheap Power in Combined Steam and Oil Engine Plant. Power, vol. 61, no. 1, Mar. 17, 1925, pp. 404-405, 5 figs. A kilowatt-hour for 10,032, B.t.u. yearly average at Doubleday, Page & Co.'s plant; output of steam engines balanced with heating demand; Diesel engines carry major part of load.

Diesel-Engined. World's Largest Diesel Engined Cement Mill. Oil Engine Power, vol. 3, no. 2, Feb. 1925, pp. 90-94, 3 figs. Continuous operation shows graphically what can be done with oil engines even in face of trying conditions; details of Diesel-electric power station at Iola, Kan., furnishing power for Lehigh Portland Cement Co.'s mill.

T

TUBES

Brass and Copper. The Manufacture of Brass and Copper Tubes, G. Evans. Metal Industry (Lond.), vol. 26, nos. 6 and 8, Feb. 6 and 20, 1925, pp. 127-130 and 133, 13 figs., and 177-179, 6 figs. Feb. 6: Drawing bars, dies, and auxiliary tools. Feb. 20: Discusses modern types of annealing furnaces and charging devices, and means of handling tubes between annealing department and pickling vats.

TUNNELING

Air-Pressure Driving. Driving a Small Tunnel Under Air Pressure at Seattle. Eng. News-Rec., vol 94, no. 10, Mar. 5, 1925, pp. 401-402, 2 figs. Air loss of 4000 cu. ft. per min. while driving 8-ft tunnel under 25-lb. air pressure through wet sand.

TUNNELS

Concreting Lining. Placing Concrete Lining in the Hetch Hetchy Tunnels, W. F. Webb. Eng. News-Rec., vol. 94, no. 9, Feb. 26, 1925, pp. 350-353, 6 figs. Mixer and pneumatic gun is one self-contained unit which moves along track; wood arch forms used; belt conveyors deliver concrete materials; crew has advanced 4000 ft. in month.

V

VACUUM TUBES

Thermionic Tubes. The Inter-Electrode Capacities of Thermionic Valves, L. Hartshorn and T. I. Jones. Experimental Wireless, vol. 2, no. 17, Feb. 1925, pp. 263-273, 11 figs. Importance in some instances of frequently-ignored capacities between grid and filament of valves. Method of measurement.

VALVES

Penstock. 21-Ft. Larner-Johnson Penstock Valves. Engineering, vol. 119, no. 3089, Mar. 13, 1925, pp. 330-331, 5 figs. Valves, installed at power station of Niagara Falls Power Co., have overall length of 30 ft. and maximum diam. of 25 ft. 9 in.

VAPORS

Temperature Above Boiling Solutions. Temperature of Vapor Above Boiling Salt Solutions. Chem. & Met. Eng., vol. 32, no. 8, Feb. 23, 1925, pp. 327-329, 1 fig. Triangular discussion of article by K. Schreber, translation of which was published in Aug. 25, 1924, issue of same journal; Schreber concludes that vapor temperature is same as that of pure boiling solvent, and not that of boiling salt solution; W. H. Bahlke and R. E. Wilson give experimental evidence controverting Schreber's work; G. Harker believes that vapor has same temperature as boiling solution; W. L. Badger considers Schreber's technique better than that of Harker.

VIBRATIONS

Elimination of. Eliminating Vibration and Noise, Rob. B. Grey. Power Engr., vol. 29, no. 228, Mar. 1925, pp. 100-102, 5 figs. Methods which have been found satisfactory in practice.

Vibrograph for Measuring. The Cambridge Vibrograph. Engineering, vol. 119, no. 3087, Feb. 27, 1925, pp. 271-272, 5 figs. Instrument is small robust form of seismograph for measuring vibration of ground and of buildings, bridges and other structures.

VISCOSIMETERS

Saybolt Thermo. Measurement of Absolute Viscosity of Light Distillates with the Saybolt Thermo-Viscosimeter, A. R. Fortsch and Rob. E. Wilson. Indus. & Eng. Chem., vol. 17, no. 3, Mar. 1925, pp. 291-293, 2 figs. By measuring both absolute viscosity and thermo-viscosity of number of light petroleum fractions satisfactory calibration curve applying to such oils was obtained and is presented; means are suggested by which operation of Saybolt thermo-viscometer can be so changed as to give reliable readings on all liquids regardless of capillary rise.

W

WATER SOFTENING

Zeolites for. Characteristic Properties of Zeolites for Water Softening, S. B. Applebaum. Am. Water Wks. Assn.—Jl., vol. 13, no. 2, Feb. 1925, pp. 213-220. "Zeolites" and "base-exchange silicates" are synonymous; previous attempts at classification that have failed; proposed classification; how arrangement of contact surfaces affects other properties of zeolites; rate of softening and regeneration; salt requirements; field of application of porous and non-porous zeolites.

WATER SUPPLY

Tests, Bacteriological. Disturbing Factors in the Presumptive Test for B. Coli, G. B. Leitch. Am. Water Wks. Assn.—Jl., vol. 13, no. 2, Feb. 1925, pp. 186-192. Particulars of investigation carried out which shows that organisms capable of producing gas symbiotically from lactose broth occur widely distributed in nature and in locations from which they can readily enter a water supply, and that samples of water negative for B. coli but giving a positive presumptive test actually contained gas producing symbiotic groups.

WATER TREATMENT

Chlorination. Readjustment of Present Orthotolidin Standards for Chlorine, H. F. Muer and F. E. Hale. Am. Water Wks. Assn.—Jl., vol. 13, no. 1, Jan. 1925, pp. 50-69, 4 figs. Investigates Ellms and Hauser colorimetric method of testing water for free chlorine with orthotolidin as reagent, and gives results of experiments.

Hydrogen-Ion Concentration. Hydrogen Ion Concentration and Water Purification at Cedar Rapids, Iowa, F. C. Mortensen. Am. Water Wks. Assn.—Jl., vol. 13, no. 1, Jan. 1925, pp. 33-38. Colloid in surface water; bacteria are colloidal; removal of colloids; the isoelectric point.

WATT-HOUR METERS

Temperature Errors in. Temperature Errors in Induction Watthour Meters, I. F. Kinnard and H. T. Faus. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 3, Mar. 1925, pp. 241-248. 17 figs. Analysis and development of temperature-sensitive magnetic material, known as thermalloy, suitable for compensation; includes appendix describing novel, magnetic thermometer utilizing thermalloy.

WELDING

Electric. *See Electric Welding, Arc.*

Oxy-Acetylene. *See Oxy-Acetylene Welding.*

WIND POWER

Economical Utilization of. The Economic Utilization of Wind Power (Die wirtschaftliche Ausnutnung der Windenergie), H. Hullen. Zeit. des Vereines deutscher Ingenieure, vol. 69, no. 6, Jan. 31, 1925, pp. 132-133, 4 figs. Conditions under which wind power can be economically utilized to greater extent than at present; empirical formula is given for determination of working efficiency of given wind intensity.

WIND TUNNELS

Use to Aircraft Designers. The Use of the Wind Channel to Aircraft Designers. Roy. Aeronautical Soc.—Jl., vol. 29, no. 170, Feb. 1925, pp. 93-99. Technical discussion.

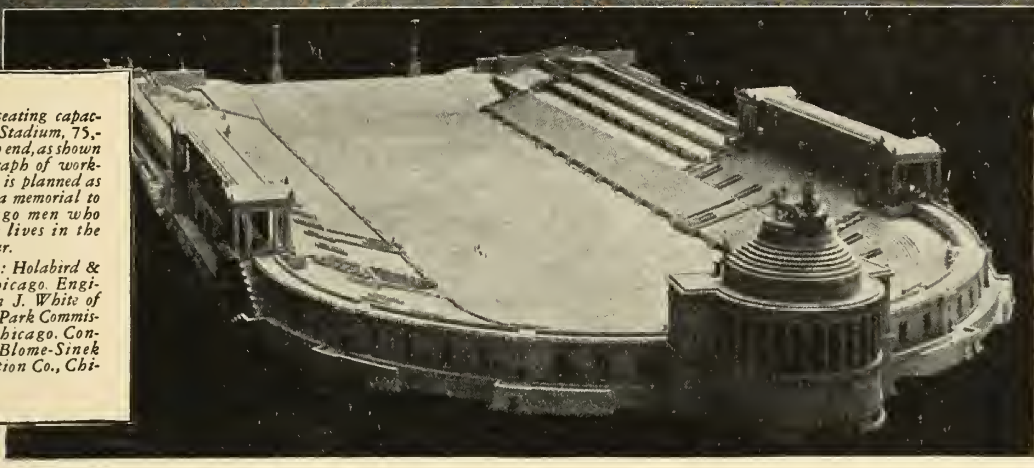
WINDMILLS

Electrical Converters for. Electrical Converters for the Utilization of the Wind Power (Elektrisk Omformermaskineri til Udnyttelse af Vindkraften), A. Larsen. Ingeniören, vol. 33, no. 49, Dec. 6, 1924, pp. 567-572, 2 figs. In order to obtain maximum power output from a windmill it is necessary to vary speed in same proportion as speed of wind changes; load on mill should change with third power of said speed; certain electrical arrangements produce an automatic change of power output of windmill in said proportion and are used for purpose of securing said maximum power output of windmill. Diagrams of connections, and results of successful tests.

Principle of Operation. Principle of Operation of a Windmill (Betragtninger over en Vindmotors Arbejdsvene), A. Larsen. Ingeniören, vol. 33, no. 50, Dec. 13, 1924, pp. 579-585, 9 figs. Torques of a windmill for various speeds of rotation and for various values of strength of wind are given in number of diagrams. Operation may be arranged for constant speed or speed of windmills may be varied with strength of wind so as always to obtain maximum output.

WIRE

Steel. Steel Wire Manufacture in Britain, E. A. Atkins. Welding Engr., vol. 10, no. 1, Jan. 1925, pp. 23-25 and 39-41, 19 figs. Survey of various methods of making wire; properties and uses of wire in welding industry. Paper read before Instn. Welding Engrs.



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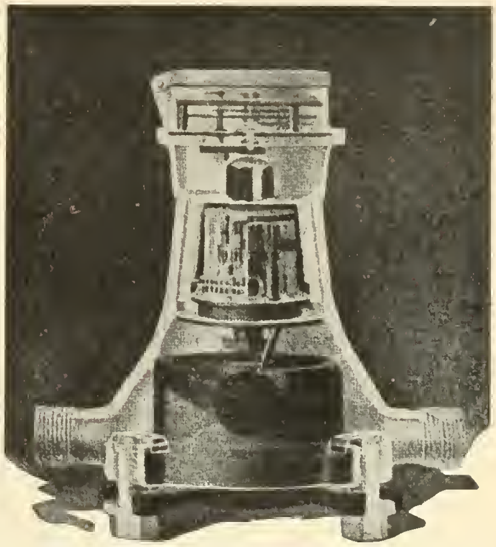

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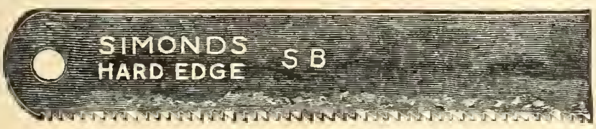

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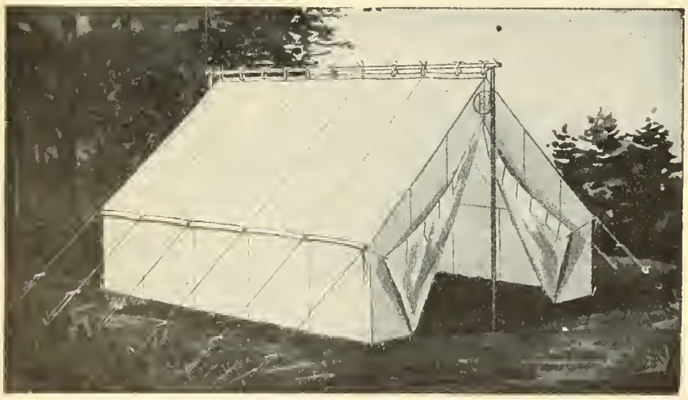

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A Selected List of Equipment, Apparatus and Supplies

For Alphabetical List of Advertisers see page 50

A

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O

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P

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Pipes, Reinforced Concrete:
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Pipes, Wrought Iron:
Crane Ltd.
Planing Machines, Metal:
John Bertram & Sons Co., Ltd.,
Plate and tank works.
Horton Steel Works, Ltd.
Plate Rolls:
John Bertram & Sons Co., Ltd.,
Plates, Brass and Copper:
Openshaw & Bennet, Ltd.
Plates, Steel:
British Empire Steel Corp., Ltd.
Hamilton Bridge Works Co., Ltd.
Vickers & Combustion Engineering, Ltd
Vulcan Iron Works, Ltd.
Plumbing Material:
Crane Ltd.
Pole Line Hardware:
Canadian Line Materials, Ltd
Posts, Indicator:
Jenkins Bros., Ltd.
Porcelain, Insulators:
Dominion Insulator & Mfg. Co., Ltd.
Power Apparatus:
Northern Electric Co., Ltd
Power Plant Equipment:
Babcock-Wilcox & Goldie-McCulloch Ltd.
Riley Engineering and Supply Co., Ltd.
Vickers & Combustion Engineering, Ltd.

Purchaser's Classified Directory

Presses, Hydraulic:
John Bertram & Sons Co., Ltd.
Pressure Tanks:
Horton Steel Works, Ltd.
Propellor Wheels:
Vickers & Combustion Engineering, Ltd.
Wm. Kennedy & Sons, Ltd.
Pulp Mill Machinery:
Dominion Engineering Works, Ltd.
William Hamilton Co., Ltd.
Pulp Pumps:
De Laval Steam Turbine Co.
Pulpwood Machinery:
Wm. Hamilton Co. Ltd.
Vickers & Combustion Engineering, Ltd.
Pulverized Fuel Systems:
Riley Engineering & Supply Co. Ltd.
Vickers & Combustion Engineering, Ltd.
Pump Governors:
C. A. Dunham Co., Ltd.
Riley Engineering & Supply Co. Ltd.
Pump Valves:
Jenkins Bros., Ltd.
Pumps:
Canadian Fairbanks-Morse Co., Ltd.
Dominion Engineering Works, Ltd.
General Supply Co., of Canada, Ltd.
Jones & Glassco, Reg'd.
Mussens Limited.
Pumps and Condensers:
Babcock-Wilcox & Goldie-McCulloch Ltd.
Pumps, Centrifugal:
De Laval Steam Turbine Co.
Dominion Engineering Works, Ltd.
Laurie & Lamb.
Pumps, Hydraulic:
Taylor Stoker Co., Ltd.
Pumps Oil:
Taylor Stoker Co., Ltd.
Punches and Punch Dies:
Pratt & Whitney Company of Canada, Ltd.
Punches and Shears:
John Bertram & Sons Co., Ltd.

R

Radiator Traps:
Canadian Johns-Manville Co., Ltd.
Radiator Valves:
Jenkins Bros., Ltd.
Radio Receiving Sets:
Northern Electric Co., Ltd.
Rail Bonds:
Dominion Insulator & Mfg., Co. Ltd.
Rail Joints:
Rail Joint Co., of Canada, Ltd.
Rails:
Algoma Steel Corp., Ltd.
British Empire Steel Corp., Ltd.
Burlington Steel Co., Ltd.
F. H. Hopkins & Co., Ltd.
Steel Co. of Canada, Ltd.
Railroad Spikes:
Steel Co., of Canada, Ltd.
Railway Equipment:
Canadian General Electric Co., Ltd.
Rawhide Pinions:
Hamilton Gear & Machine Co.
Rawlplugs:
Dominion Engineering Agency Ltd.
Reamers:
Pratt & Whitney Co., of Canada, Ltd.
Recording Instruments:
Vickers & Combustion Engineering, Ltd.
Refrigerating Machinery:
Taylor Stoker Co., Ltd.
Reinforcing Steel:
Burlington Steel Co., Ltd.
Trussed Concrete Steel Co., of Canada, Ltd.
Rivets:
British Empire Steel Corp., Ltd.
Road Oils & Preservatives:
Barrett Co., Ltd.
Road Rollers:
Dominion Insulator & Mfg. Co. Ltd.
Mussens Limited.
Rock Drills, Air and Steam:
Lancashire Dynamo and Motor Co., of Can. Ltd.
Rods, Steel:
British Empire Steel Corp., Ltd.
Roofing, Prepared:
Barrett Co., Ltd.
Roofs, Built up, Felt & Pitch:
Barrett Co., Ltd.
Roofing, Asbestos and Prepared:
Canadian Johns-Manville Co., Ltd.
Roofs, Asbestos Built up:
Canadian Johns-Manville Co., Ltd.
Roofing, Asbestos Ready-to-lay:
Canadian Johns-Manville Co., Ltd.
Roofing, Corrugated Asbestos:
Canadian Johns-Manville Co., Ltd.
Rope, Wire:
Dominion Wire Rope Co., Ltd.
Mussens Limited.
Rubber Goods, Mechanical:
Jenkins Bros., Ltd.

S

Safes:
Babcock-Wilcox & Goldie-McCulloch Co., Ltd.
Sash, Steel:
Trussed Concrete Steel Co., of Canada, Ltd.
Sawmill Chains:
Link-Belt Ltd.
Sawmill Machinery:
William Hamilton Co., Ltd.
Saws:
Simonds Canada Saw Co. Ltd.
Scales:
Canadian Fairbanks-Morse Co. Ltd.
Screening Equipment:
Link-Belt, Ltd.
Mussens Limited
Vickers & Combustion Engineering, Ltd.
Screw Blanks, Lead:
Cumberland Steel Co.
Separators — Steam, etc.:
Riley Engineering and Supply Co., Ltd.
Sewer Pipe:
Jno. E. Russell Co., Ltd.
Shaft Couplings, Flexible:
De Laval Steam Turbine Co.
Shafting, Cold Drawn:
Cumberland Steel Co.
Sheathing:
Barrett Co., Ltd.
Sheets:
Steel Co., of Canada Ltd.
Shingles, Asbestos:
Canadian Johns-Manville Co., Ltd.
Shingles, Prepared Asphalt:
Barrett Co., Ltd.
Skip Hoists:
Link-Belt Ltd.
Mussens Limited.
Vickers & Combustion Engineering, Ltd.
Sleeping Robes:
Grant-Holden-Graham, Ltd.
Smoke Stacks:
Wm. Hamilton Co. Ltd.
Horton Steel Works, Ltd.
Vickers & Combustion Engineering, Ltd.
Sodas:
Nichols Chemical Co., Ltd.
Soot Blowers:
Riley Engineering and Supply Co., Ltd.
Speed Reducers, Gear:
Hamilton Gear & Machine, Co.
Spikes:
British Empire Steel Corp., Ltd.
Springs:
B. J. Coghlin Co., Ltd.
Sprinkler Tanks:
Horton Steel Works, Ltd.
Stacks:
Horton Steel Works, Ltd.
Stair Steps, Safety:
Irving Iron Works Co.
Staples:
British Empire Steel Corp., Ltd.
Steam Heating Specialties:
C. A. Dunham Co., Ltd.
Steam Joints, Flexible:
Riley Engineering and Supply Co., Ltd.
Steam Shovels:
F. H. Hopkins & Co., Ltd.
Mussens, Ltd.
Steam Traps:
C. A. Dunham Co., Ltd.
Canadian Johns-Manville Co., Ltd.
Steel, Ground Alloy:
Cumberland Steel Co.
Steel Head Frames:
Hamilton Bridge Works Co., Ltd.
Steel Pipe:
Horton Steel Works, Ltd.
Steel Plate Construction:
Horton Steel Works, Ltd.
Steel Sash:
Can. Metal Window & Steel Products, Ltd.
Steel Shafting:
Cumberland Steel Co.
Steel storage tanks:
Horton Steel Works, Ltd.
Stokers:
Riley Engineering & Supply Co. Ltd.
Vickers & Combustion Engineering, Ltd.
Stokers, Side-feed:
Riley Engineering & Supply Co. Ltd.
Vickers & Combustion Engineering, Ltd.
Stokers, Under-feed:
Taylor Stoker Co., Ltd.
Riley Engineering & Supply Co. Ltd.
Vickers & Combustion Engineering, Ltd.
Stone Crushers:
General Supply Co., of Canada, Ltd.
Mussens Limited.
Structural Steel:
Algoma Steel Corporation, Ltd.
British Empire Steel Corp., Ltd.
Canadian Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.
Standard Steel Constrn. Co., Ltd.
Steel Co. of Canada, Ltd.
Vickers & Combustion Engineering, Ltd.
Vulcan Iron Works, Ltd.
Superheaters:
General Supply Co., of Canada, Ltd.
Superheater Co., Ltd.
Switches, Disconnecting:
Canadian Line Materials, Ltd.
Switchboards, Power Lighting:
Canadian General Electric Co., Ltd.
Canadian Johns-Manville Co., Ltd.
Switchgears:
Lancashire Dynamo and Motor Co. of Can. Ltd.

T

Tanks:
Horton Steel Works, Ltd.
Wm. Hamilton Co. Ltd.
Tanks, acid:
Horton Steel Works, Ltd.
Tanks, cyanide, etc.:
Horton Steel Works, Ltd.
Tanks, Cylindrical:
Horton Steel Works, Ltd.
Tanks, elevated steel:
Horton Steel Works, Ltd.
Tanks, iron and steel:
Horton Steel Works, Ltd.
Tanks, lead lined:
Horton Steel Works, Ltd.
Tanks, Oil:
Horton Steel Works, Ltd.
Tanks, Steel:
Horton Steel Works, Ltd.
E. Leonard & Sons, Ltd.
Vickers & Combustion Engineering, Ltd.
Tanks, Wood Stave:
Pacific Coast Pipe Co., Ltd.
Taps:
Pratt & Whitney Co., of Canada, Ltd
Tar:
Barrett .Co., Ltd.
Tents:
Grant-Holden-Graham, Ltd.
Tie Plates:
British Empire Steel Corp., Ltd.
Tools, Small:
Pratt & Whitney Co., of Canada. Ltd.
E. Leonard & Sons, Ltd.
Towers:
Horton Steel Works, Ltd.
Track Tools:
B. J. Coghlin Co., Ltd.
Tractors:
Mussens Limited
F. H. Hopkins & Co., Ltd.
Transformers, Lighting & Power:
Canadian General Electric Co., Ltd.
Transmission Machinery:
Wm. Hamilton Co. Ltd.
Link-Belt Ltd.
Trolley Materials:
Dominion Insulator & Mfg. Co., Ltd.
Tubing, Seamless Steel:
Openshaw & Bennet Ltd.
Turbines Hydraulic:
Boving Hydraulic & Engineering Co., Ltd.
Dominion Engineering Works, Ltd.
General Supply Co., of Canada, Ltd.
Wm. Hamilton Co. Ltd.
Vickers & Combustion Engineering, Ltd.
Turbines, Steam:
De Laval Steam Turbine Co.
Turbo Generators:
De Laval Steam Turbine Co.

U

Under-feed Stokers:
Riley Engineering and Supply Co., Ltd.
Taylor Stoker Co., Ltd.
Vickers & Combustion Engineering, Ltd.
Union Pipe Couplings:
Dart Union Co., Ltd.

V

Valve Boxes:
Jenkins Bros., Ltd.
Valve Files:
Jenkins Bros., Ltd.
Varnishes, Acid Resisting:
Dominion Paint Works, Ltd.
Varnishes, Insulating:
Dominion Paint Works, Ltd.
Valves:
Canadian Fairbanks-Morse Co., Ltd.
Crane Limited.
C. A. Dunham Co., Ltd.
Dominion Engineering Works, Ltd.
Jenkins Bros., Ltd.
Kerr Engine Co., Ltd.
Valves, Automatic Cut-off:
Riley Engineering & Supply Co. Ltd.
Valves, High Pressure Air:
Knox Mfg. Co.
Riley Engineering and Supply Co., Ltd.
Valves, Oiler:
Knox Mfg. Co.
Valves, Penstock:
Dominion Engineering Works, Ltd.
Valves, Regulating:
C. A. Dunham Co., Ltd.
Riley Engineering & Supply Co. Ltd.
Valves, Relief:
Riley Engineering & Supply Co. Ltd.
Valves, Rock Drill:
Knox Mfg. Co.
Valves, Steam Throttle:
Knox Mfg. Co.
Valves, Throttle:
Knox Mfg. Co.
Venturi Meters:
General Supply Co., of Canada, Ltd.

W

Washers:
British Empire Steel Corp., Ltd.
Water Meters:
Neptune Meter Co., Ltd.
Water Meters, Volumetric:
Canadian Johns-Manville Co., Ltd.
Water Power Plant Machinery:
Wm. Kennedy & Sons, Ltd.
Vickers & Combustion Engineering, Ltd.
Waterproofing:
Barrett Co., Ltd.
Canadian Johns-Manville Co., Ltd.
Water Softening Plants:
Laurie & Lamb.
Water tanks:
Horton Steel Works, Ltd.
Waterworks Constructional Articles:
Lincoln Electric Co., of Canada, Ltd.
Welding Machines, Electric and Accessories:
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Canadian Westinghouse Co., Ltd
Dominion Insulator & Mfg., Co., Ltd.
Lincoln Electric Co., of Canada, Ltd.
Wheelbarrows:
Bateman-Wilkinson.
Winches:
Wm. Hamilton Co. Ltd.
Taylor Stoker Co., Ltd.
Wire:
British Empire Steel Corp., Ltd.
Steel Co., of Canada, Limited.
Wire Mesh:
Trussed Concrete Steel Co., of Canada, Ltd.
Wire Rope:
Dominion Wire Rope Co., Ltd.
F. H. Hopkins & Co., Ltd.
Wires and Cables:
Northern Electric Co., Ltd.
Wood Preservations:
Barrett Co., Ltd.
Woodruff Key Cutters:
Pratt & Whitney Company of Canada, Ltd.
Worm Gear:
Hamilton Gear & Machine Co.
Link-Belt Ltd.
Worm Reduction Gears:
De Laval Steam Turbine Co.

Consult the advertiser, his information is valuable.

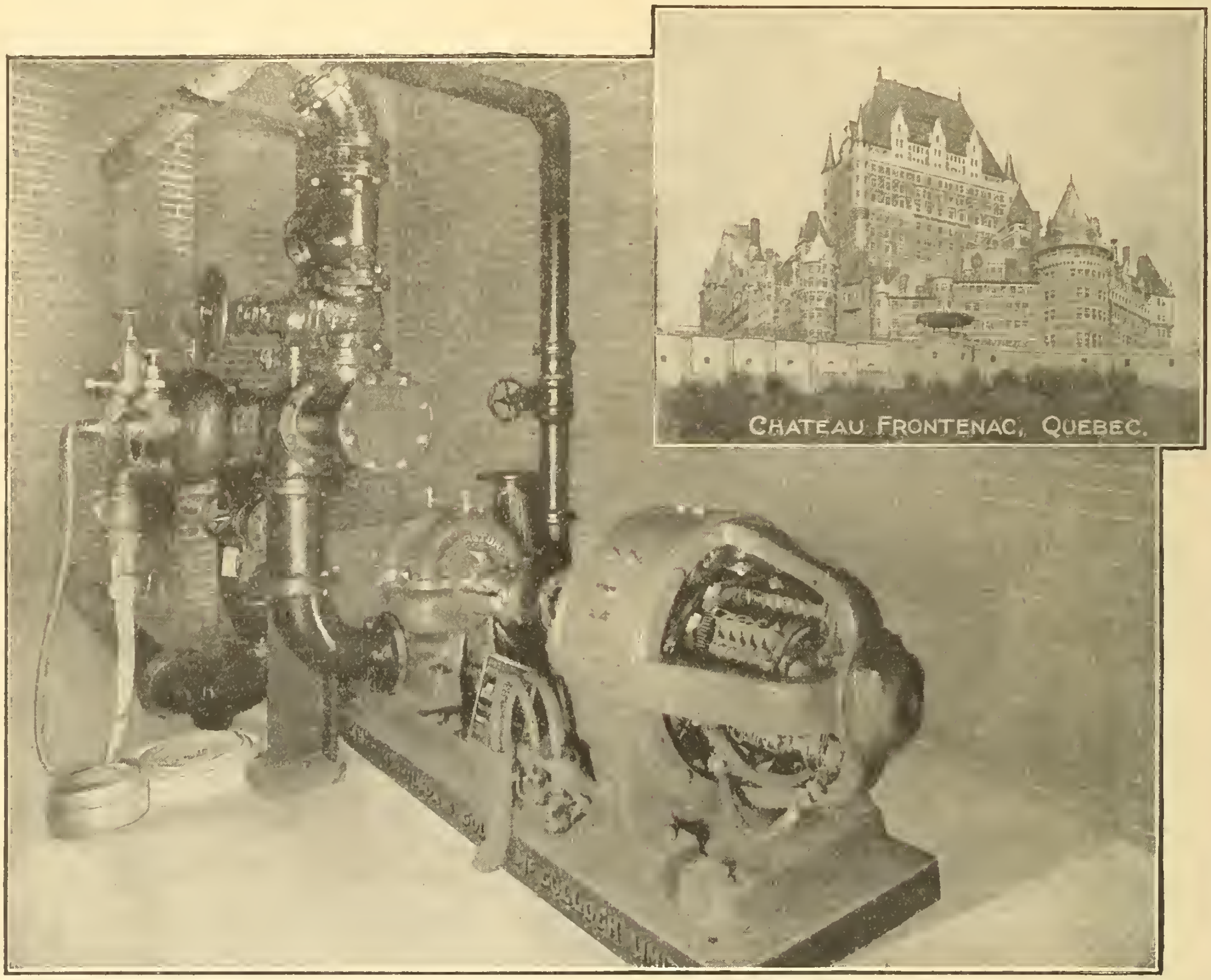
INDEX TO ADVERTISERS

Members are urged to consult The Journal's advertising pages.

PROFESSIONAL CARDS

THE REES RoTURBo

A Centrifugal Pump for Any Service



CHATEAU FRONTENAC, QUEBEC.

Illustration shows the two stage Volute Type Underwriters Centrifugal Fire Pump recently installed by us at the Chateau Frontenac, Quebec. Delivering 100 gals. per min. at 130 lbs. pressure, supplying four 1⅛″ streams, taking water from City Mains and developing a pressure sufficient for good Fire Streams at the top story of the hotel. The characteristic of this pump is such that it will deliver 1,500 gals. at 95 lbs. pressure taking approximatively the same power as that taken at Normal Duty.

Catalogues, specifications, prices and engineering advice on request.

Babcock-Wilcox and Goldie-McCulloch, Limited

HEAD OFFICE AND WORKS, GALT, ONTARIO, CANADA

TORONTO OFFICE:
1101-3 Bank of Hamilton Bldg.

OTTAWA OFFICE:
185 Sparks St.

EASTERN BRANCH:
College St., St. Henry, Montreal, Que.

WESTERN BRANCH:
248 McDermott Ave., Winnipeg, Man.

MARITIME OFFICE:
406 Maritime Bldg.,
New Glasgow, N.S.

BRITISH COLUMBIA AGENTS:
Chas. C. Moore & Co., Engineers,
Standard Bank Bldg., Vancouver, B.C.

THE ENGINEERING JOURNAL

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

"TO FACILITATE THE ACQUIREMENT AND INTERCHANGE OF PROFESSIONAL KNOWLEDGE AMONG ITS MEMBERS, TO PROMOTE THEIR PROFESSIONAL INTERESTS, TO ENCOURAGE ORIGINAL RESEARCH, TO DEVELOP AND MAINTAIN HIGH STANDARDS IN THE ENGINEERING PROFESSION AND TO ENHANCE THE USEFULNESS OF THE PROFESSION TO THE PUBLIC"

THE ENGINEERING INSTITUTE OF CANADA FOUNDED 1887

JUNE 1925

PUBLISHED MONTHLY BY THE ENGINEERING INSTITUTE OF CANADA

AT 176 MANSFIELD STREET, MONTREAL

ol. VIII No. 6

When You Want "Big"
SMALL TOOLS

WHEN small tools of larger size than ordinary are wanted, let PRATT & WHITNEY make them

We make taps $\frac{1}{16}$ in. diameter for instrument work or 4 in. and 6 in. diameter for heavy structural work — AND ALL SIZES IN BETWEEN.

We can give you tiny end mills, $\frac{1}{8}$ in. diameter or inserted blade cutters as large as 24 in. or 36 in. diameter — AND ALL SIZES IN BETWEEN.

All made with the same care and relative degree of precision.

P. & W. Small Tools cover all requirements for machine shops, automobile plants, boiler shops, railroad shops, shipyards, steel mills. They're made in infinite variety, for every purpose both standard and special.

Among our recent developments are spiral-fluted formed (Curvex) Cutters, Curvex Hobs for milling thread rolling dies, Spiral Pointed Taps, and Spiral Fluted Expansion Hand Reamers.

Have you a copy of our Small Tool Catalogue?

PRATT & WHITNEY CO.,

of Canada, Limited

Works: Dundas, Ontario

MONTREAL
723 Drummond Bldg.
WALKERVILLE
103½ Sandwich St.
TORONTO
32 Front St. West.

HALIFAX
Roy Building.
WINNIPEG
1205 McArthur Bldg.
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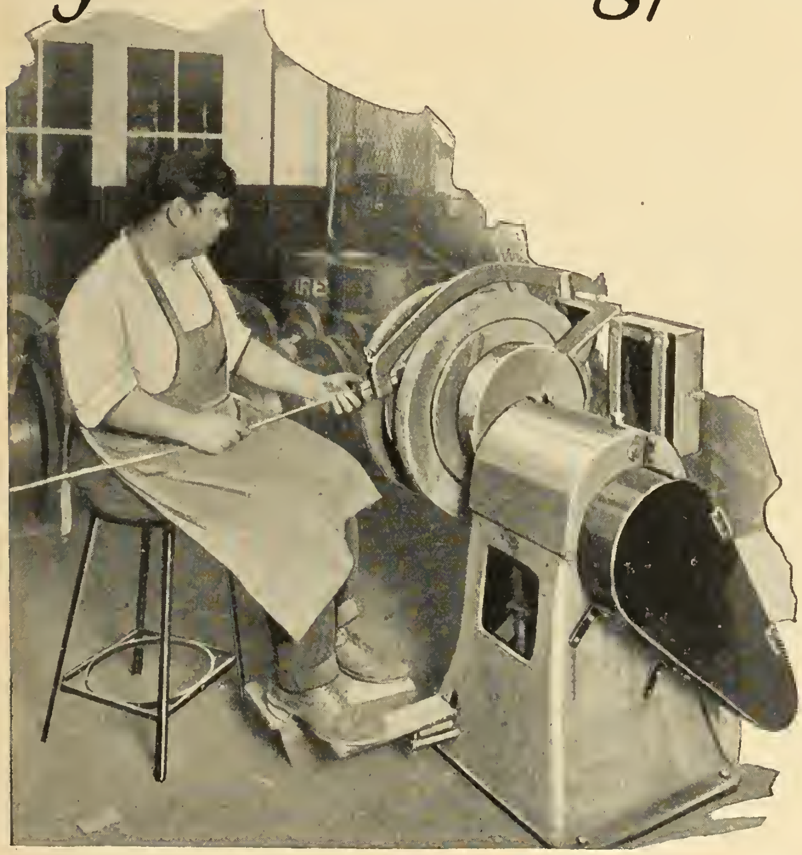
B.C. Equipment Co.

PRATT & WHITNEY

SLIVERS!

COPPER SLIVERS AND COPPER DUST REMOVED DURING INSPECTION OF 150 LBS OF (.400 x .100) HALF ROUND WIRE

"The Conductor for Type H. Form K Transformers is cleaned and inspected before insulating"



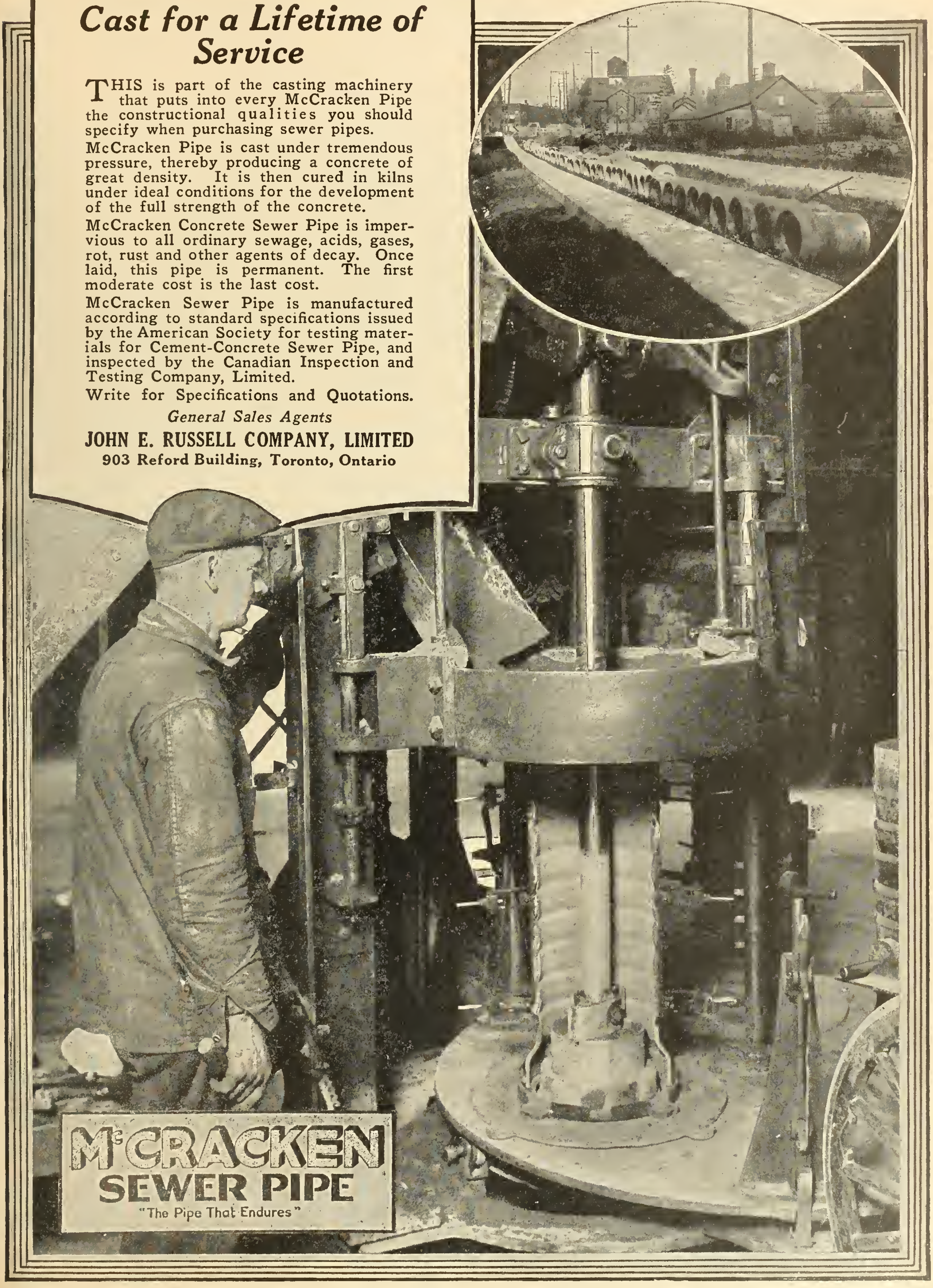
THE bare copper wire is passed through a wiping device, which removes dust and slivers. A rigid inspection is also made to see that the conductor is mechanically perfect before insulating.

The durability of the Type H Form K Transformer is greatly increased by the elimination of slivers and burs, which would project through the insulation and cause a short circuit between turns, with a consequent break-down.

Type H Form K Transformers

A Canadian General Electric Product

Combined Storm and Sanitary Sewer being laid at Campbellford, Ont.



Cast for a Lifetime of Service

THIS is part of the casting machinery that puts into every McCracken Pipe the constructional qualities you should specify when purchasing sewer pipes.

McCracken Pipe is cast under tremendous pressure, thereby producing a concrete of great density. It is then cured in kilns under ideal conditions for the development of the full strength of the concrete.

McCracken Concrete Sewer Pipe is impervious to all ordinary sewage, acids, gases, rot, rust and other agents of decay. Once laid, this pipe is permanent. The first moderate cost is the last cost.

McCracken Sewer Pipe is manufactured according to standard specifications issued by the American Society for testing materials for Cement-Concrete Sewer Pipe, and inspected by the Canadian Inspection and Testing Company, Limited.

Write for Specifications and Quotations.

General Sales Agents

JOHN E. RUSSELL COMPANY, LIMITED

903 Reford Building, Toronto, Ontario

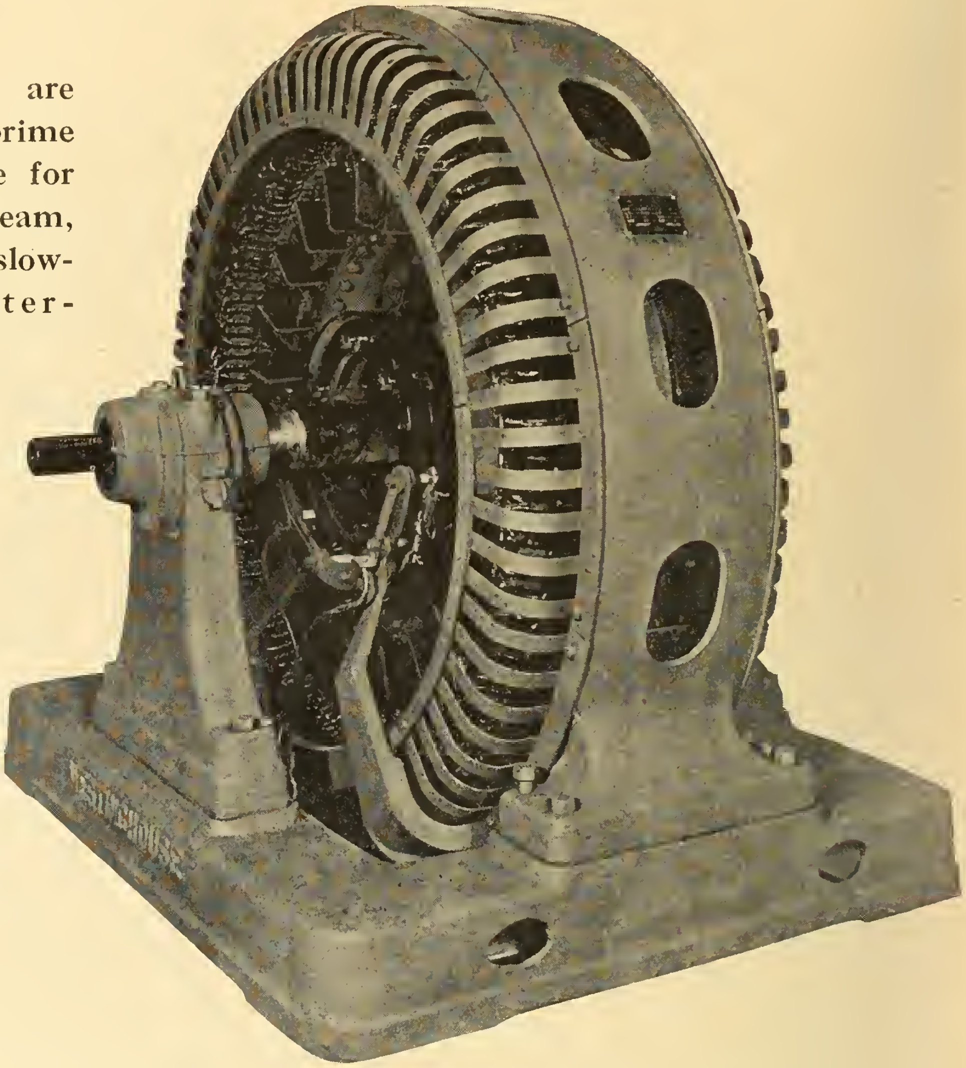
Alternating-Current Generators

Capacities 50 to 3000 kv-a.

These generators are applicable to all prime movers, being suitable for direct connection to steam, gas or oil engines, or slow-speed horizontal water-wheels.

Westinghouse Type E Generators are highly efficient at all loads.

They are sturdy in construction and built for many years of service, and are economical to operate and maintain.



Type E Alternating-Current Generator.

Canadian Westinghouse Company, Limited
Hamilton, Ontario

TORONTO, Bank of Hamilton Bldg.
HALIFAX, 105 Hollis Street
CALGARY, 320 Eight Ave. West

MONTREAL, 285 Beaver Hall Hill
FORT WILLIAM, Cuthbertson Block
VANCOUVER, Bk. of Nova Scotia Bldg.
LONDON, Dominion Saving Bank Bldg.

OTTAWA, Ahearn & Soper Ltd.
WINNIPEG, 158 Portage Ave. E.
EDMONTON, 211 McLeod Bldg.

Repair Sops:

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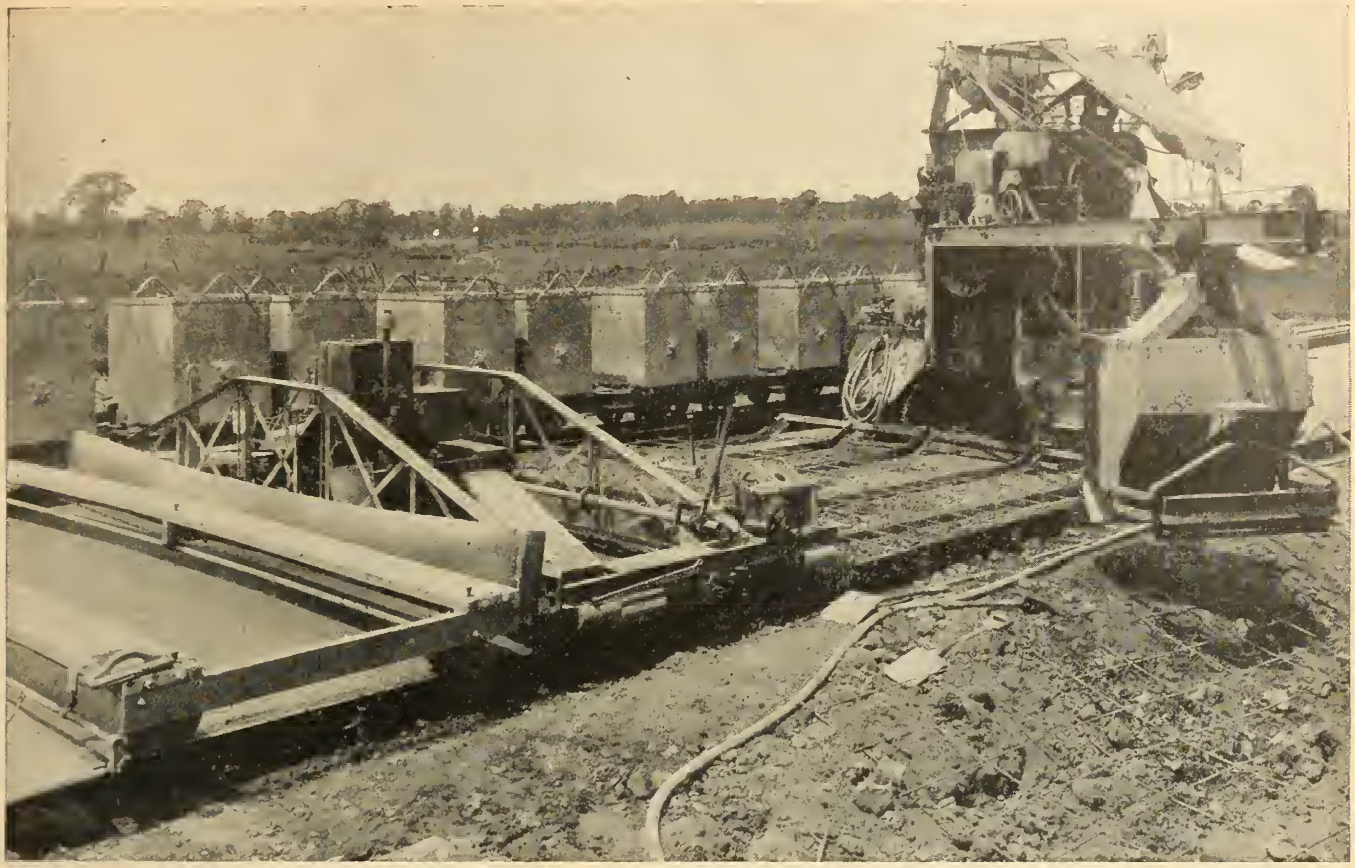
WINNIPEG—158 Portage Ave. East

VANCOUVER—1090 Mainland St.

TORONTO—366 Adelaide St. West
CALGARY—320 Eighth Ave. West

CANADIAN WESTINGHOUSE

Westinghouse

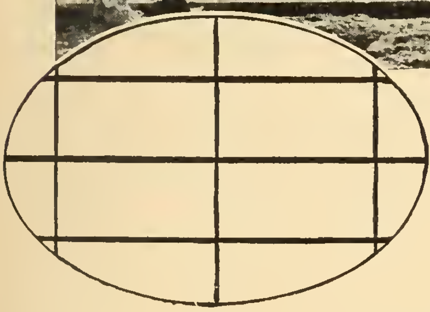


Protection for the Public's Road Investment

Good roads for modern motor traffic represent a great public asset, — one which deserves the best protection that can be secured. Truscon Wire Mesh has been scientifically designed to reinforce concrete road slabs. It is a steel fabric which gives the road maximum resistance to stresses of all sorts and prevents deterioration from weather changes.

The steel cross members of Truscon Wire Mesh bind the concrete into integral slabs that will not break up. The serviceable character of the new road is preserved indefinitely. The initial cost is low, use is simple, long life and low maintenance are assured.

Write for full information



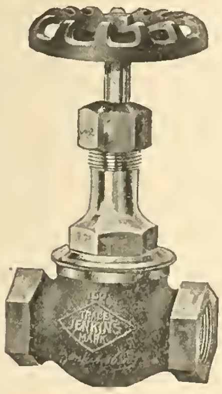
Truscon Wire Mesh can be had in convenient flat sheets cut to roadsize for easy application.

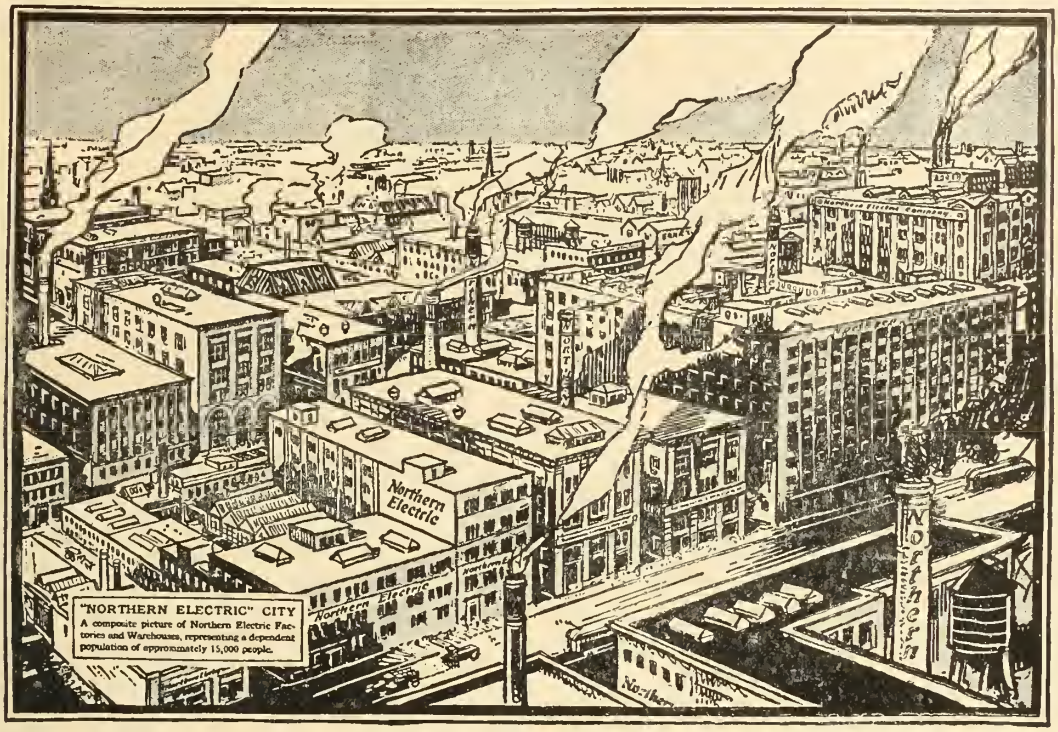
TRUSSED CONCRETE STEEL COMPANY
of Canada Limited, - Walkerville, Ontario

Branch Offices in Montreal, Toronto, Winnipeg, Calgary and Vancouver

TRUSCON WIRE MESH

TRUSCON STEEL CO





A City with a dependent population of

15,000

STREET after street of busy factories and warehouses — thousands upon thousands of workers and their dependents . . . mile after mile of railroad sidings . . . a city of industry solely devoted to the manufacture of things electrical.

That is "Northern Electric" City.

Of course, it does not exist just that way, but, were it possible to assemble in one place all the factories and warehouses of this great Canadian industry, that is what we would have.

In the background would be a city of homes for the Northern Electric workers and their families. There would be stores . . . and shops to serve them . . . theatres to entertain them. A good-sized bank would be needed to hold the employees' savings.

The nation's telephones and telephone equipment would be made in that City. So would the nation's electric cables and telephone wires. Thousands of the nation's radio sets would claim it as their home. It would be the source of Canada's electrical necessities, its conveniences and its aids.

"Northern Electric City" would be a monument to the pertinacity of those men who had faith in Canada, who were sincere in their endeavour to serve their country by developing its industries along broad and progressive lines.

Northern Electric

Makers of Canada's Telephones

The Name on the phone NORTHERN ELECTRIC

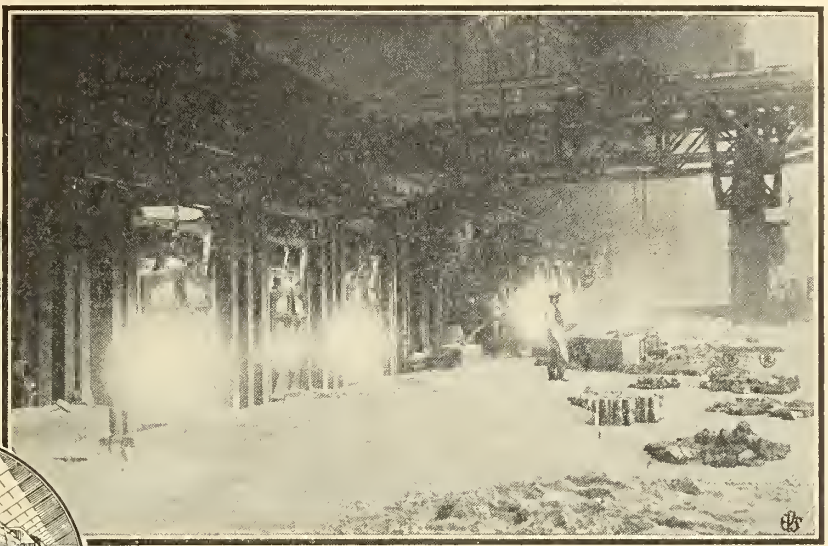
101M

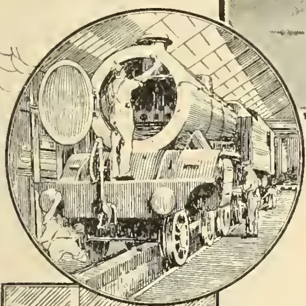
No. 1 of a series of Advertisements issued by one of Canada's Greatest Electrical Organizations.

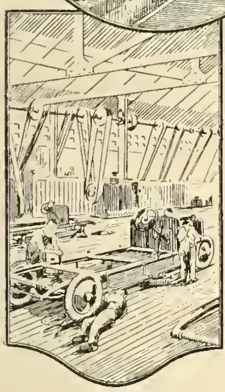
NORTHERN ELECTRIC COMPANY LIMITED — *Head Office and Factories:* MONTREAL

Branch Offices in Canada MONTREAL HALIFAX QUEBEC OTTAWA TORONTO HAMILTON LONDON WINDSOR WINNIPEG REGINA CALGARY VANCOUVER

ARMSTRONG·WHITWORTH







SHIPS
MARINE ENGINES
LOCOMOTIVES
MACHINE TOOLS
FORGINGS CASTINGS
NON FERROUS PRODUCTS
DROP STAMPINGS
HIGH SPEED STEELS
SMALL TOOLS GAUGES
PNEUMATIC TOOLS
ELECTRIC LIGHTING SETS
ROAD MAKING MACHINERY
HYDRAULIC MACHINERY
HYDRO ELECTRIC PLANT
CIVIL ENGINEERING
GENERAL ENGINEERING

STEEL

Over 70 Years' Experience.

IN 1852 we produced Steel by the Crucible Process, in 1873 by the Acid Open Hearth Process, and from 1912 by the Electric Furnace.

To-day, as then, we are continually searching for new and better steels, which will further enhance the high reputation of A. W. Steels. Our Research Department, which includes some of the most skilled metallurgists in the steel trade, is always ready to advise correct choice of steel for any duty.

We invite enquiries for:

HIGH SPEED ALLOY AND CARBON TOOL STEELS.
AERO AND MOTOR STEELS.
"VIBRAC" STEEL FOR SHIPS' PROPELLER SHAFTS, etc.
STAINLESS STEEL.
RUSTLESS IRON.
INGOTS FROM 50 LBS. TO 120 TONS.
BLOOMS AND BILLETS, BOTH ROLLED AND FORGED.
ROLLED AND HAMMERED BARS.
FORGINGS AND CASTINGS.
STEELS FOR SPECIAL PURPOSES.

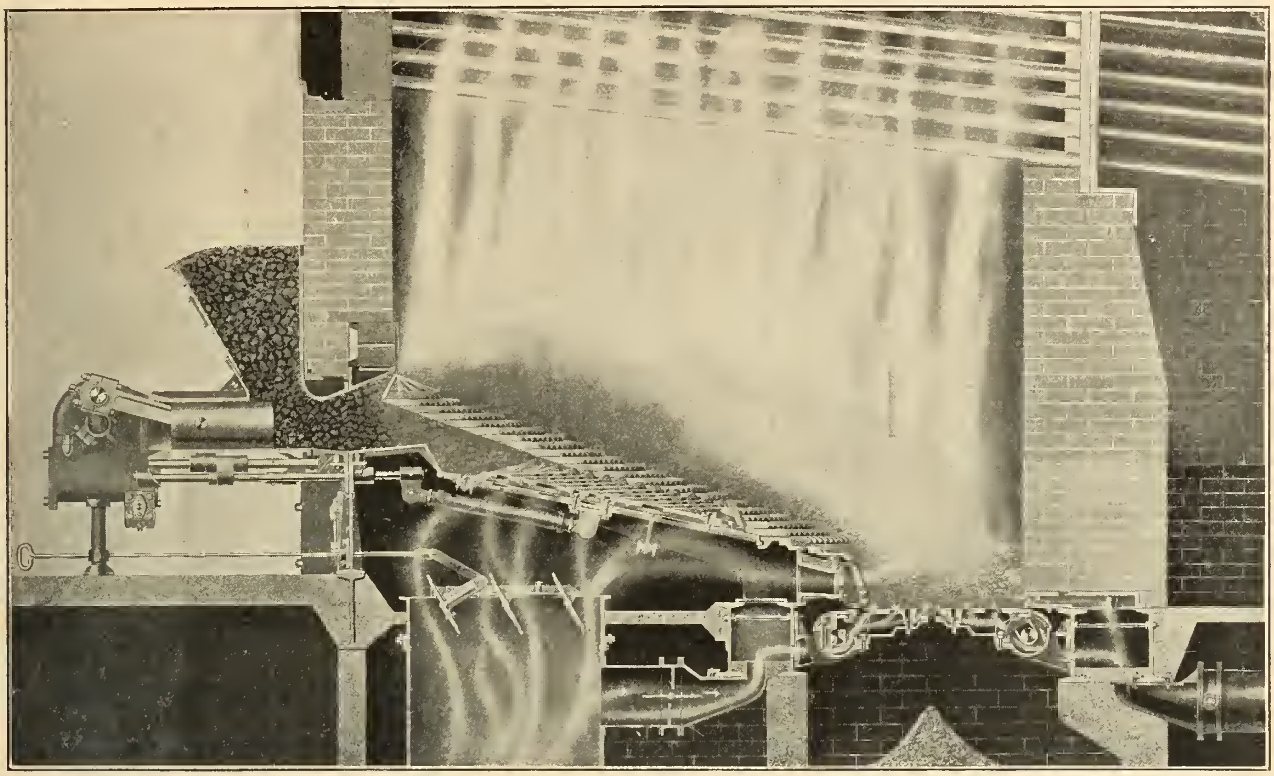
Agents in Canada:
Charles Walmsley Co. of Canada Limited,
Drummond Building,
Montreal, Que.

Sir W. G. ARMSTRONG, WHITWORTH & CO.,
LIMITED,
OPENSHAW WORKS, MANCHESTER, ENGLAND.

LONDON OFFICE:
8, GREAT GEORGE STREET, - WESTMINSTER, S. W. I.

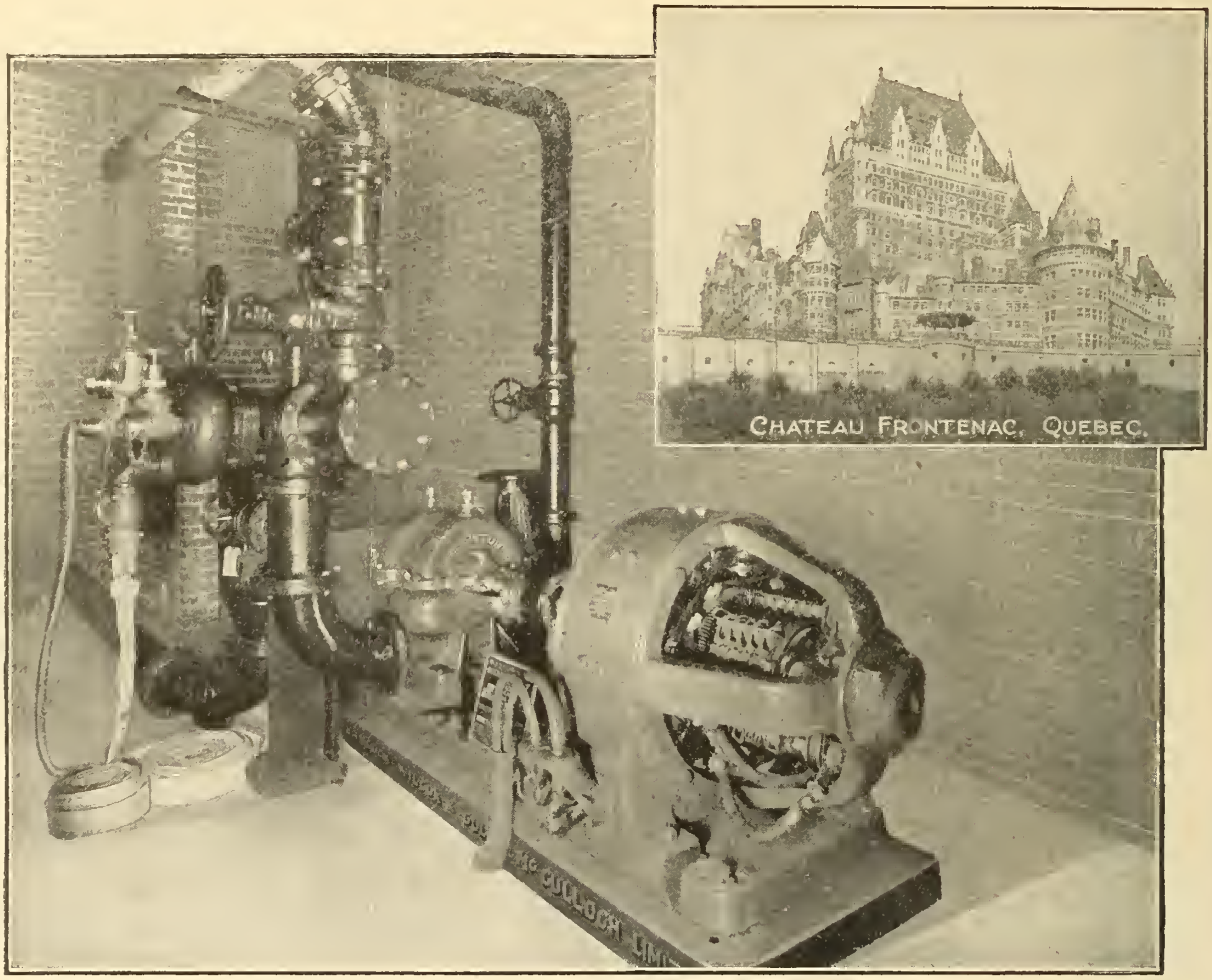
Telephone: **Victoria 4010 (6 lines).**
Code: **Bentley's**
Telegrams: **"Zigzag, Parl. London."**

(E.P.S. 233)



THE REES RoTURBo

A Centrifugal Pump for Any Service



CHATEAU FRONTENAC, QUEBEC.

Illustration shows the two stage Volute Type Underwriters Centrifugal Fire Pump recently installed by us at the Chateau Frontenac, Quebec. Delivering 1000 gals. per min. at 130 lbs. pressure, supplying four 1⅛" streams, taking water from City Mains and developing a pressure sufficient for good Fire Streams at the top story of the hotel. The characteristic of this pump is such that it will deliver 1,500 gals. at 95 lbs. pressure taking approximately the same power as that taken at Normal Duty.

Note particularly that the delivery of this pump is 1000 gallons per minute and not 100 gallons per minute as erroneously reported through a typographical error in the advertisement of this Company appearing in the May issue of the Journal.

Catalogues, specifications, prices and engineering advice on request.

Babcock-Wilcox and Goldie-McCulloch, Limited

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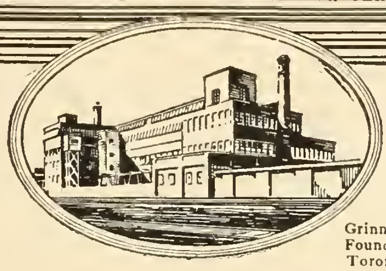

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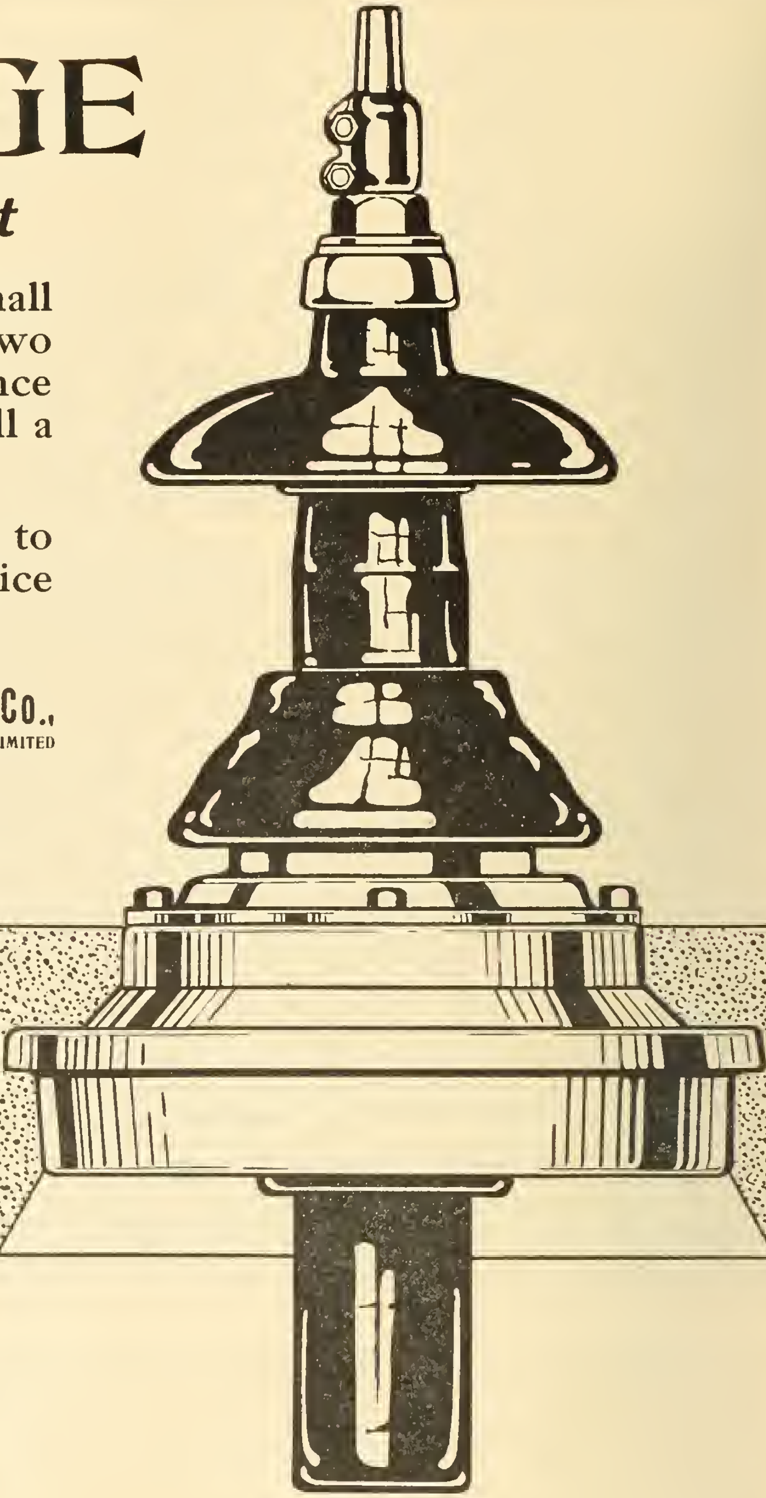

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TIME IS THE TEST

THE

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Consideration of Rainfall and Run-Off in Connection with Sewer Design in the Montreal District

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Paper read before the Montreal Branch, The Engineering Institute of Canada, April 16th, 1925.

The design of combined sewers and storm-water drains is generally governed by the *rational method* which recognizes as axiomatic the direct relation between the rainfall and the run-off, as shown by the formula: $Q = C\,i\,A$, in which Q is the total amount of run-off in cubic feet per second from a given area; C is the coefficient representing the ratio of run-off to rainfall generally called the coefficient of imperviousness; i is the intensity of rainfall in cubic feet per second per acre, (or the rate of rainfall in inches per hour). One inch per hour equals 1.008 cubic feet per second per acre; and A is the drainage area in acres.

In the earlier years, designs for drains to carry away the water of storms were based largely upon observations of the volumes of water seen coming from known areas in time of storms and upon the sizes of drains existing. It was only about 1885 that the first attempt was made to determine the relation between intensity and duration of rain, by Professor F. E. Nipher, of St. Louis, Mo.

It is well known that the intensity of precipitation varies inversely with the duration of the downpour, and for this reason the total precipitation should not be used in the design of storm-water drains. It is the maximum rate of precipitation lasting for a sufficient time to produce maximum run-off conditions which is of importance. In fact it would be impracticable to base the designs on a total precipitation of, say, one to eight inches per day. Until recent years no intensity calculations were available, since practically all rainfall records gave merely the total precipitation in each storm with the time of beginning and ending. Such records are of slight value in the study of storm water run-off.

The variation in intensity was not recognized as significant until automatic rain gages had been in use long enough to give a sufficient number of readings to enable investigators to predicate definite statements as to the relation between the intensity of rainfall and the period of time during which rain might fall continuously at any given rate.

It was not until about 1910 that the belief became general through municipal engineering offices and among specialist engineers that there was great need of more accurate and complete knowledge of rainfall and run-off. Before this date the general tendency was to rely on various empirical formulæ for run-off as established by Hawksley, (London 1857); Burkli-Ziegler, (Zurich 1880); Adams, (Brooklyn 1880); McMath, (St. Louis 1887); Hering, (New York 1889).

Very few problems are more elusive than the determination of the quantity of water per second that a storm drain should be designed for. This is due to the fact that the problem is indeterminate, and that the information and formulæ which are used, only serve to guide the judgment of the engineer, upon the soundness of which the correctness of final solution very largely depends. In fact, no two engineers acting independently, would reach the same conclusions, as only the factor A, in the formulæ, can be determined accurately. The factor C depends largely on experience and judgment, while i depends more on the choice of the intensity curve, which is derived from the automatic rain-gages distributed in different districts.

In order to get accurate results, automatic rain-gages should be used, and charts of same tabulated. The first rain-gage used by the city of Montreal from April 15th, 1916, to the summer of 1920, was a Wilson dial rain-gage which had no automatic recorder. The total precipitation was taken by an observer who indicated the time of beginning and ending of the storm, with the time of maximum precipitation. These data do not give accurate information.

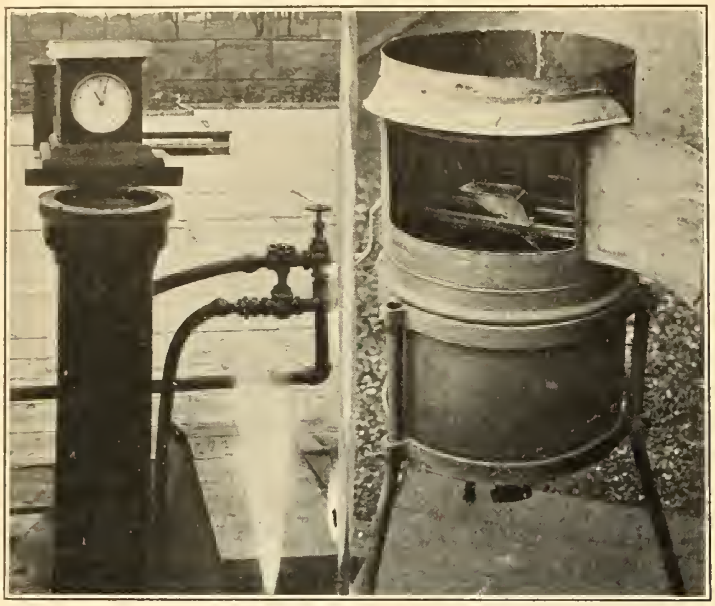

Figure No. 1.—The Wilson Dial Rain Gauge — installed in Montreal in 1916.

Figure No. 2.—The Friez Gauge installed in Montreal in 1920.

Another disadvantage of this type of rain gauge is the loss of collected water, in order to get the exact total of rainfall for each storm. In fact the rain water is collected by a 10-inch square funnel and conducted through a tube into a bucket of two compartments. When one of the compartments is filled, it tips down moving the needle of the register, but at the same time this water is flowing out of the instrument, thus escaping a check reading.

A Friez gauge made by Julien P. Friez, of Baltimore, was installed in the summer of 1920, on the roof of the Bassin Elgin pumping station situated on Commissioners street, between St. François-Xavier and Place Royale. The elevation of the funnel being at 44.00 city datum.

In this instrument, the rain is collected in a funnel, 12 inches in diameter, and conducted through a tube into a bucket containing two compartments.

These compartments are supported on trunions and have a capacity of 0.01 inch of rain in each bucket; as soon as a bucket is full, it tips down and discharges the accumulated rain into a reservoir below, presenting the other bucket for refilling. This is clearly shown in figure No. 2. Each time the bucket tips, it makes an electrical contact which puts in motion a pen set on a chart carried by a revolving cylinder connected to a clock movement.

The graph represented does not give directly the progress of the storm; the motion of the pen being only reciprocating: up for 0.05 inch and down for 0.05 inch of rain. The amount of rainfall is indicated by counting the number of steps, and the time-scale is 2 inches to an hour. It is therefore possible to determine the rates of rainfall from this record with a very good degree of precision.

At the bottom of the chart there is the total rainfall by register as explained above, and the total rainfall is observed by the stick test. The stick test is made with the water collected in the reservoir situated below the instrument. Every drop of water which is received by the funnel must pass through the bucket, and be discharged into the reservoir. Even if the buckets are not working the total rain is collected.

After the storm is over, the observer in charge opens the valve at the bottom of the instrument and measures the water in a cylinder measuring 10 inches high by 3¾ inches in diameter. This cylinder contains exactly the equivalent of one inch of rainfall. The last cylinder taken from the reservoir is scaled by a rule divided in hundredths of an inch.

The following tabulation of rainfalls has been prepared, giving the registered readings as compared with the stick tests.

TABLE No. 1, — Difference Between the Readings of the Chart and the Stick Test.

Date	Intensity 5′	10′	15′ inches per second	Total Duration hr. min.	Readings Chart	Stick Test	Difference
1922							
Mar. 7	0.36	0.27	0.24	10—37	0.59	0.67	0.08
20							
Apr. 7	0.48	0.48	0.40	2—00	0.39	0.43	0.04
10	0.72			1—45	0.18	0.21	0.03
11	0.60	0.54	0.52	5—20	1.30	1.47	0.17
15		0.12		11—50	0.35	0.41	0.06
18	0.72	0.60		2—05	0.21	0.23	0.02
May 5	0.36	0.12		11—50	0.62	0.70	0.08
7	0.36			6—30	0.36	0.41	0.05
June 3	0.36			12—35	0.80	0.79	+0.01
9	1.68	1.32	1.04	1—25	0.33	0.36	0.03
11	0.48	0·42		5—00	0.46	0.58	0.12
16	0.12			5—40	0.22	0.24	0.02
17	1.80	1.80	1.48	11—40	1.81	1.94	0.13
18	0.84	1.60	0.56	18—20	0.86	0.90	0.04
21	0.72	0.72	0.56	15—00	0.48	0.53	0.05
22	0.60	0.54	0.48	17—00	1.35	1.42	0.07
27		0.24		3—15	0.19	0.32	0.13
29	0.84	0.54		9—15	0.35	0.36	0.01
July 1	0.72	0.54		4—30	0.34	0.38	0.04
3		0.12		3—45	0.06	0.07	0.01
11	0.36			0—20	0.03	0.04	0.01
12	3.60	2.04		0—50	0.36	0.35	+0.01
13	3.0	2.10	1.48	1—40	0.44	0.43	+0.01
23	0.60	0.42		16—30	0.73	0.80	0.07
27	3.0	2.34	1.72	2—45	0.71	0.60	+0.11
Aug. 1	0.84	0.54		1—20	0.23	0.25	0.02
4	2.88	1.74	1.20	1—40	0.40	0.41	0.01
7	1.44	1.12	1.08	14—10	0.91	0.93	0.02
18	1.08	0.66		2—25	0.38	0.41	0.03
25	4.20	2.82	2.00	2—15	0.63	0.61	+0.02
Sept. 3		0.18		3—00	0.06	0.05	+0.01
12	0.84	0.60	0.56	10—30	0.55	0.61	0.06
14	0.36			3—15	0.15	0.14	+0.01
Oct. 7	0.42	0.33		4—15	0.44	0.48	0.04
10	0.24	0.24		11—00	0.48	0.46	+0.02
Nov. 15		0.54		8—00	0.47	0.51	0.04
18	0.12	0.12		5—30	0.16	0.17	0.01
20		0.09		13—45	0.33	0.39	0.06
Dec. 1	0.36	0.24		7—50	0.22	0.23	0.01
Oct. 1	0.96	0.66	0.56	18—00	0.96	0.96	0.00
1923							
Apr. 6	0.24	0.18		2—10	0.13	0.15	0.02
8		0.06		4—30	0.06	0.08	0.02
11	0.36	0.30		4—30	0.23	0.25	0.02
22	0.18			8—30	0.70	0.74	0.04
28	0.30			10—00	0.32	0.31	+0.01
29	0.12			6—30	0.29	0.30	0.01
30		0.09		10—00	0.24	0.32	0.08
May 9	0.36	0.30	0.26	12—50	0.49	0.50	0.01
11	0.12			6—00	0.24	0.25	0.01
15	0.36	0.30		6—50	0.74	0.78	0.04
16	0.48		0.36	11—00	0.47	0.48	0.01
21	0.36	0.30		9—25	0.47	0.49	0.02
June 6	0.36			3—10	0.12	0.13	0.01
July 4	1.80	1.32	1.44	6—00	0.93	1.04	0.11
6	1.68	1.26	1.16	5—40	1.29	1.31	0.02
25	0.72			18—00	0.21	0.26	0.05
Aug. 12	1.92	1.20		4—45	0.45	0.48	0.03
21	0.36	0.30		14—00	0.75	0.78	0.03
24	0.72	0.60		2—40	0.17	0.18	0.01
25	0.36			2—25	0.16	0.14	+0.02
28	0.60	0.42		8—30	0.49	0.51	0.02

Date	Intensity 5'	10'	15' inches per second	Total Duration hr. min.	Readings Chart	Stick Test	Difference.
1924							
Sept. 12	0.48			1—30	0.05	0.06	0.01
20	0.42			4—00	0.29	0.30	0.01
28	0.54	0.39		2—20	0.23	0.25	0.02
Oct. 24	1.56	1.08	0.88	18—00	2.21	2.54	0.33
30	0.36			5—40	0.23	0.24	0.01
Nov. 7	0.24			21—10	0.44	0.45	0.01
30	0.48	0.36		17—50	1.65	1.97	0.32
1924							
Apr. 6	0.24			15—00	0.82	0.92	0.10
12	0.24			4—00	0.10	0.11	0.01
22	0.18			20—00	1.04	1.10	0.06
30	0.12			6—00	0.16	0.20	0.04
May 1	0.10			13—00	0.20	0.24	0.04
3	0.18	0.12		11—00	0.52	0.57	0.05
4	0.36	0.30		9—30	0.68	0.74	0.06
12	0.24	0.24		9—00	0.59	0.60	0.01
15	0.36	0.30		5—30	0.58	0.60	0.02
18	0.24			4—00	0.28	0.30	0.02
24	0.24	0.18		7—30	0.24	0.25	0.01
June 28	2.76	1.68		6—15	1.02	1.08	0.06
July 9	1.20	1.02	0.92	3—00	0.51	0.63	0.12
16	0.36			7—00	0.27	0.32	0.05
22	1.20	1.08	1.04	4—45	0.70	0.84	0.14
25	1.08	0.78		8—30	1.44	1.74	0.30
30	0.84	0.66		1—35	0.14	0.21	0.07
Aug. 4	0.84	0.72		6—40	0.34	0.40	0.06
13	0.15			6—00	0.18	0.22	0.04
31	1.68	1.14		1—50	0.42	0.49	0.07
Sept. 2	0.15			9—00	0.62	0.65	0.03
5	0.72	0.48		6—00	0.55	0.60	0.05
9	0.72	0.66		11—40	0.37	0.39	0.02
13	0.21			2—00	0.12	0.13	0.01
22	0.42	0.42		4—00	0.50	0.51	0.01
29	0.48			13—00	1.48	1.55	0.07
30	0.51	0.36		24—00	2.20	2.40	0.20
Nov. 7	0.60	0.54		7—00	0.52	0.57	0.05
22	0.30	0.24	0.20	6—00	0.77	0.88	0.11
23	0.18			15—00	1.12	1.14	0.02
Dec. 9	0.48	0.36		3—50	0.18	0.20	0.02

The writer attempted to establish a relation between the maximum intensity and the difference of the readings in the stick test, but found it impossible to obtain definite figures. In fact most of the time the stick test shows more precipitation than the register. It was found that during heavy rains a very small portion of the water splashes out of the bucket, and sometimes the bucket itself stops on center, thus entirely failing to register, as a portion of the water flows to the reservoir, without causing the buckets to tip.

In the above table it will be noticed that in a few cases the stick test shows less precipitation than the chart. This is probably due to evaporation which occurred between the ending of the rain and the time of the test made by the observer. This shows that the adjustment of the instrument ought to be very carefully made, and its adjustment watched as its record is absolutely dependent upon the electrical apparatus working correctly.

McGill University is also proprietor of a Friez gauge. Their instrument is situated at the observatory building near Carleton road opposite the McTavish street water works pumping station, about 6,140 feet distant from the city of Montreal gage. The elevation of this gage is 162.59 city datum, which compared to city of Montreal rain gage gives a difference of 118.59 feet higher. The rainfalls observed by McGill University and by the city of Montreal have been compiled on the following table. Both figures were plotted side by side, in order to show the differences which can occur between the two points of observation.

TABLE No. 2-A, — McGill Observatory Rainfall Record — Montreal District

Table giving rainfalls, having intensities of one-inch or more per hour during the periods of time (minutes) at the head of the respective columns.

Year	Date	5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.
1906	June 6	0.11	0.22	0.33							
	8	.31	.36	.37	0.38	0.47	0.58	0.64	0.71	0.77	
	July 28	.18	.28	.33	.44	.46					
	30	.35	.52	.56	.60	.62	.64	.65			
	Sept. 3	.14	.24	.30	.36	.45					
	13	.33	.50	.52	.53	.53	.54				
	23	.11									
	Oct. 6	.09	.18								
1907	Apr. 30	.10	.18								
	May 19	.08	0								
	June 14	.09									
	25	.09	0								
	26	.36	.40	.43	.50	.53	.56.				
	July 5	.09									
	24	.21	.23	.26							
	Aug. 17	.10									
	24	.09									
	Nov. 3	.09									
1908	May 12	.14	.24	.32	.40	.48	.56				
	29	.10									
	31	.10									
	June 29	.09									
	July 7	.16	.24	.26							
	28	.08									
	29	.10	.18	.25							
	Aug. 8	.18	.28	.43	.52	.61					
1909	May 28	.10									
	July 13	.10									
	16	.16	.22	.28							
	Sept. 23	.08									
1910	May 27	.15	.18								
	June 8	.14	.21								
	22	.21	.36	.42	.52	.62	.64	.65	.66		
	July 21	.08									
	24	.16	.32	.36							
	30	.10									
	Aug. 2	.09									
	4	.25	.35	.40	.43	.45					
	10	.15	.28	.34	.40	.45					
	11	.12	.17								
	23	.13	.18								
	31	.12	.19								
	Sept. 6	.11	.18								
	20	.20	.23								
	Oct. 1	.10	.20	.25							
1911	May 1	.15	.23	.30	.33						
	June 11	.35	.69	.75	.78						
	12	.16	.18								
	14	.09									
	19	.18	.21								
	27	.19	.26	.26							
	July 6	.19	.22								
	16	.25	.42	.46	.49	.51	.53				
	17	.08									
	21	.10									
	Aug. 16	.16	.32	.34							
	19	.14	.21								
	28	.19	.30	.42	.50	.57	.68	.70	.73	.81	.81
	Sept. 12	.10									
1912	Apr. 22	.08									
	May 13	.11									
	17	.12									
	24	.14	.25	.28							
	June 10	.08									
	20	.08									
	July 14	.12	.17								
	29	.11	.17								
	Aug. 10	.08									
	12	.11									
	Sept. 7	.16	.21	.31	.34						
	19	.18	.33	.41	.48	.53	.59	.62			
	Oct. 12	.13									
1913	Mar. 21	.16	.18								
	June 16	.14	.18								
	26	.14	.21	.27							
	July 9	.08									
	13	.10									
	24	.12	.18								
	28	.32	.47	.49	.50						
	Aug. 1	.10									
	9	.10									
	Sept. 3	.18	.34	.39	.40	.42					
	8	.15	.17								
	18	.12	.21								
	22	.11	.18								
	'July 18	.20	.32	.33	.33						
1914	May 31	.26	.46	.65	.70	.71	.73				
	June 29	.13	.18								
	Aug. 11	.08									
	14	.11	.21								
	18	.10									
	30	.10	.20	.26	.33						
	Sept. 1	.09									
	Oct. 17	.08									
1915	Apr. 19	.08									
	June 13	.14									
	Sept. 8	.30	.45	.46	.46	.47					

TABLE No. 2-B, — McGill Observatory and City Station Rainfall Records — Montreal District.

Table giving rainfall, having intensities of one inch or more per hour during the periods of time (minutes) at the head of the respective columns up to 60 minutes and other registered rainfall of maximum intensities up to 240 minutes.

Year	Date	5 min. McGill	5 min. City	10 min. McGill	10 min. City	15 min. McGill	15 min. City	20 min. McGill	20 min. City	25 min. McGill	25 min. City	30 min. McGill	30 min. City	40 min. McGill	40 min. City	50 min. McGill	50 min. City	60 min. McGill	60 min. City	75 min. City	90 min. City	120 min. City	180 min. City	240 min. City
1916	May 17	0.04																						
	June 16	0.05			0.09																0.26	0.33		
	17																				0.41			
	July 17	0.09		0.14	0.24						0.36													
	31						0.27				0.29													
	Sept. 15		0.11																					
	23						0.27																	
	29		0.10																					
	Oct. 13			0.05															0.35	0.39	0.47	0.61	0.82	1.08
1917	July 18		0.17		0.24																			
	21		0.43																		0.81			
	30		0.33		0.69				1.12	0.68			1.23				1.72		1.76		2.01			
	Aug. 2		0.12																					
	9	0.36	0.46	0.62	0.56	0.82	0.78	1.07	0.97	1.25	1.18	1.41	1.24	1.51	1.35	1.54	1.39	1.56	1.10	1.18	1.24	1.32		
	15	0.25	0.29	0.30	0.30		0.34				0.50				0.59									
	17		0.25		0.48				0.73		0.81		0.86		0.79		0.86		1.18					
	24		0.17		0.22																			
	Sept. 1		0.13																					
	Oct. 10												0.16						0.30		0.44	0.58	0.77	1.01
	30		0.16										0.25						0.32			0.61	0.83	1.26
1918	May 19		0.12																					
	22		0.15				0.27		0.37															
	June 12		0.10		0.17		0.27												0.48	0.60	0.70	0.81	1.11	
	29	0.14		0.27		0.34		0.37		0.42														
	July 11	0.23	0.09	0.34	0.13	0.37		0.38																
	Aug. 7	0.21	0.22	0.25																				
	Sept. 5																					0.68	0.84	0.97
	13																				0.55	0.62	0.75	0.87
	Oct. 13	0.11		0.20		0.25	0.82																	
1919	June 7	0.12		0.22																				
	15	0.13		0.19		0.26	0.30																	
	26	0.14		0.18																				
	July 10	0.21	0.09	0.31		0.33	0.35	0.38	0.44															
	Aug. 10	0.10			0.16																			
	24	0.10																						
	Sept. 8		0.11																			0.62	0.78	
	21	0.33		0.39		0.40	0.29	0.40																0.75
	Oct. 5	0.10		0.17																				
‡1920	July 17	0.10																						
	28	0.08																						
	30			0.17																				
	Aug. 10	0.20		0.27		0.38		0.41		0.42														
	31	0.28		0.54		0.70		0.84		1.00		1.08		1.11		1.12		1.13						
	Sept. 28	0.15		0.25		0.31		0.37		0.45		0.51												
	Oct. 27	0.15		0.22		0.28																		
‡1921	April 15	0.18		0.19																				
	May 31	0.10																						
	July 15	0.18		0.27		0.34		0.38																
	27	0.12		0.17																				
	31	0.14		0.19																				
	Aug. 11	0.17		0.26		0.33		0.35																
	20	0.12																						
	Sept. 11	0.10																						
	12	0.15		0.20		0.25		0.37		0.44														
	19	0.29		0.31																				
	28	0.13		0.18																				
1922	June 9	0.15	0.15	0.22	0.22	0.26	0.26															0.78	0.86	
	17		0.15		0.30		0.37		0.39		0.41													
	July 12		0.30		0.34																			
	13		0.25		0.35																			
	27		0.25		0.39		0.43																	
	Aug. 4		0.24		0.29																			
	7		0.12		0.17																			
	25		0.35		0.47		0.50		0.52															
	Oct. 8		0.08																					
1923	July 4	0.19	0.15	0.26	0.22	0.38	0.36	0.41	0.40	0.44	0.44	0.46										0.92	1.01	
	6	0.11	0.14	0.19	0.21	0.29	0.29	0.36	0.34	0.41	0.37	0.45	0.4[illegible]											
	Aug. 12	0.15	0.16	0.23	0.20																			
	29	0.13	0.12																					
	Oct. 21	0.10	0.13	0.19	0.18																			
	Nov. 30																		0.30		0.56	0.71	0.88	
1924	May 4																					0.32	0.52	
	June 28		0.23		0.28																	0.33	0.44	0.57
	July 8		0.08																					
	9	0.13	0.10	0.24	0.17	0.29	0.23	0.34		0.38														
	22	0.15	0.10	0.24	0.18	0.31	0.26																	
	25	0.12	0.09	0.22		0.29		0.35																
	Aug. 25	0.39		0.57		0.67																0.46	0.60	0.67
	31	0.14	0.14		0.19																	*0.59	*0.77	*0.89
	Sept. 30																							

‡City records of 1920 and 1921 were destroyed by fire.

*Readings at McGill Gauge.

From this record table No. 3 was prepared, giving the different intensities with the time stated and the corresponding number of storms of each per year.

TABLE No. 3, — Probability of the Occurrence in any Year of Storms of an Intensity of One Inch per Hour or Greater, for Various Periods of Time, at Montreal, Que.

(Based upon the records of McGill University and the city of Montreal for 19 years, 1906-1924 incl.)

Intensity inches per hour	Number of storms of stated intensity	Total number of storms of intensity stated or greater	Corresponding number of storms per year probability	
5	2	2	0.105	5-min. period
4	5	7	0.368	
3	16	23	1.210	
2.5	7	30	1.579	
2	16	46	2.421	
1.5	43	89	4.684	
1.0	75	164	8.631	
4.0	2	2	0.105	10-min. period
3.0	5	7	0.368	
2.5	6	13	0.684	
2.0	10	23	1.210	
1.5	21	44	2.316	
1.0	62	106	5.579	
3.0	3	3	0.158	15-min. period
2.5	3	6	0.316	
2.0	3	9	0.474	
1.5	16	25	1.316	
1.0	38	63	3.316	
3.0	2	2	0.105	20-min. period
2.5	1	3	0.158	
2.0	3	6	0.316	
1.5	8	14	0.735	
1.0	30	44	2.316	
3.0	1	1	0.053	25-min. period
2.5	1	2	0.105	
2.0	1	3	0.158	
1.5	5	8	0.460	
1.0	23	31	1.631	
2.0	3	3	0.158	30-min. period
1.5	2	5	0.263	
1.0	13	18	0.947	
2.0	1	1	0.053	40-min. period
1.5	1	2	0.105	
1.0	5	7	0.371	
2.0	1	1	0.053	50-min. period
1.5	1	2	0.105	
1.0	3	5	0.265	
1.5	2	2	0.105	60-min. period
1.0	2	4	0.210	
1.0	1	1	0.125	75-min. period
0.75	1	2	0.250	
0.50	1	3	0.375	
1.0	1	1	0.125	90-min. period
0.75	1	2	0.250	
0.50	2	4	0.500	
0.66	1	1	0.125	120-min. period
0.40	3	4	0.500	
0.30	9	13	1.625	
0.37	1	1	0.125	180-min. period
0.35	1	2	0.250	
0.25	10	12	1.500	
0.30	1	1	0.125	240-min. period
0.25	2	3	0.375	
0.20	3	6	0.750	

By plotting the points obtained from each tabulation, a series of curves are derived, as shown in figure No. 4.

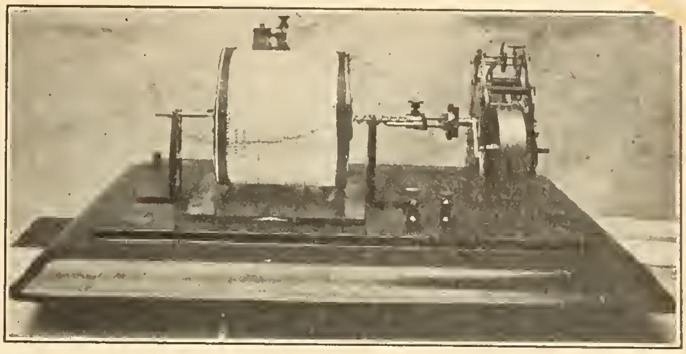

Figure No. 3.—Recording device for Friez Gauge.

For practical use, it is generally more helpful to know the curve intensity of precipitation in storms of various degrees of frequency. For example, it is shown that for a storm of a frequency of unity, for such as is likely to occur once a year, an intensity of 3.0 corresponds to a duration of 5.5 minutes; an intensity of 2.5 to a duration of 7.5 minutes; an intensity of 2.0 to a duration of 10 minutes; and so on. A series of curves of intensity corresponding to different degrees of frequency or probability, can be readily constructed as shown in diagram No. 5.

From this diagram, the equation of every curve shown in figure No. 6 is found. The curve *D*, represented by the equation $i = \frac{150}{t + 26}$ is the extreme storm recorded since 1906 to date. It happened on July 30th, 1917, and was almost equalled by another on August 9th, 1917.

The curve *A*, represented by the equation $i = \frac{12.6}{t^{0.667}}$ was obtained in 1915 by observation from 1906 to that year, and represented the intensity of precipitation for storms of five years frequency. This equation has been used since 1915 for every study of sewers in the city of Montreal.

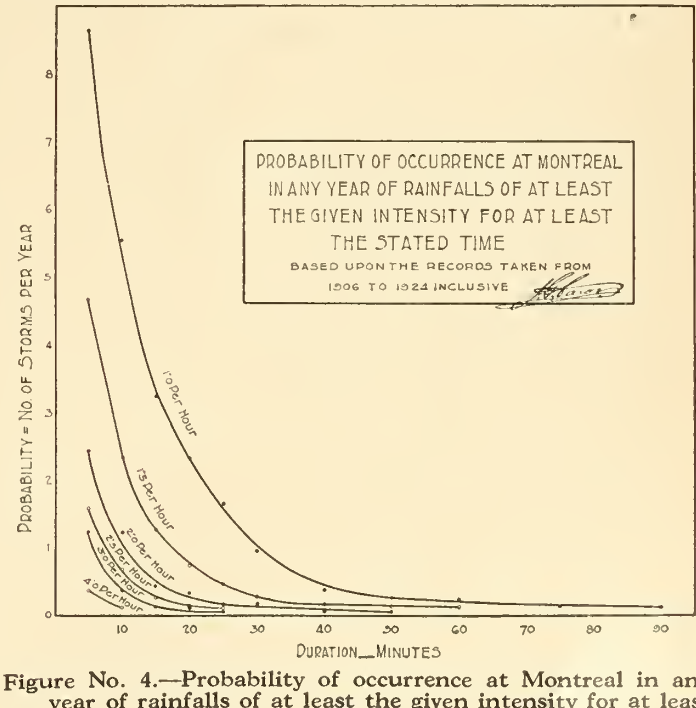

Figure No. 4.—Probability of occurrence at Montreal in any year of rainfalls of at least the given intensity for at least the stated time.

The curves B and C, represented by the equations $i = \frac{68}{t + 10}$ and $i = \frac{100}{t + 15}$ correspond reasonably well with the intensity curves of storms to be expected, respectively once in five years, and once in ten years.

If the two extreme storms of July and August 1917 were eliminated, the curves B and C would correspond respectively to once in eight years, and to the maximum storm. (See table No. 4.)

TABLE No. 4, — Probability of the Occurrence in any Year of Storms of an Intensity of One Inch per Hour or Greater for Various Periods of Time, at Montreal, Que.

(Not including storms of July 30th. and August 9th., 1917.)

Intensity inches per hour	Number of storms of stated intensity	Total number of storms of intensity stated or greater	Corresponding number of storms per year probability	
5	1	1	0.052	5-min. period
4	5	6	0.316	
3	15	21	0.105	
2.5	7	28	1.474	
2	17	45	2.368	
1.5	42	87	4.579	
1.0	75	162	8.526	
4	1	1	0.052	10-min. period
3	4	5	0.263	
2.5	6	11	0.579	
2.0	10	21	1.105	
1.5	22	43	2.263	
1.0	61	104	5.474	
3	1	1	0.052	15-min. period
2.5	3	4	0.210	
2.0	3	7	0.368	
1.5	16	23	1.210	
1.0	38	61	3.210	
2.5	1	1	0.052	20-min. period
2.0	3	4	0.210	
1.5	8	12	0.631	
1.0	30	42	2.210	
2.5				25-min. period
2.0	2	2	0.105	
1.5	4	6	0.316	
1.0	23	29	1.526	
2.0	1	1	0.052	30-min. period
1.5	2	3	0.158	
1.0	13	16	0.842	
1.5	1	1	0.052	40-min. period
1.0	5	6	0.316	
1.5				50-min. period
1.0	3	3	0.158	
1.5				60-min. period
1.0	2	2	0.105	
1.0				75-min. period
0.75				
0.50	1	1	0.125	
1.0				90-min. period
0.75				
0.50	2	2	0.250	
0.40	2	2	0.250	120-min. period
0.30	8	10	1.250	
0.35	1	1	0.125	180-min. period
0.25	10	11	1.375	
0.30	1	1	0.125	240-min. period
0.25	2	3	0.375	
0.20	3	6	0.750	

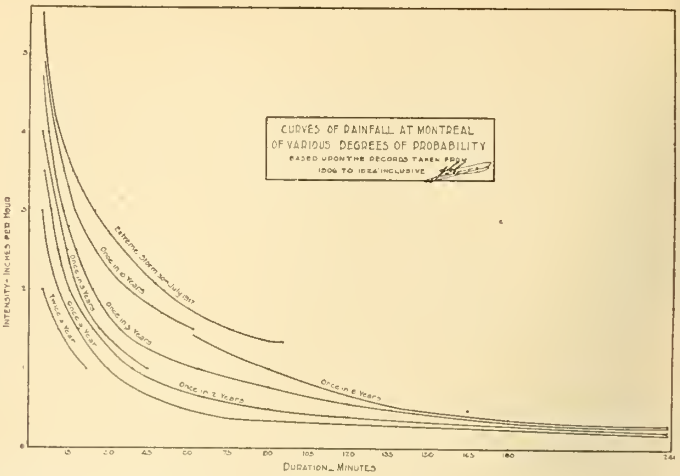

Figure No. 5.—Curves of rainfall at Montreal of various degrees of probability

For this reason, curve A very well suits our purpose, as it meets curve B at 120 minutes, thus keeping on the safe side for the design of large collector sewers, and the small difference in the shorter period is well compensated by the fact that the city of Montreal has a by-law which compels all proprietors to build their cellars no lower than three feet above the crown of the sewer. Besides, in tributaries the diameter is generally a 2-foot by 3-foot brick sewer which in most cases is larger than needed. This standard was adopted in order to give the cleaners better access to the sewers, but it will become less general with improved facilities for removing dirt from the sewers.

A diagram, figure No. 7, has been prepared in order to facilitate discussion. Each storm of one inch intensity or over has been plotted for different periods and years, from 1906 to 1924 inclusively. The A curve is also shown in dotted lines so that the storms which have exceeded this curve may be seen at a glance.

Figure No. 8 has also been prepared in order to give a comparison with other towns. Montreal has the lowest rate of rainfall compared with those shown; even with the maximum curve, and specially from the 45-minute period to the 240-minute period, no comparison can be made with other towns, except London, where the same equation, which represents the maximum storms of the Montreal district was given.

The curves shown on this diagram were derived from data kindly loaned by Mr. R. O. Wynne-Roberts, M.E.I.C., who, in turn, obtained the information by correspondence with the engineers of the cities named.

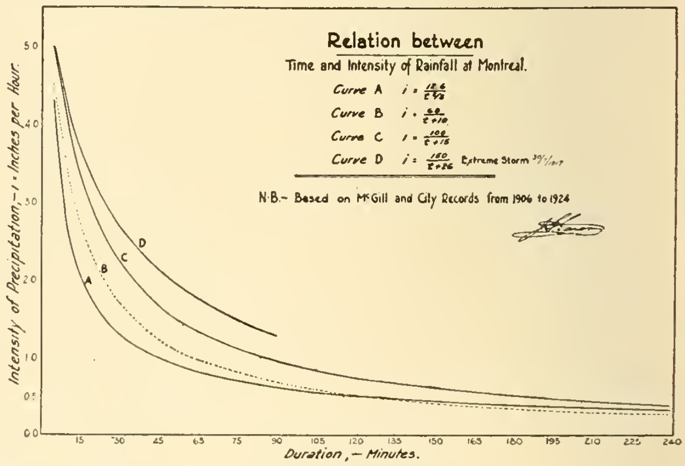

Figure No. 6.—Relation between Time and Intensity of Rainfall at Montreal.

Run-off Factor

To determine the coefficient of run-off, the area and the intensity of precipitation should be used together with the percentage of water reaching the sewer in the minimum time of concentration. In other words, the volume of storm water to be cared for by a sewer depends upon the intensity and duration of the rain, the character, slope and area of the surface to be drained.

Of the water falling as rain, a portion serves to wet the surface; another portion is lost by evaporation; still another is required to fill the depressions and irregularities of the surface, some is taken by vegetation, etc., or absorbed by porous earth where it is either retained by capillary attraction or else percolates slowly through the earth to increase the ground water after many hours, without finding its way into the sewers. The remainder flows off until it reaches some natural or artificial channels. This last portion is really the one which concerns the storm drainage problem.

The run-off factor or the proportion of the total rainfall which will reach the sewers varies with: —(a) The duration and intensity of the rain; (b) The condition and slope of the surface of the ground; (c) The character of the soil, and (d) The minimum time of concentration.

The run-off will change from time to time as the character of the surface is artificially modified by the construction of buildings, sidewalks, and pavements.

The run-off from any given area is greatest when all parts of the area are contributing at the greatest possible rate. The maximum run-off is to be expected from a rainfall of maximum uniform intensity lasting long enough to allow the water from the farthest point of the drainage area to reach the outlet. This length of time is called, the *time of concentration.*

The time of concentration is the time, generally measured in minutes, required for the water to flow to a

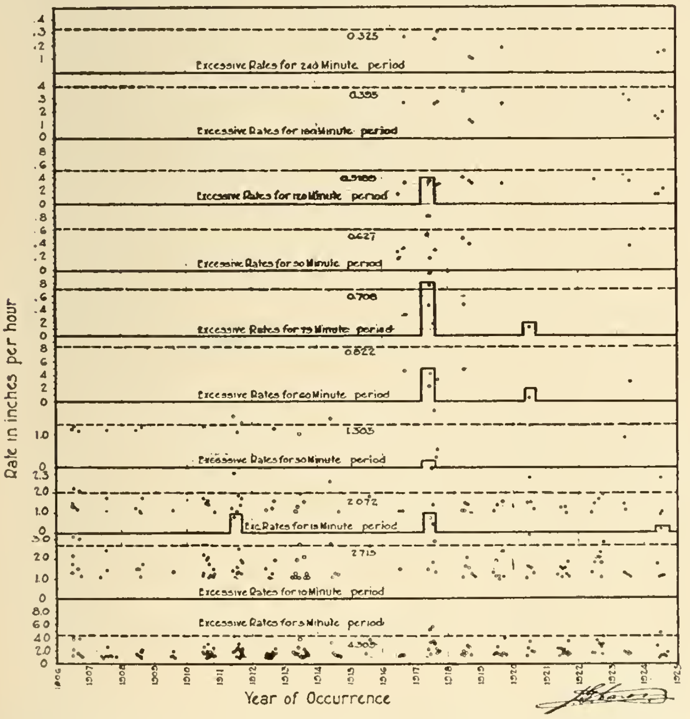

Figure No. 7.—Rate of Rainfall at Montreal for different periods compared with the Intensity Curve $i = \frac{12.6}{t^{0.667}}$ shown dotted.

point under consideration. It consists of two parts:—(a) The time required to reach the inlet, and (b) the time of flow in the sewers. The time to reach the inlet depending on what has been said above, can, in other words, be arrived at by Kutter's formulæ, as shown in figure No. 9.

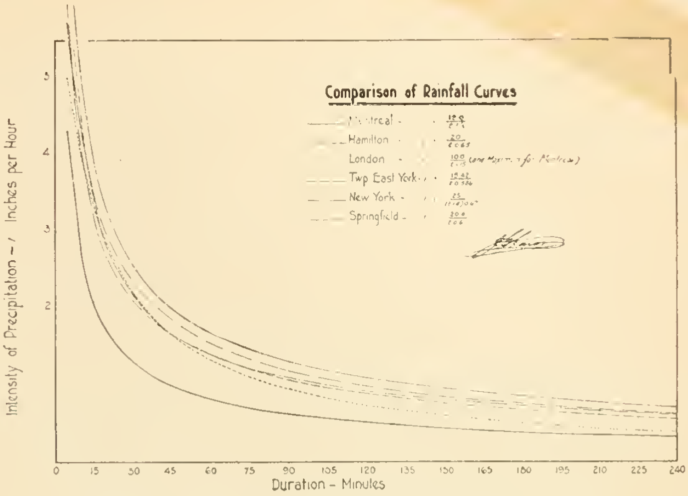

Figure No. 8.—Comparison of Rainfall Curves.

The time of flow in the sewer is obtained by a simple hydraulic computation when one knows the type, the size and slope of the sewers considered.

The coefficient of run-off is very difficult to determine with exactness, even for existing conditions, and is subject to great modification, by artificial alterations in the conditions of the surface, such as the construction of pavements or buildings. For this reason it is necessary in the design of sewers to estimate the conditions which are likely to exist in the future.

In 1918, the writer had the opportunity of presenting, in this same hall, some information relating to the run-off observed for residential districts of the western part of Montreal. Unfortunately the records of that information were destroyed by the fire in the city hall, and consequently it is impossible to give you many details, but one remembers fairly well the equations which served at that time to determine the run-off factor, and also the diagram which was prepared according to it, as shown in figure No. 10.

The coefficient *C* was checked against a specific problem: — A certain cellar was flooded during June of the year 1918, and I was asked to determine to what elevation, according to the formulæ in use, the water

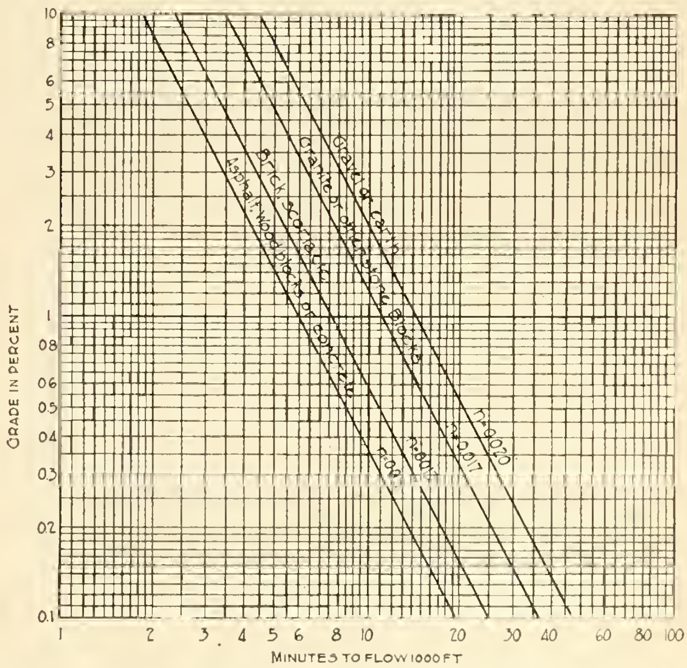

Figure No. 9.—Time required for water to flow 1000 feet in different gutters—Kutter's Formula.

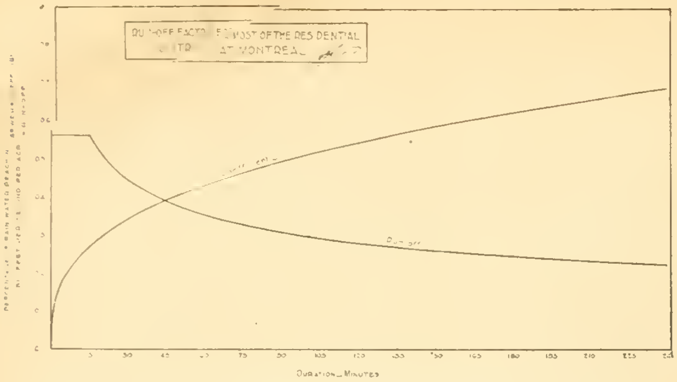

Figure No. 10.—Run-off factor for most of the residential districts at Montreal.

should have risen. The intensity of this special storm was figured. The coefficient C was computed for a residential district varying from 40 to 30 per cent impervious, and the equation was found to be $0.111t^{0.334}$. A complete survey of the sewer collector was then made, and after figuring the hydraulic elements of the sewer and having used the intensity and coefficient C mentioned above, we arrived with about one inch difference from the observed height of water in the cellar.

I have the honour to present you to-night, a new table No. 5, and diagram figure No. 11, being the summation of all the work which has just been explained.

The intensity has been derived by the equation $i = \frac{12.6}{t^{0.667}}$

To determine the variable factor C, the two extremes were first found, as being represented by the equation $C = 0.2t^{0.34}$ for 100 per cent imperviousness, which is very near the same as assumed by Mr. Charles E. Gregory and explained at length in Transactions of the American Society of Civil Engineers. The minimum C could be represented by the equation $C = 0.05\ t^{0.334}$. Between these two extreme equations, I have plotted the curve for the equation observed in 1918, ($C = 0.111\ t^{0.334}$), and taking this latter as a base for comparison with the extremes, it was found that a converging series of arithmetical progression of 0.0038 for every 10 per cent of change in imperviousness, from the maximum pervious to the maximum impervious, could provide for any of the imperviousness percentages. Of course this is only a means to guide the judgment in the average problems of drainage in Montreal. Where steep grades or very impervious soil are encountered, the percentage of imperviousness should be increased, as this diagram was only prepared for the imperviousness represented by roofs, pavements, sidewalks or anything which should be considered as watertight.

TABLE No. 5, — Table for Run-off Coefficient for Montreal District with Various Degrees of Imperviousness at Stated Periods of Concentration.

Imperviousness.	Run - Off					
	15 min.	20 min.	30 min.	40 min.	50 min.	60 min.
100%	0.9332	0.840	0.724	0.6514	0.6002	0.5614
90	0.88251	0.7962	0.689	0.6218	0.57437	0.53844
80	0.82802	0.7487	0.6502	0.5884	0.54474	0.51168
70	0.76973	0.6974	0.6076	0.5512	0.51131	0.48112
60	0.70764	0.6423	0.5612	0.5102	0.47408	0.44676
50	0.64175	0.5834	0.5110	0.4654	0.43305	0.4086
40	0.57206	0.5207	0.457	0.4168	0.38822	0.36664
30	0.49857	0.4542	0.3992	0.3644	0.33959	0.32088
20	0.42128	0.3839	0.3376	0.3082	0.28716	0.27132
10	0.34019	0.3098	0.2722	0.2482	0.23093	0.21796
0	0.2553	0.232	0.203	0.1841	0.1709	0.1608
	70 min.	80 min.	90 min.	100 min.	110 min.	120 min.
100%	0.5307	0.5053	0.4840	0.4656	0.4506	0.4369
90	0.5100	0.48647	0.46675	0.44971	0.43579	0.4231
80	0.48552	0.46384	0.4457	0.43002	0.41718	0.4055
70	0.45723	0.43741	0.42085	0.40653	0.39477	0.3841
60	0.42514	0.40718	0.3922	0.37924	0.36856	0.3589
50	0.38925	0.37315	0.35975	0.34815	0.33855	0.3299
40	0.34956	0.33532	0.3235	0.31326	0.30474	0.2971
30	0.30607	0.29369	0.28345	0.27457	0.26713	0.2605
20	0.25878	0.24826	0.2396	0.28208	0.22572	0.2201
10	0.20769	0.19903	0.19195	0.18579	0.18051	0.1759
0	0.1528	0.1460	0.1405	0.1357	0.1315	0.1279
	130 min.	140 min.	150 min.	160 min.	170 min.	180 min.
100%	0.4238	0.4130	0.4026	0.3933	0.3846	0.3767
90	0.41096	0.40095	0.39131	0.38269	0.37463	0.36731
80	0.39432	0.3851	0.37622	0.36828	0.36086	0.35412
70	0.37388	0.36545	0.35733	0.35007	0.34329	0.33713
60	0.34964	0.342	0.33464	0.32806	0.32192	0.31634
50	0.3216	0.31475	0.30815	0.30225	0.29675	0.29175
40	0.28976	0.2837	0.27786	0.27264	0.26778	0.26336
30	0.25412	0.24885	0.24377	0.23923	0.23501	0.23117
20	0.21468	0.2102	0.20588	0.20202	0.19844	0.19518
10	0.17144	0.16775	0.16419	0.16101	0.15807	0.15539
0	0.1244	0.1215	0.1187	0.1162	0.1139	0.1118
	190 min.	200 min.	210 min.	220 min.	230 min.	240 min.
100%	0.3687	0.3624	0.3560	0.3500	0.3444	0.3389
90	0.35989	0.35405	0.34812	0.34255	0.33736	0.3322
80	0.34728	0.3419	0.33644	0.3313	0.32652	0.32182
70	0.33087	0.32505	0.32096	0.31625	0.31188	0.30758
60	0.31066	0.3062	0.30168	0.2974	0.29344	0.28954
50	0.28665	0.28265	0.2786	0.27475	0.2712	0.26770
40	0.25884	0.2553	0.25172	0.2483	0.24516	0.24206
30	0.22723	0.22415	0.22104	0.21805	0.21532	0.21262
20	0.19182	0.1892	0.18656	0.1840	0.18168	0.17938
10	0.15261	0.15045	0.14828	0.14615	0.14424	0.14234
0	0.1096	0.1079	0.1062	0.1045	0.1030	0.1015

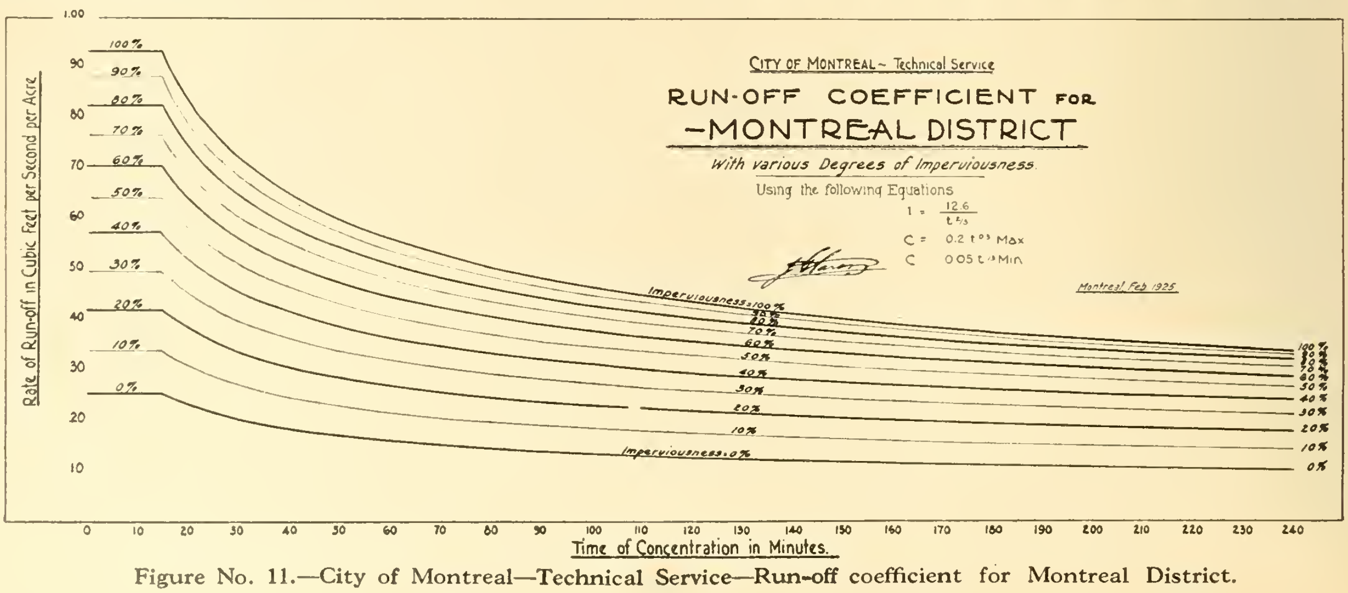

Figure No. 11.—City of Montreal—Technical Service—Run-off coefficient for Montreal District.

Special Features in Connection with the Generation and Distribution of Electrical Energy in Great Britain

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Paper prepared for presentation before the Montreal Branch of The Engineering Institute of Canada

One feels some hesitation in taking as a subject for discussion before a Canadian institute of engineers the special features in connection with the generation and distribution of electrical energy in Great Britain. The use of electric power in Canada and in the United States is on such a much larger scale than anything that we have in Great Britain, and the uses to which electricity is being put are so much more numerous than they are in Great Britain, that it might not seem of any great utility to give an account of what has been done on the other side of the water. At the same time, the conditions that exist in Great Britain are so different from those in Canada, and the problems that have to be faced are so different, that it is hoped that there may be a few points which will be of interest to Canadian engineers.

In Great Britain there is very little water power available for generating electrical energy. In the figures recently given by the Electricity Commissioners for Great Britain, the percentage of the total units generated that are produced by water power is just over one-half of one per cent (0.55), and although various schemes have been proposed to make use of the water power resources in North Wales and certain parts of Scotland, it does not seem likely that hydro-electric power will ever provide a considerable percentage of the total electrical energy that is required in Great Britain. Such schemes as that proposed for the Severn entail a very heavy capital expenditure in their development, and it is very doubtful whether the spending of so much money can be justified. It is, of course, an axiom that the cost of electrical energy is partly capital and partly running charge, and unless the running charges in Great Britain, due to the high price of coal, become much greater than they are at present, it seems unlikely that many water power schemes will be developed.

A complete survey of the water power resources of Great Britain has recently been made, and a report was published on this subject in 1921. The general conditions stated in connection with these schemes was that it was not worth while considering large scale developments for which the capital cost exceeded £60 per effective horse power, (£80 per effective kilowatt), and for smaller developments from £80 to £90 per effective horse power, (£107 to £120 per effective kilowatt). In deciding all these prices, the estimates were based on pre-war prices with an addition of 50 per cent. The larger proportion of potential water power is in Scotland and in the twelve schemes examined by the committee, each of which exceeded in capacity 3,500 kilowatts, the average continuous capacity was rated at over 112,000 kilowatts, and the cost of developing ranged from £15 to £60 per kilowatt. Of the Welsh schemes that were considered, the total capacity was just under 18,000 kilowatts, but the average cost was a good deal higher varying from £17 to over £80 per effective kilowatt.

Although recommendations have been made for the general developments of water powers, the only scheme in which any great progress has been made is that in connection with the supply of power to North Wales, and more recently in connection with the scheme for establishing a power station at Fort William, in Scotland.

Historical

The systems of electric supply in Great Britain were established in the first place without any appreciation of the ultimate necessity of co-ordination. A large number of small undertakings were erected and equipped for the supply of cities and large towns. The nature of the supply, that is, the voltage and frequency used, varied within wide limits. In some of the earlier stations a frequency of 83 1-3, (5,000 per minute) was used, and all sorts of voltages of supply were adopted, varying from 250 to less than 100 volts. Another factor which has been of great importance in connection with electricity supply has been the difficulty of running overhead lines. This lack of progress has been due partly to the difficulty of obtaining wayleaves, safety regulations and other protective devices in favour of the post office authorities, and partly due to the natural conservatism of the supply authorities in Great Britain.

In the early days, progress was delayed by legislation. The principal acts are those of 1882, 1888, 1899, 1909, 1919 and 1922. Up to 1909 the legislation was such that development along lines, which are now regarded as essential for success was almost impossible. Powers were given for small areas, and association of the various undertakings with one another was impossible. There was no body charged with co-ordination of electricity supply; interconnection was actually disallowed; standardization of systems and voltages was a thing unknown. A great deal of unnecessary capital was spent in the erection of these stations, coal was wasted, and a large number of small inefficient generating stations were built which, with the powerful gas interests in competition, resulted in tardy development, and the necessity for the establishment of a still greater number of separate power plants in factories, owing to the high charges for electricity that were being made by the supply authorities. The position was somewhat improved by the power company legislation from 1900 onwards, and further advance resulted from the 1909 act which made linking up, the giving of bulk supplies, and supplying outside the statutory areas, in special circumstances, practical matters.

The power acts were the outcome of Viscount Cross's committee, and powers were obtained by companies to supply electricity in bulk to power consumers over wide areas. The companies were not, however, allowed to supply for general purposes, and this restriction, coupled with the fact that the administration of some of the authorities left much to be desired, retarded progress. It must be noted, however, that a certain number of these undertakings, notably the Newcastle Electric Supply Company, the Clyde Valley Power Company, the Yorkshire Power Company, the North Metropolitan Company, and the Lancashire Power Company, have all done excellent pioneer work and are now flourishing concerns. These systems have, however, been developed in face of very great difficulty, partly owing to lack of capital and partly owing to difficulties in obtaining wayleaves for running power cables. The larger municipalities also have done excellent work so far as the supply within the local authority boundaries was concerned.

It became evident, however, especially during the war when the demand for electrical power increased, that a change would have to be made, and that the whole position should be reviewed with a view to greater economy. This was done by the Board of Trade Electric Power Supply Committee in 1917-18.

Nearly all the difficulties were on the administrative side. The settlement of engineering questions was comparatively easy as was to be expected in a country where immediate advantage should be taken of the splendid work of pioneer men like Ferranti, Willans and Parsons.

Act of 1919 and Appointment of Electricity Commissioners

The report of the committee appointed by the Board of Trade to consider the question of electric power supply presented in 1918 recommended, (a) the appointment of electricity commissioners to whom should be transferred the existing powers of the Board of Trade and to whom large additional powers should be given for regulating and encouraging the distribution of electricity; (b) that the existing system under which electricity is separately generated for small areas should be abolished; (c) that the electricity commissioners should divide the United Kingdom into districts technically suitable for the economical generation and distribution of electricity; (d) that in each electrical district a district electricity board should be set up which should purchase all generating stations of authorized distributors whether local authorities companies, or power companies; and (e) that largely extended powers should be granted amongst other things for the use of overhead wires, wayleaves, and the acquisition of water rights. This report brought about the legislation of 1919 and the electricity commissioners were appointed early in 1920. Owing to causes which need not be examined here, the 1919 act fell short of the recommendations of the committee, in that the setting up of joint electricity boards with compulsory powers to purchase generating stations was not provided for. The duties of the commissioners are the promoting, regulating and supervision of electricity supply, and the act provided machinery for empowering the commissioners:—

(a) To conduct experiments.
(b) To appoint advisory committees.
(c) To determine electricity districts and to approve or formulate schemes for improving the existing organization of electricity supply in such districts.
(d) To consent or to refuse consent to the establishment of a new or the extension of an existing generating station.
(e) To sanction borrowing by local authorities under the electric lighting acts.
(f) To require the alteration of the type of current, frequency or pressure employed in the undertakings of authorized undertakers.
(g) To make special orders in respect of matters arising under the act of 1919, or anything which might, under the electric lighting acts, be effected by a provisional order.

In a sense the commissioners may be regarded as the "General Staff" of the electricity supply industry. Their expenses are paid by the industry and although they have to undertake a mass of detail work which was formerly carried out by the government departments concerned, the commissioners' principal function is to see that all possible means are adopted by the industry to cheapen production, by scrapping old wasteful methods, and generally to assist development so that the whole field is adequately served at a minimum cost.

The commissioners are not an executive body, the actual carrying out of new schemes being left in the hands of the authorized undertakers. The policy of the commissioners is to shut down small and inefficient generating stations concentrating the load on the better placed stations, coupling these up with one another and also with new capital stations, some of which have been completed and of which a considerable number are under construction. No generating station can be established or extended without the consent of the commissioners, and this leads to an investigation, in connection with proposed extensions, of the possibilities of a bulk supply. The commissioners can also call upon undertakings to link up; a certain amount of control results from the fact that the commissioners sanction the loans required by local authorities. The commissioners have provisionally determined thirteen large districts in England, and two in Scotland. The size of these areas varies within fairly wide limits, and depends to a certain extent on the density of the demand for electric power in the different districts. The average size is from 1,500 to 2,000 square miles. Some of the districts, notably the West Lancashire district, only has an area of about 450 square miles. One of the largest in England is that in Shropshire and Stafford which has an area of approximately 2,500 square miles. It is intended that a joint electricity authority or some other body should be set up in these districts, charged with the duty of coordination and so reduce the coal consumption per unit generated to a reasonable amount. In settling the area of these districts, the commissioners take into account the convenience of administration, economic transmission distances, and whether grouping will be conductive to cheapness of supply.

Progress During Recent Years

Schemes of improvement are invited from existing undertakers operating in the district. When a scheme is approved, after all the formalities have been gone through, including two local enquiries, an order is made by the commissioners. If this order sets up a joint electricity authority and is confirmed by the ministry of transport, and approved by both Houses of Parliament, the joint authority can exercise all the powers of the authorized undertakers in the district, transfer the undertakings, build generating stations, erect transmission lines, and borrow money for carrying out the scheme in every detail. The authorities, however, cannot supply electricity on a retail basis in competition with existing undertakers, the intention of the commissioners is that the joint electricity authorities should confine themselves to the larger questions of generation on a big scale and transmission and distributing centres.

Up to the present time, new bodies have been constituted in four districts, two joint electricity authorities, and two advisory boards, and it is expected that work in another four districts may be completed this year. The greatest difficulties in the setting up of workable schemes have been found to be due to the tendency towards individualism of both municipal and company interest; the reluctance of owners of generating stations to allow these to be controlled by and vested in a new body; and the difficulties arising from different frequencies and systems of supply. A good deal of progress, however, has been made in spite of the fact that the high price of plant and the uncertainty of pending legislation has tended to hamper developments during the last few years.

The average consumption per head of population in Great Britain, based on published returns for electric light and power stations is approximately only 100 kilowatts per annum, although it is estimated by the commissioners that if allowance is made for electricity generated in traction stations and private stations, it is very nearly 200 kilowatts per annum. It is as high as 500 units per annum in some districts. During the last few years, however, the electrical industry has been the least depressed of any of the engineering industries in Great Britain.

Another direction in which considerable progress has been made is in the laying of interlinking lines working at high voltages for inter-connecting power stations that already exist, and thus equalizing the load on them. Up to the present, five capital stations have been erected, eight are under construction, including one hydro-electric station, and, provided a comprehensive scheme of main transmission can be agreed on, the situation as regards electricity supply is full of promise. There has been a notable rush for distribution powers to cover areas which at present are unprovided for, and since the end of the War from January 1920 to March 31st, 1923, one and one-quarter million kilowatts of plant have been installed, which represents an increase of 60 per cent in three years.

The output from these stations in 1919 was 3,694,000,000 units, in 1922 this had risen to 4,572,000,000 units, an increase of 24 per cent, and for 1923 the increase is 19 per cent. This increase would have been considerably greater had it not been for industrial depression. The amount of capital invested in the electrical supply undertakings at the end of 1918 was approximately £100,000,000 at the end of 1922 it was £144,000,000. While this increase in plant installed has been going on, there has been a notable reduction in the amount of coal consumed per unit generated. The figures for coal consumption in the four years 1920, 1921, 1922, 1923, has been in the ratio of 100-93-83-79. This review of the position of the electricity supply industry has been made very largely on information supplied to me by Mr. Page, one of the electricity commissioners, to whom I wish to express my indebtedness for the great trouble he has taken in the matter.

Special Technical Features in British Electricity Supply

Owing to the extensive development of the gas interests in Great Britain, and the fact that gas supply is given in a very large number of towns, the use of electricity for heating and cooking has not progressed to anything like the same extent as it has done in America. This state of affairs is, however, changing, and with the increasing difficulty of obtaining domestic service, the use of mechanical appliances and of electric cooking is making rapid strides. The diversity factor of this load is very considerable, and it is, therefore, a load which is extremely valuable to the central station engineer. In one of the smaller districts outside London where an intensive campaign has been conducted during the last twelve months, 1,200 cookers were installed within three months.

People in Great Britain have, however, a great deal to learn as to the use that can be made of electricity. There is still a certain amount of distrust as to the continuity of the service, although, actually the number of breakdowns of supply in Great Britain is almost infinitesimal. Apart from times when the mains have been disconnected for the purpose of extension, I cannot remember any occasion, during the last fifteen years, in Liverpool, when the supply of electricity has not been available, and I think it is very creditable to the supply authorities in our large stations, that such a result has been achieved. Reliability is regarded by us as the first essential for supply, the average Britisher is more impatient and distrustful of delay from breakdowns, than any other cause, and there is no worse advertisement for electricity than a breakdown which may last only a few minutes.

Nearly 97 per cent of the stations in Great Britain are working on steam, and of these, a very large majority are driven by steam turbines. The highest recorded thermal efficiency for the year ending March 31st, 1923, was just under 20 per cent, with a fuel consumption of 1.74 pounds per unit generated. Higher figures than these have been obtained on test; and the actual consumption of steam per kilowatt hour in the case of the Dalmarnock (Glasgow) steam turbine was just under 10 pounds of steam per kilowatt hour.

Frequency

The frequency that has been adopted for general purpose in Great Britain is 50 cycles, a figure which has been recommended by the British Engineering Standards Association for all new systems, though there are considerable areas on the North East Coast, operating at a frequency of 40 cycles, and some, notably Glasgow, at a frequency of 25 cycles. The highest power turbine which has yet been constructed with two poles at 50 cycles, is about 12,500 kilowatts, though several firms are prepared to build machines up to 18,000 kilowatts, to run at 3,000 revolutions per minute. With the higher frequency of 60 cycles, it is not possible to design such high power turbines with a two pole rotor and, therefore, the greater lightness of the high speed turbines, (as compared with those running at lower speeds) cannot be secured.

Considerations of frequency are, of course, entirely different in connection with water power plant, and the use of the higher or lower frequencies is not a matter of great importance in connection with the design of water wheel driven generators. The consensus of opinion among those who are responsible for electricity supply is that it is outside the bounds of practical politics, to bring about the adoption in the near future of one standard frequency throughout the country, and that the most that can be attempted at present is to aim at standardizing the frequency in particular districts. At the present time, the electricity commissioners are trying to secure that the stations using odd frequencies, such as 100, 93, 87½ and 60 should be got rid of, and so the number of main frequencies in use be reduced to three, namely 50, (standard), 40 and 25 cycles. The advantage of 25-cycle current for long distance transmission is, of course, well recognized, on account of the smaller charging currents that are needed for the line and, also, the reduced drop, due to inductive effects. For general purposes, however, the use of 25 cycles is not desirable, and the only large station using that frequency in Great Britain is Glasgow. That frequency was adopted at a time when rotary converters at 50 cycles were not altogether satisfactory, but I think the engineers responsible for the Glasgow undertaking, must regret, by this time, that a higher frequency was not used.

The use of frequency changers in Great Britain is comparatively rare. I do not know of any case in which a large number of frequency changers has been installed, such as have been put down, for example, in connection with the Shawinigan supply for the City of Montreal. Although by far, the greater part of electrical energy in Great Britain is generated with 3-phase currents, there have been one or two very interesting special cases. Mr. Highfield, the engineer for the North Metropolitan

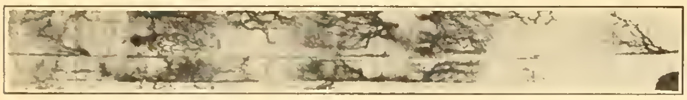

Figure No 1.—Showing Burning of Paper due to Corona Discharge.

Company, and past-president of the Institution of Electrical Engineers, installed some years ago a direct current high voltage system similar to that which has been designed by M. Thury. The advantages of continuous currents for very long distance transmission are well known. The gain due to the fact that smaller insulators can be used on the line and that inductive effects and charging currents are altogether got rid of, are very important. The use of this arrangement was seriously considered in connection with the electric supply from the Zambesi Falls to the Rand, but I think the installation of the North Metropolitan Supply Company, is the only one that has been put into practical use in Great Britain. This system, with a total capacity of about 500 kilowatts, has been in successful operation in Great Britain for the last ten or twelve years, but I understand from Mr. Highfield, that its use is not likely to be extended, owing to the necessity for inter-connection between the North Metropolitan Company and other supply companies, using three-phase currents.

Cables

One of the features which is, perhaps, most interesting in connection with electricity supply in Great Britain has been the extent to which cables have been used. As already mentioned, great difficulty has arisen when overhead lines had to be installed, and in a very large proportion of the electricity supply undertakings the use of overhead lines is practically unknown, though it is increasing rapidly in some districts.

The manufacture of 20,000-volt cable is, of course, standard practice, great lengths of this have been in operation for the last sixteen or seventeen years, and the cable manufacturers do not anticipate any serious difficulty.

The length of 30,000-volt, 3-core cable that has been manufactured during the last three or four years is over 350 miles, of which, nearly 40 per cent has been manufactured at the works of the British Insulated and Helsby Cables Company. All this cable is not yet operating at the full working pressure, but a considerable proportion of it has been in use since about 1921. One section of this, a length of 5 miles has been in actual use since February 1922, and has never given any trouble. In another length of 9½ miles which has been in use since September 1922, four faults were found at the joints, the cable itself has not given any trouble at all.

Other companies who are intending to use 30,000-volt cables are the County of London Company with 42 miles, the Shropshire and Worcestershire Company with a length of 15 miles, and the Manchester Corporation. The largest cable at 30,000 volts that has yet been constructed is that for the Manchester Corporation, in which the section of copper in each core is 0.35 square inch. Considerable lengths of cable for 45,000 volts have been constructed, but are not yet in operation, and the manufacturers are, I understand, willing to undertake the supply of 60,000-volt cable, though no figures are yet available.

One point of considerable interest in connection with high tension cables is the sparking due to corona discharge that is apt to occur, along the length of the paper insulation. In figure No. 1 is shown a specimen of paper that has been taken from a cable in which the wrapping of paper round the core has not been designed to accord with the direction of the electrostatic field due to the charges on the cores. It will be noticed that there is evidence of corona discharge and that the surface of the paper has been burnt by this discharge. In designing high tension cables it is important that this should be considered and in the cables that are now being constructed for extra high pressure, the wrapping round the core is arranged so as to follow the direction of the electrostatic lines of force.

One point of practical importance in connection with high tension cables is the method of testing. When a cable is designed for 50,000 or 60,000 volts, the charging current which it takes at full pressure is considerable, and it is often difficult to carry out a test with alternating currents after the cable has been laid. In order to get over this difficulty, methods of testing by direct or continuous current have been introduced, and a good many cable firms use a continuous voltage test for their extra high tension cables.

A good deal of discussion has arisen as to the ratio between the maximum continuous voltage that should be used in making the test, and the "working" alternating current voltage between the phases. It is well known that a dielectric will withstand higher dielectric stress when it is applied continuously than it will when the stress is an alternating one, and a figure as high as 2.6 has been given for the ratio between the d.c., and a.c., voltages which will break down the dielectric. The use of very high continuous pressures for testing cables is, however, open to serious objection. If too high a pressure is used, deterioration of the dielectric due to the formation of ozone in the interstices of the dielectric is more likely to occur.

In a paper by Messrs. Hayden and Eddy in the A.I.E.E. Journal, volume 42, 1923, it is stated that the ratio of d.c., to a.c., for test voltage on 33,000-volt cables should not be as high as 2.4. The actual ratio between the breakdown pressures, measured on samples of impregnated paper cable, varies from 1.6 to 2.46. In cable compound the ratio was 1.35 for impregnated paper 2.5. In a paper by Dr. Lichtenstein, the ratio was shown to vary considerably with increasing pressure and to be considerably less than 2.18 at a pressure of 33,000 volts a.c. Careful examination of these figures leads to the conclusion that the actual true ratio between the maximum voltage required to breakdown with continuous voltage, and the maximum voltage required to breakdown with alternating voltage, does not exceed 1.5. As a result of these observations, it may be stated that it is not advisable to apply a continuous test voltage to 33,000-volt cables exceeding 100,000 volts between the cores. If this test pressure is exceeded the test is more likely to damage the cable than serve any useful purpose.

A good deal of discussion has arisen as to the additional losses that are likely to occur when three phase current is supplied through three single-phases which are lead sheathed. It is well known that armoured cable supplying single-phase current is not suitable for this purpose, owing to the heavy losses that take place in the armouring of the sheaths, but where cables are lead sheathed only, the use of three single-core cables for a three phase supply is quite usual.

Distribution

A very large proportion of the electric power which is supplied in Great Britain is delivered to the consumer in the form of continuous or direct current. This is very largely due to the fact that many of the supply undertakings in Great Britain were started before three-phase currents were in general use. Hopkinson had devised, early in the eighties, the three-wire system, which is associated with his name, and about 86 per cent of the electricity supply undertakings in Great Britain still use the direct current, three-wire system for distribution; in fact, that may be regarded as the standard system of distribution for most of the large towns. A direct current supply to factories has been found a very great convenience when a large range of speed variation in the motors connected to the supply has been required.

There are many motors in operation to-day where the range of speed variation is as much as 8: 1, while a range of speed variation of 6: 1 is met with frequently. The cost of changing over from direct current to alternating current is very largely due to the additional charge which is entailed by the installation of large range variable speed three phase motors. Where the range of speed variation is relatively small, this is not a matter of very great difficulty, but the cost of a three phase motor which is required to have a speed range of even 5: 1 is very heavy, and this fact has militated against an extensive transformation of system. When new stations are put down, it is an almost invariable rule for the transmission and distribution to be effected by three phase currents, and in some towns where a large proportion of the load is a lighting load, the distributing network is being gradually changed from d.c., to a.c. It follows from this that the transformation of alternating current to direct current for distribution purposes is a very serious and important problem.

In the earlier stations it was an almost invariable rule to use motor generators, but as rotary converters improved in design, they have gradually displaced the motor generators. A type of machine which has been installed in quite a number of sub-stations is the motor converter. This machine has the advantage of running at half the speed of a rotary converter with the same number of poles and the commutating problem is, therefore, much less difficult. Quite recently there has been considerable development in the use of mercury arc rectifiers, which are now being built up to powers of 500 kilowatts. Although some difficulty was found in the earlier types, due to their interference with telephones, this difficulty has now been overcome by the use of special shunts. Some of the methods employed have been described in a paper recently read before The Institution of Electrical Engineers by S. C. Bartholomew.* Where a direct current supply is needed for traction purposes for high voltages, the use of the mercury arc rectifier is likely to increase, and as the voltage at which the rectifier operates is raised, the efficiency of the machine, of course, increases rapidly. The same type of converter has been used quite extensively in Germany and Switzerland and in connection with the electrification of the Midi Railway.

Quite recently a new type of machine, called a transverter, for converting alternating into direct current has been described by Messrs. Calverley and Highfield.† In this machine the rotating part is the brush rocker and brushes, which are driven by a synchronous motor connected to the a.c. supply. The three phase alternating current is supplied to six oil immersed stationary transformers, each with three cores and duplicate secondary windings. The ratios are so chosen and the connections made so that the pressures on the secondaries give a 36-phase current. The secondaries are connected to a stationary commutator from which direct current is collected through the rotating brushes.

The direct current is brought out through slip rings connected to the two sets of brushes. The machine may be used either to transform from alternating current to direct current or vice versa, and would seem likely to prove of great value in very long distance transmissions of power, and possibly for linking up alternating systems of different frequency. The transverter exhibited at the British Empire Exhibition was of 2,000 kilowatts and transformed from 6,600 volts, a.c. to 100,000 volts d.c.

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* Journal of the I.E.E., 1924.

† The Electrician, May 9th, 1924.

Author's Note. — I am greatly indebted to Mr. J. S. Highfield for information relating to the installation of the Thury system and the transverter, and to Mr. B. Welbourn for data with reference to the installation of high pressure cables in Great Britain.

Work of Canadian Railway Troops in the Great War, 1914-1919.

A brief outline of the organization and work of the Canadian Railway Troops.

Lt.-Col. A. C. Garner, D.S.O.,
Late O. C. 12th Battalion, Canadian Railway Troops.

It may be said that practically nothing had been done in the way of railway construction in the British army areas until the winter of 1915-16 when the Canadian Corps built a system of light railways to serve the area occupied by the corps and which proved the usefulness and success of light railways. Meanwhile light railways had been used by the Germans and French to great advantage, particularly as to the former.

This situation was not due to lack of appreciation and necessity as to an adequate system of both standard and narrow guage railways by the British War Office,but rather to the fact that sufficient technical troops, material and rolling stock were not available.

The first Canadian railway troops to arrive in France was the Canadian Overseas Railway Construction Corps, a force of some six hundred of all ranks, and composed chiefly of personnel carefully selected from the staffs of our several transcontinental railways. This unit reached France in the autumn of 1915, and did not become actively engaged in railway construction until the spring of 1916, being employed meanwhile on the building of gun emplacements for heavy artillery, and defensive works.

During 1916 railway battalions were organized in Canada composed of personnel suitably qualified and at the same time other battalions were organized in England from selected personnel drawn from all branches of the Canadian troops in England at that time. Two battalions were organized in France in the autumn of 1917, these being formed by re-organization of the 2nd and 3rd Canadian Labour Battalions into the 12th and 11th Battalions C.R.T., respectively, the selection of these units as railway troops being due to the good services they had performed on railway construction since arrival in France early in 1917. Railway battalions began to arrive in France about the spring of 1917, and by the winter of that year the Corps Canadian Railway Troops was fully organized with a working force of thirteen battalions and several operating and workshop companies, or a strength of about fifteen thousand all ranks. Included in these battalions were the "Canadian Overseas Railway Construction Corps" and a "Pioneer Battalion" from the Canadian corps; both these units being reorganized as railway battalions. In the spring of 1918 the 14th Battalion C.R.T., organized in England arrived in France and by the end of the war, or on Armistice Day, the corps had attained a strength of some twenty thousand, all ranks. It is a fact that systematic and extensive railway construction only commenced about the middle of 1917. By winter of 1917-18 a system of light railways had been constructed and were in operation along the British front from the Belgian coast on the north to about opposite Peronne on the south, and consisting of about one thousand miles of line and in addition standard gauge railway construction had been increased by sixty per cent.

In order to make this paper as short as possible it will not be possible to give in detail the value of a well organized and ample system of railways and what it meant towards ensuring the success of our several armies. It is almost sufficient to say that no extensive operations were carried out after the summer of 1917 without General Headquarters being assured by "Transportation" that the railway system in the area affected was complete and able to take care of the situation in case of advance or retirement.

In the battle of Arras, April-May 1917, all requirements were met, similarly in the advance on Cambrai and later repulse in November-December, 1917. The retirement in March 1918 and the general advance, August-November 1918, in the latter case all along the line trains were running into the several cities, towns and villages within forty-eight hours, and in some cases within twenty-four hours, of our troops taking the various places. Similarly transportation and railway troops gave the same results in all operations north of Arras, but I have only referred to those actions and areas in which the 12th Battalion C.R.T., was engaged.

We learned of the commander in chief's appreciation through orders, and more directly through the director general of transportation after the Armistice, when he stated that the commander in chief attributed a great deal of his success, particularly in the latter stages of the war to transportation and the work of railway troops. This seeming self praise of railway troops services may appear out of place, but the facts are as stated.

Early in 1918, Brigadier General J. Stewart C.B., C.M.G., commanding Corps Canadian Railway Troops was in addition to that appointment made director of railways, harbour and dock construction for the British armies in France and Belgium, a striking and remarkable tribute to his efficiency and the work of Canadian railway troops by the British authorities and especially so since General Stewart never professed to have a knowledge of matters military.

To continue, Corps Headquarters C.R.T., was located at General Headquarters for all the British armies and came directly under the director general of transportation and the director general of construction. The former was represented in each army by an assistant director general of transportation, having under him a chief railway construction engineer, or R.C.E., and staff for standard gauge railways and an assistant director of light railways and staff for light railways, the two latter with commanding officers of Canadian railway battalions, when in an army area, represented the director general of construction. Each staff of the R.C.E., and A.D.L.R., above noted, were complete, (as in civil administration), as to operation, signals, telegraph and telephone, rolling stock, construction and maintenance. Canadian railway battalions, one or more depending on the extent of the system and amount of work to be done, were assigned each army.

Each battalion commander received his orders as to movements army to army, etc., interior economy and battalion equipment, etc., from the general officer commanding Canadian Railway Troops. He was assigned his work and territory in each army by the R.C.E., or A.D.L.R., of the army depending on whether his work was in connection with standard gauge or light railways, and for military efficiency generally, discipline, clothing, quarters and rations, he was responsible to the army commander through the several army corps commanders in whose area he might be operating, briefly, the battalion commander acted under two different heads, viz:—through the Corps C.R.T., for technical duties and equipment and through the army for military efficiency, duties, training and fighting equipment, etc.

Despite this seeming complication the battalion commander was given the greatest liberty or freedom of action, and was entitled and able to approach, at any time he saw fit, the army commander, the G.O.C., C.R.T. and directors general of construction and transportation.

From the foregoing you can see that the battalion commander was directly responsible to three heads, viz:—the G.O.C., C.R.T., the A.D.G.T. and the army commander and also that the unit had to be organized along two lines, viz:— (1) General engineering; (2) Military efficiency in every respect, including fighting. Each battalion was well outfitted with technical equipment, mechanical transport, motor cycles, mules, wagons, scrapers, etc. The strength was kept up to an average of one thousand and fifty, all ranks. In addition the R.C.E. or A.D.L.R., as the case might be, supplied us with steam shovels, pile drivers, working tools, work trains and labour. Each sapper was supposed to be able to handle from five to ten labourers, but the average amount of labour employed was usually from five hundred to one thousand. This was due to the scarcity of same and at times fighting troops had to be employed in order to get the work done. The most labourers I had at one time was between five thousand and six thousand, when the battalion was engaged in construction of part of the "Amiens Defense System", in April, 1918, and before the German offensive was finally checked.

Disposition of a railway battalion was made to best serve and control the work and area assigned to it. Sub-areas were assigned each company with company headquarters centrally situated and battalion headquarters centrally situated as to the whole. The location of each camp was an important matter to ensure invisibility from enemy observation, protection from shell fire and aerial bombing.

A small survey party was organized in each company, consisting of one officer and a few other ranks, and also at battalion headquarters, and this personnel was placed under the direction and control of the chief engineer of the battalion, who was directly responsible to the battalion commander for all engineering work performed by the battalion, and for the preparation of all engineer reports, plans and estimates. The second-in-command acted as such and also occupied a position similar to that of a large contractor in civil life.

Normally we were responsible for our area as to construction and maintenance, preparation of plans, (as to railways), in case of advance or retirements and defence of our system by fighting. In cases of retirement, operation of the system also fell to our lot, as proven in the retirement before Cambrai, December, 1917, and retirement on the Somme in March and April, 1918, and in such instances the care of labour assigned us was an added responsibility, as they were not armed.

All railways were carefully surveyed, mile posts erected, stations, sidings, etc., were laid out and named and proper plans of the whole system made. All plans, sketches, etc., were made at battalion headquarters by an efficient draughting staff, who were well equipped.

As each line or branch was constructed it was handed over to the operating staff, or department of the C.R.E., or A.D.L.R., who arranged whilst construction was in progress for the construction of telephone and telegraph lines to cover the whole system. Telephones were installed at each station, (called controls), and at the battalion and each company headquarters, the whole being linked up with the signal system of the army. In addition, men of the battalion were placed on duty with the telephone operator at each station or control post, so that in case of derailment, damage to track by shell fire or other emergency, a working force was on the ground in the shortest possible time, and at any hour of the day or night.

This was the ideal system of intercommunication, but as you can imagine it was rarely fully attained or experienced. To supplement this system a despatch motor cycle service was organized by and kept under the control of battalion headquarters and under the most trying circumstances I found this service to be the most satisfactory and always entirely reliable. You can imagine the position in case of attack or defense, with the telephone system put out of business in almost the first hour. On forward or front line construction work field telephones were used by working parties to advantage.

Speaking of railway systems, these, at the outset, of necessity covered the several army areas, each system eventually being linked up with that on either side. They were however kept intact once completed, irrespective of where army area boundaries might come or be at later periods. The result was that in taking over or completing a system that one might be working in two and in some cases three different army areas.

On arrival in an army area, the battalion commander would be assigned his area and work by the C.R.E., or A.D.L.R., as the case might be. He would then requisition for material, labour, work trains and tools. Each

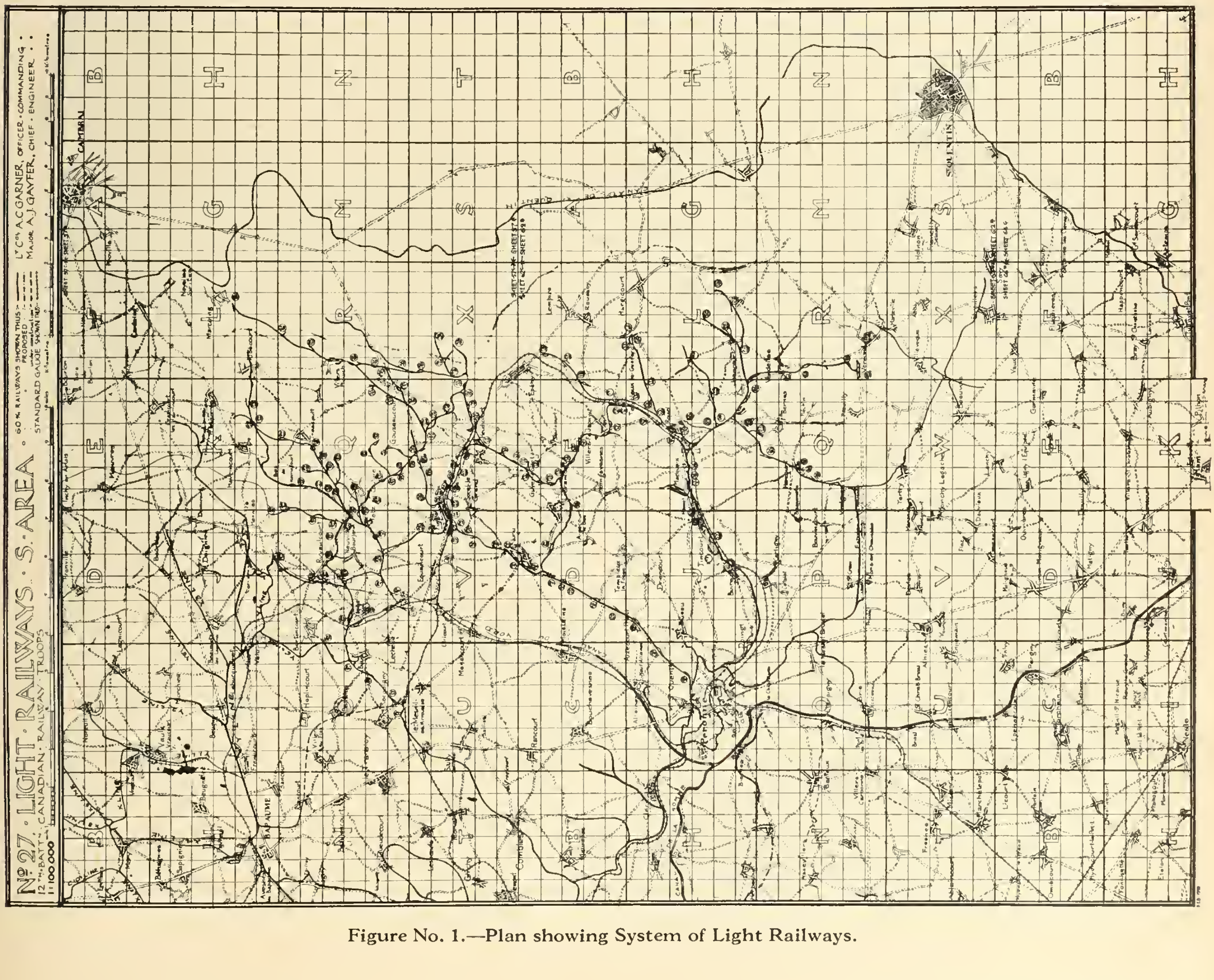

Figure No. 1.—Plan showing System of Light Railways.

construction job would be considered in the light of a contract, dates were fixed, and work would then be rushed to completion. This generally necessitated a good deal of rustling and close supervision, as material rarely arrived in proper order, that is in the order required, or in sufficient quantities, labour was always short, slow in arriving and had to be trained and other difficulties of a like nature had to be overcome in order to get the work done which was usually from a week to ten days ahead of time. I leave you to imagine the results obtained and rapidity of work, when you consider the keen competition always existing between the several railway battalions and the urgency of the work.

Light Railways

Light railways were used to link up the several railheads, (standard gauge), some six to ten miles in rear of the front line, each railhead being practically the end of the standard gauge system, as an illustration, railheads at Achiet-le-Grand near Bapaume and Peronne may be cited. Each system spread out in fan like form or shape from each railhead and linked up with similar systems operating or extending from railheads on either side. These systems on the average ran up to within eight hundred yards of the front line and were again linked up with light tramways (push car propositions), which were carried practically up to the front line and usually constructed by the army engineers or tramway companies under the supervision of the Canadian railway troops battalion commander and were taken over by him in case of advance. When systems were completed a time table was made up and trains were run on schedule, and in addition to carrying supplies and material of all kinds, bringing back the wounded and men going on leave, they were used in carrying out relief by whole army divisions, which latter was effected quickly, smoothly and without accidents. Each system served from six to ten miles of front line.

As tractor power we used steam locomotives by day over lines mainly screened from the enemy excepting as to balloon and aerial observation, and for forward and exposed work we used gasoline tractors of 20 to 40 horse power. By night, (our most active operating period), we used both steam and gasoline. Train loads averaged about 50 tons net, with a speed of ten to twenty miles per hour, depending on track conditions and urgency of orders, the average speed being twelve miles per hour.

A maximum two per cent grade was not exceeded excepting where for various good reasons this was unavoidable. The sharpest curvature was seventeen degrees and thirty-two minutes with one hundred metre radius, or a thirty-five degrees and thirty minute curve with fifty metre radius, and in station yards and terminals a sixty-one degree and two minute curve with thirty metre radius. Still sharper curves excepting in the latter case had to be used at times.

Rails were of varying lengths and weights, viz:—lengths two and one-half, five and seven metres, and weights nine, fifteen and twenty pounds respectively to the metre. Whenever possible rails of five metres length and twenty pounds to the metre were used. Steel ties four feet long eight inches wide with edges flanged downwards for a depth of about two inches and rails bent to certain curvatures and fittings for frogs, turnouts, switches, etc., in made up forms were supplied, but such material was rarely found of value in the form or shape supplied, as when put down or made up as the case might be they would not fit the various types of rolling stock used. The idea was good and later such equipment was built to suit the requirements, in the meantime a good deal of this material was remade or rebuilt and wooden ties were used whenever obtainable and particularly on curves which ensured a steadiness and non-shifting of track as compared with steel ties.

For ballast we used mine earth, sand, chalk, and at times we had only clay. The first two were always difficult to obtain, but chalk could generally be secured in the area or within reasonable distances. The chalk made the lines show up clearly to enemy observation, and these were sprinkled with coal dust, dirt, etc., when time permitted. Special work and material required in preparation for an attack was carefully camouflaged or covered with scrub, Willesden canvas, etc.

We generally experienced difficulty with water supply over the system. This was obtained by deepening existing wells, boring new ones, tapping the army water supply and by carrying water in tanks.

The rolling stock included steam locomotives of various types ranging from ten to fifteen tons, gasoline tractors from twenty to forty horse power and petrol electric tractors of sixty horse power. The latter, however, were not entirely satisfactory.

Cars twenty feet long and four feet six inches wide, with drop sides, and a capacity about ten tons and the same capacity as cars used on standard gauge, crews from (3) three to (4) four men, viz:—engineer, fireman and train hands, the latter were usually qualified as either engineers or firemen, and there was no difficulty in obtaining a good supply of technically qualified train crews. All train crews were tried out practically under well qualified men. Repair shops were established at convenient points to take care of rolling stock and as you can imagine these shops were greatly overworked.

A rough comparison between light railways and mechanical or motor lorry transport and showing the advantages of the former would not seem out of place at this point. As stated the average train load carried 50 tons net and three or four men as train crew, the fuel was economical, the average speed was 12 miles per hour, and the upkeep of road comparatively inexpensive. To carry an equal amount by mechanical or lorry transport would require roughly eighteen 3-ton lorries, three men to each lorry, an average speed of eight miles per hour, and fuel at about one-half gallon of gasoline per lorry, per mile or nine gallons of gasoline. Other items of consideration are delays on account of break-downs, presenting large targets for the enemy, costly upkeep of road, requiring as many if not more men than on railways, and the difficulty and cost of obtaining road material. The comparison is readily apparent and greatly in favour of light railways without going into further detail.

Location of Lines

In addition to the usual difficulties all lines had to be laid out with a view to being screened from enemy observation as much as possible. and had also to be made to fit in with the army requirements as to disposition of forces, and batteries, and along lines suitable for attack or retirement. Cuts, fills and bridge work was avoided as much as possible and you can readily imagine that as a result lines were very winding.

Daily returns were sent in to battalion headquarters from those in charge, covering the system under the battalion and these were made up into weekly returns and sent to corps headquarters, C.R.T. A monthly return was also prepared which was forwarded through the usual channels to Canada.

Work, methods, systems etc., as to standard gauge were mainly the same as those followed by our railway systems in Canada. In fact the construction, maintenance and operation of both standard gauge and light railways were carried out as nearly as possible in conformity with our systems in Canada.

The American army, (as to railway troops), adopted practically the same organization and system as ours. Some of these battalions were attached to battalions of the C.R.T., for instruction in the latter part of 1917, and the early portion of 1918, and in this connection the 14th Battalion U.S. Engineers were attached to us for a short time late in 1917, and in the early part of 1918, and until after the retirement before Amiens the 12th Battalion U.S. Engineers were attached to us. These battalions were, however, organized more for purposes of operation than for railway engineering in general, and operation was the work upon which they were mainly engaged while working with us.

Depending on the situation, the battalion would be employed a few months alternately on standard gauge and light railways, altogether we were employed about an equal amount of time on each class of work, viz:—a year on standard gauge and a year on light railways.

I found the light railway work by far the most interesting, as it fitted in so closely with all military operations, kept us in close touch with all branches of the service and the activities of an army as a whole, and being the furthest forward that railways could be constructed and operated we therefore experienced forward area and practically front line conditions.

I would like you to picture our work being carried out under a harassing, and in many instances steady shell fire both day and night, often severely bombed by night and the work being performed without the attendant excitement experienced by those "going over the top". It was a common thing to have several thousand feet of line blown out weekly by shell fire. All ranks as a whole worked harder than they had ever done in civil life. It was a common experience to work from three weeks to a month without a break, and this involved much night work. The battalion was over thirteen months in *forward areas* without relief or a break, but I never heard any complaints or grumbling, the desire of all seemed to be to do their work well and to maintain the good name established, but "not advertised", although duly recorded, of the Corps Canadian Railway Troops.

As an experience of endurance I may quote the retirement before Amiens in March and April, 1918, when all ranks worked incessantly under high pressure and facing a continuous and terrific shell fire and in addition intense bombing by night and machine gun fire from enemy aeroplanes for three days and four nights without sleep or rest of any kind. Lines were operated in the face of the enemy, and so long as they were of any service to our retiring troops, and were only abandoned when there was no further use for them and the enemy were practically on top of us. In some instances operating parties being surrounded by the enemy had to effect their escape as best they could. Immediately afterwards we built some forty odd miles of trench and wire entanglements, being a part of the Amiens defence system, and in a creditably short space of time, before any real break or rest was experienced.

When the attack commenced about 4.30 a.m., March 21st, 1918, the battalion had charge of the light railway system operating out of Peronne railhead. This system comprised about one hundred and twenty-five miles of line and served about nine miles of the front line. The attached sketch serves to illustrate a light railway system and this particular incident.

The following information extracted from *Official Records* and covering the work of railway troops up to July, 1918, may be of interest:—"During the past fourteen months they have of broad-gauge railways, located, 297 miles; graded 320; repaired 77; track laid 300; ballasted 295; surfaced 228; and maintained 946; while of narrow-gauge have located 1,750; graded 946; repaired 238; track laid 934; ballasted 913; surfaced 673; and maintained 6,923. In addition they have built miles of trenches, many bridges, salvaged much property and prepared safe shelters for the nurses and doctors in the bombed area. Much of this work has been done under fire, and the casualty list but partially indicates the dangers to which the Canadian troops are subjected."

The number of casualties from enemy weapons was 1,381.

Decorations and despatches awarded up to July, 1918, included C. M. G. 2, D. S. O. 17, D. C. M. 15, M. M. 183, Mentioned in Despatches 50.

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Professional Conduct

As the question of the employment of government engineers in municipal or private practice outside their regular duties has been before the membership and the Council of the Institute for some time, the case of one of our members in Ontario thus engaged having been ventilated in Ontario through questions by a member of the Legislature, the Council of the Institute has assured itself that these practices have been discontinued under directions from the Provincial Government, and such steps are being taken as will insure that there shall be no recurrence.

The prompt and energetic action of the Government of Ontario, once this long tolerated abuse had been called to their attention, should be a source of satisfaction to the engineers of this country.

Misuse of Term Engineer

Members of *The Institute* will be interested in a proposal originating in the United States and approved by the United States Civil Service Commission to adopt the term "engineman" in place of "engineer" when referring to positions, the duties of which are the operation, maintenance and repair of stationary or moving engines.

This action might well be followed by our own governmental and public authorities. The indiscriminate use of the word engineer has done much to obscure in the public mind the real importance and significance of the engineering profession. Our members can, themselves, aid in correcting this state of things by consistently restricting the use of the word engineer to denote the profession which we desire it to signify.

The Western Professional Meeting

The Calgary Branch is able to report substantial progress in connection with the arrangements for the western Professional Meeting which will open in Banff on July 11th, and will close on the 16th. Morning sessions for papers and professional business will be held on the 13th, 14th and 15th.

Provision is being made for the camp accommodation of members from outside points, the necessary equipment for this purpose, including tents, cots, blankets, and cooking and messing, having been secured.

Committees of the Calgary Branch are completing the organization and arrangements for the technical programme, sports, transportation, camp management, and publicity, and a large attendance is expected.

By the time this announcement is in print further information will be available, so that members can make their plans in detail.

A particularly pleasing feature is that the meeting will be held immediately after the Calgary Stampede (July 6th to 11th), which members will be able to attend just before they proceed to Banff. It will be hard for members to resist the combined attractions of Calgary during the Stampede week, the natural beauties of Banff, and the technical and social features of the Professional Meeting.

Committee announces arrangements for Meeting

The Secretary of the Calgary Branch, who is also Secretary of the Committee of Arrangements, has issued the following circular announcing details of the Meeting, to the Secretaries of all the branches of *The Institute.*

To the Secretaries of other Branches of the E.I.C.:

Final decision having been reached with regard to holding the Western Professional Meeting at Banff this year, I am now in a position to give you particulars relating to arrangements and decisions made by the Committee of Arrangements.

Camping accommodation will be provided for about 200 members, delegates, wives and families of members. The camp will include dining facilities, and will be fully equipped with cots, bedding and general conveniences. It will be on the same site as that of the Western Professional Meeting held in 1920 at Banff. This is close to one of the best 18-hole golf courses in Canada, which is available to all who wish to play upon payment of very reasonable ground fees.

The camp will be pitched on Saturday afternoon, July 11th, when all who wish may go under canvas, although dining accommodation will not be ready until the following day at noon, but the restaurants in Banff will be available to supply all needs in the meantime.

The committee went very carefully into the matter of charges to cover expenses, and they do not desire to more than break even. Having estimated costs under favourable conditions, the following will be the probable charges:

Camp charges............................ $4.00

The above charge will be paid upon entering camp by all persons over 16 years of age, whether they stay in camp for the whole time of the meeting or not. This does not apply to guests and visitors who do not go under canvas. No camp charge for children under 16 years.

Men unaccompanied by families, per day.....	$3.50
Men accompanied by wives, per couple, per day	6.00
Children — 10 years and under, per day......	2.00
Children — 10 to 16 years, per day...........	3.00

The charges in the above four items cover camp accommodation and meals.

The official opening of the meeting will be on Monday, July 13th, and morning sessions will be held on that day and the two following days. Afternoons will be given to recreation and likewise Thursday, July 16th, — the last day.

The committee desires to arrange matters so that there will be plenty of time for recreation, and although there will be technical papers, discussions, council and committee meetings, and other business, it is hoped these can be so arranged that they will not take up more than the mornings of the three days mentioned.

There are many details yet to work out, which various sub-committees have in hand, and in due course I will advise you of any important matters which may come up before the Banff Meeting takes place.

I believe it is generally known that the Calgary Stampede ends on July 11th, and it is thought that a number of the members from outside points would care to take in some of the Stampede on their way to Banff for the Western Professional Meeting.

Summer tour fares are good from all points to Banff, with stop-over privileges, and I do not believe better rates than these can be obtained.

Yours very truly,

G. P. F. Boese,

Secretary, Committee of Arrangements.

OBITUARIES

William James Stewart, M.E.I.C.

William James Stewart, M.E.I.C., chief hydrographer, and widely known and respected official of the Dominion Government, died at Ottawa May 5th. Mr. Stewart, who had been in failing health for several weeks, had been confined to the Civic hospital for the past two weeks. He was in his 63rd year.

A large circle of friends, including many prominent government officials, will deeply mourn and regret the loss of Mr. Stewart, who was greatly admired by all with whom he was thrown in contact during his professional duties. He also had a great number of close Ottawa friends not in the service, he having lived in the city his entire life.

W. J. STEWART, M.E.I.C.

Mr. Stewart was born in Ottawa, a son of Lt.-Col. John Stewart, first commanding officer of the Ottawa Field Battery, and Mrs. Mary Stewart, on January 3rd, 1863. He was educated in the Ottawa Public Schools, was a gold medal graduate of the Ottawa Collegiate Institute in 1879, and a gold medal graduate from the Royal Military College, Kingston, in 1883.

After graduating, he was appointed assistant to Captain Boulton, R.N.R., who was working on a survey of the Great Lakes. In 1893 Mr. Stewart succeeded Captain Boulton, and in July, 1904, was appointed chief hydrographer of the Dominion.

During his term as chief hydrographer, Mr. Stewart did much excellent work in connection with surveys, chart making and map making. He issued all charts of the Atlantic and Pacific coasts, and also of the Great Lakes. In 1907 he was appointed a commissioner for Canada on the International Waterways Commission, and was advising engineer to the Boundary Waters Commission. He delineated the boundary line between Canada and the United States as agreed upon in the treaty between Great Britain and the United States in 1909. Afterwards he was appointed advising engineer for the International High Joint Commission, and later advising engineer for the Department of External Affairs.

At the request of the British Government, Mr. Stewart was sent to Europe to advise on the International boundary lines as decided upon by the Treaty of Versailles, and after his return to Canada, was appointed one of the commission who investigated the effect of the Chicago withdrawal of the water from the Great Lakes. At that time he studied the levels of the St. Lawrence River between Montreal Harbour and Quebec. Later he represented Canada in connection with the regulation works at the mouth of lake Superior and at Sault Ste. Marie.

Mr. Stewart was an outstanding mathematician and was considered an authority on mathematics and on hydrography. He was a very close friend of the late Dr. Klotz of the Dominion observatory. In religion Mr. Stewart was an Anglican and a prominent member of St. John's Anglican Church. He was a follower of various kinds of sport, and was an enthusiastic curler. Surviving him are his widow, formerly Miss Clara L. Lasher, of Kingston; two daughters, the Misses Avis and Sybil, at home; and two sisters, Mrs. J. E. Macpherson, of Ottawa, and Mrs. J. C. Hunter.

The funeral was held on the 7th May, and the floral tributes were very beautiful and numerous, and in addition to the many personal tokens included the following from organizations with which Mr. Stewart was associated: Department of Marine and Fisheries, Staff of Hydrographic Survey of Canada, Department of Labour, International Joint Waterway Commission, Dominion Water Power and Reclamation Service, Sir Adam Beck and Hydro-Electric Commission, Interdepartmental Committee, St. Lawrence Waterways, Shipping Federation of Canada (Montreal), Dominion Marine Association (Montreal), Staff of St. Lawrence Ship Channel, Royal Military College Club, Ottawa Branch of *The Engineering Institute of Canada,* Girls' Auxiliary of St. John's Church, Aluminum Company of America and the Northern Aluminum Company.

Out-of-town representatives of prominent public bodies were Messrs. A. Monro Grier, K.C., president Canadian Niagara Power Company; H. G. Acres, chief engineer Hydro-Electric Power Commission; C. C. McLennan, also of the Hydro Commission; L. G. Rorke, director of surveys for Ontario; Arthur Amos, director Hydraulic Service for Quebec; A. R. Decary, of Quebec, representing the Council of *The Engineering Institute;* F. W. Cowie, representing the Montreal Harbour Board, and Brig.-Gen. C. H. Mitchell, representing Toronto Branch of *The Engineering Institute of Canada.*

John Blakelock McCaw, S.E.I.C.

John Blakelock McCaw, S.E.I.C., died on July 12th, 1924, at St. Alexis de Grande Baie, near Chicoutimi, P.Q., in a heroic effort to save two young women from drowning. Mr. McCaw had successfully rescued one of the girls and was swimming to the aid of the other when he was overcome by exhaustion and disappeared before any assistance could be given him.

Mr. McCaw was born in Sherbrooke, P.Q., on April 4th, 1901, where he received his elementary and high school education. In 1923 he graduated from McGill University as a Bachelor of Science in mechanical engineering.

Mr. McCaw was very active in sports, excelling in track work, basketball and wrestling. In the latter he represented his university at the inter-collegiate assault-at-arms while in his freshman year.

During his summer vacations he was engaged in bridge construction near Sherbrooke, and later was on the engineering staff at the Cedar Rapids power development. At the time of his death, Mr. McCaw was attached to the statistical department of Messrs. Price Brothers and Company's Kenogami paper mill.

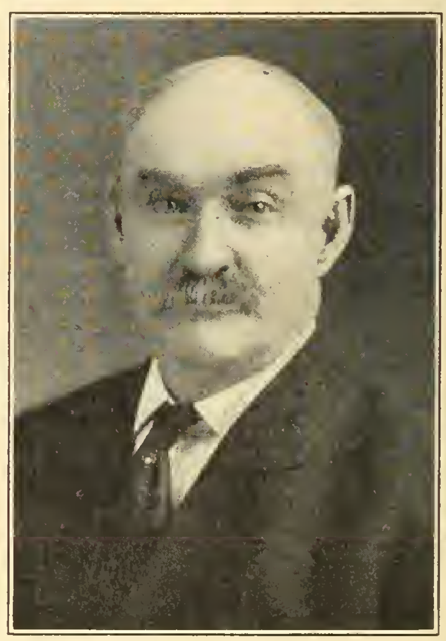
Hedley Vicars Thompson, M.E.I.C.

Hedley Vicars Thompson, M.E.I.C., whose death occurred at his home in Toronto on February 17th, after a brief illness, was born at Oxford, Nova Scotia, on May 9th, 1859, and received his degree of B.A.Sc. from McGill University in 1885. Mr. Thompson went to Chicago in 1886, where he was employed with the Chicago, Burlington and Quincy Railroad until 1890, and then with the Keystone Bridge Company at their Chicago office. From August 1892 to September 1909 the late Mr. Thompson was engaged as draughtsman, designing engineer and plant engineer with the New Jersey Steel and Iron Company, the Trenton Iron Company and six years with the American Bridge Company. From 1909 to December 1914 he was designing engineer of the bridge department of the Canada Foundry Company.

Subsequent to 1914, Mr. Thompson was in private practice, during which time, among other engagements, he was in charge of the structural design or reporting on existing or proposed bridges for the Canadian Allis Chalmers Limited, Norman McLeod, Limited, Ontario Railway and Municipal Board, City of London, Ontario, and City of Hamilton, Ontario. Mr. Thompson was admitted to *The Institute* as member in 1921. The loss to the profession of such a highly esteemed member will be read of with regret by the many members of *The Engineering Institute* who knew him.

Charles Orrin Foss, M.E.I.C.

C. O. Foss, M.E.I.C., formerly chief engineer of the New Brunswick Electric Power Commission, who was widely known as connected with railway and power work in the Maritimes, died suddenly on May 19th, at his home at Pennacook, N. H. Mr. Foss was born at Wentworth, N. H., on March 20th, 1852. He came to Canada in September, 1884, as engineer on the Nictaux and Atlantic Railway with headquarters at Middleton, N.B. He was later engaged on the construction of the Transcontinental Railway in New Brunswick. In 1917 he was appointed chief engineer of the St. John and Quebec Railway and directed the construction of the line from Gagetown to Westfield. Later he undertook for the New Brunswick Government investigation of the possibilities of water power development in that province, giving special attention to the proposed development at Musquash. In 1920 he was appointed chief engineer and a member of the New Brunswick Electric Power Commission and had charge of the Hydro development at Musquash. He resigned from that appointment about one year ago. Mr. Foss was admitted to *The Institute* as a Member on December 18th, 1902.



C. O. FOSS, M.E.I.C.

Reginald Edward Walter Hagarty, A.M.E.I.C.

R. E. W. Hagarty, A.M.E.I.C., consulting engineer of Toronto, died on April 29th, 1925, at Calydor, Gravenhurst, Ont. Mr. Hagarty was born at Seaforth, Ont., on March 22nd, 1886. He moved to Toronto with his parents while quite young, so that his primary education was received in that city. On matriculating, from Harbord Collegiate, Toronto, he enrolled with the science class at the University of Toronto, graduating with honours in civil engineering in 1908. Following graduation he joined a party of engineers sent by the Guggenheim interests of New York to the Yukon on mineral survey work. After his return from the Yukon, he became associated with the Trussed Concrete Steel Company, with which he was engaged until 1915, as the firm's representative in western Canada. Later he returned to Toronto as a consulting engineer, specializing in concrete and steel construction. In this capacity he was retained in connection with the erection of the King Edward Hotel, Toronto, the Mount Royal Hotel, Montreal the Medical Building at Western University, London, and the Sarnia and St. Catharines Collegiates. He was formerly consulting engineer to the Steel Fabricators Association of Canada. The late Mr. Hagarty joined *The Institute* as Student on March 12th, 1908 and was transferred to Associate Member on January 24th, 1916.

PERSONALS

Robert Forbes, S.E.I.C., is on the divisional engineer's staff of the Belleville division of the Canadian National Railways and is engaged on survey work.

W. M. Reynolds, S.E.I.C., formerly with the Lumsden Engineering Company at Welland Junction, Ont., is now engaged on dam and power house construction for the Backus-Brooks Company at Kenora, Ont.

F. Hubert Denteith, S.E.I.C., who is graduating from McGill University this year, has been appointed junior chemist with the Brandram-Henderson, Limited, Montreal.

A. A. Anderson, A.M.E.I.C., of the Department of Public Works, Canada, has been appointed senior assistant engineer and has been transferred from London, Ont., to Fort William, Ont.

B. M. Hill, M.E.I.C., and C. McN. Steeves, M.E.I.C., were re-elected, at the recent meeting of the alumni of the University of New Brunswick, to the senate of the university for a further period of two years.

Karl R. Somerville, S.E.I.C., who has recently completed his course in electrical engineering at the University of Toronto, has been appointed to the test course with the Canadian General Electric Company, and is located at Schenectady, N.Y.

J. E. Buerk, A.M.E.I.C., engineer on construction of the Carter-Halls-Aldinger Company at Winnipeg, Manitoba, has been transferred by the company to their Vancouver office. Mr. Buerk has been connected with this company for the past fifteen years.

John Farley, S.E.I.C., who has been connected with the Toronto office of the Link-Belt Company for some time has been transferred to the Montreal office of the company in the capacity of manager. Mr. Farley graduated from the University of Toronto in 1922.

J. Forest Rutherford, S.E.I.C., of Westmount, Quebec, who has just completed his third year in electrical engineering at McGill University is located at Isle Maligne on electrical work for the Quebec Development Company for the summer months.

R. S. Weir, S.E.I.C., is with the Quebec Development Company at Isle Maligne, where he is engaged in electrical work for the summer months. Mr. Weir has just completed his second year in electrical engineering at McGill University.

E. J. Peal, S.E.I.C., who graduated from Queen's University in mechanical engineering in 1924, and who has been with the Bailey Meter Company in Cleveland, Ohio, has been transferred to the company's office in Montreal.

William A. Dawson, S.E.I.C., formerly engaged with Tallman Brass and Metal Company, Hamilton, Ont., has accepted a position as machine designer with the Ford Motor Company of Canada, at Ford, Ontario. Mr. Dawson is a graduate of Queen's University having received his degree of B.Sc. in 1923.

W. D. Lee, A.M.E.I.C., is resident engineer on the construction of the trans-provincial highway through the Fraser Canyon for the Public Works Department of British Columbia. Mr. Lee's early work included surveying for the Canadian Pacific Railway and construction work with the Winnipeg Aqueduct Construction Company.

Herbert Aldous, Jr.E.I.C., is with Messrs. Sullivan and Fried, general contractors and engineers, Toronto, in charge of their estimating department. Mr. Aldous is a graduate of the London College of Municipal and Sanitary Engineers. He came to Canada in 1921 and was for some time with the Ontario Department of Public Highways.

J. W. Anderson, A.M.E.I.C., who was previously located in Ottawa, where as sales engineer he represented a number of prominent industrial companies producing electrical, mechanical and other engineering equipment, has moved to Montreal, where he has opened an office at suite 607, McGill Building.

W. P. Dobson, M.E.I.C., laboratory engineer with the Hydro-Electric Power Commission of Ontario, Toronto, has been elected one of the vice-presidents of the American Institute of Electrical Engineers at the recent meeting of the society held at the Engineering Societies Building, New York, on May fifteenth last.

Grant S. Sherman, A.M.E.I.C., has been appointed to the staff of Messrs. Butler, Barnett & Taylor, civil engineers of South Palm Beach, Florida, in charge of highway construction and various projects in connection with county engineering work. Prior to going to the United States Mr. Sherman was located in Nova Scotia on provincial highway work.

D. M. Mawhinney, A.M.E.I.C., has resigned the position of superintendent and engineer for the Elkin Construction Company with whom he has been for the past year and has been appointed general superintendent for Conrad Sebolt, general contractor of New Brunswick, New Jersey, which company specializes in city, county and state concrete highway work.

Yves Lamontagne, A.M.E.I.C., assistant Canadian Government trade commissioner, Brussels, Belgium, has left for England where he is to take charge of the Information Bureau maintained by the Department of Trade and Commerce of Canada at the British Empire Exposition. Mr. Lamontagne will be located at the Canadian Pavilion, Wembley Park, London, England, for the next eight months. In a letter to the secretary, Mr. Lamontagne states that he will be pleased to have any members of *The Engineering Institute of Canada* visiting Wembley call on him at the Canadian Pavilion.

J. F. Wickenden, Jr.E.I.C., has been appointed Montreal representative of the Asbestos Manufacturing Company, Limited. The company's plant at which various asbestos products are manufactured is located at Lachine, Quebec. Mr. Wickenden graduated from McGill University with the degree of B.Sc., in 1920, and holds a certificate from the Université de France (Toulouse) 1919. His early work in Canada was on surveys for the Geological Survey of Canada and with the St. Maurice Forest Protection Association and later with the contract department of Horton Steel Works.

Engineer Appointed to Council of Public Health, Saskatchewan

At the last session of the Saskatchewan Legislature an amendment was passed to the Public Health Act of the province which provided that there be added to the Council of Public Health a civil engineer.

The Council of Public Health is an advisory body which meets from time to time and considers and reviews the regulations made under the Public Health Act and reports to the minister of public health any suggestions or recommendations regarding such regulations as may be necessary in the interests of public health.

The council, as previously constituted, consisted of the deputy minister, three qualified medical practitioners and a qualified veterinary surgeon.

The amendment to the Public Health Act which authorizes the appointment of a civil engineer to the council came into force on May 1st and in the Saskatchewan *Gazette* of May 9th, Professor C. J. MacKenzie, M.E.I.C., dean of civil engineering of the University of Saskatchewan, was appointed as a member of the Council of Public Health.

Recent Additions to the Library

Transactions, Proceedings, etc.

Presented by the Societies:
- List of Members of the Institute of Metals 1923.
- Proceedings of the Royal Society of Edinburgh, 1923-24 and 1924-25.
- Annuaire de 1925, Société des ingénieurs civils de France.

Reports

Presented by the Department of National Defence, Canada:
- Report on Civil Aviation, 1924.

Presented by the Department of Mines, Ontario:
- 33rd Annual Report, 1924.

Presented by the Department of Labour, Canada:
- 14th Annual Report on Labour Organization in Canada 1924.
- Labour Legislation in Canada 1924.
- Wages and Hours of Labour in Canada, 1920-1924.

Presented by the Dominion Water Power and Reclamation Service, Department of the Interior, Canada:
- Annual Report 1923-1924.

Presented by the Department of Mines, Ottawa:
- Rapport du Ministère des Mines, 1924.

Presented by the Structural Materials Research Laboratory Lewis Institute, Chicago, Ill.:
- Quantities of Materials for Concrete, by Duff A. Abrams and Stanton Walker — Bulletin 9, second edition.
- The Contribution of Scientific Research to the Development of the Portland Cement Industry in the United States, by Duff A. Abrams.

Technical Books

Presented by Messrs. Chapman & Hall:
- Port Administration and Operation by Brysson Cunningham.

Presented by Messrs. Henry Carey Baird & Company, Inc.:
- Metallurgy of Aluminium and Aluminium Alloys by Robert J. Anderson.

ELECTIONS AND TRANSFERS

At the meeting of Council held on May 19th, 1925, the following elections and transfers were effected:—

Member

OSLER, Stratton Harry, Col., B.Sc., (McGill Univ.), (Grad. R.M.C.), asst. director, Engineer Services, Dept. Militia and Defence, Ottawa, Ont.

Associate Members

DOGHERTY, Alex. Charles, elect'l. and mech. engr., T. Pringle & Son, Ltd., Montreal, Que.

HAIMES, James, asst. city engr., Lethbridge, Alta.

HODGSON, Sydney Scarth, local manager for Hodgson, King & Marble, New Esquimalt Dry Dock, Esquimalt, B.C.

PENMAN, Alan Carleton, manager, Montreal office, W. S. Lee, M.E.I.C., Montreal, Que.

PETFORD, Herbert Stanley, B.Sc., (McGill Univ.), heating, ventilating and power plant work, with F. A. Combe, M.E.I.C., and E. A. Ryan, A.M.E.I.C., Montreal, Que.

WATSON, John Tait, chief engr., Lethbridge Light & Power Plant, Lethbridge, Alta.

Juniors

GENDRON, Henri, B.Sc., (Univ. of Montreal), Dept. of Development, Shawinigan Water & Power Company, Montreal, Que.

MOFFAT, Alexander Robertson, transitman on rly. trial lines, for Messrs. Morrow & Beatty, Kapuskasing, Ont.

OS, Hartvik, C.E., (Univ. of Trondhjem), dftsman. and inspr. on grain elevator constrn., C. D. Howe & Co., Port Arthur, Ont.

SAUVAGE, Robert, B.A.Sc., C.E., (Ecole Polytech.), Dept. of Public Works and Labour, Quebec, Que.

SMITH, Joseph Thomson, M.C., B.Sc., C.E., (Edinburgh Univ.), instr'man. and dftsman., C.P.R., Winnipeg, Man.

Affiliates

ATKINSON, Fred, gen. mgr., The Atwood Company, Montreal, Que.

BROWN, James Sutherland, Col., C.M.G., D.S.O., Director, Military Operations and Intelligence, Dept. National Defence, Ottawa.

JOHNSON, John David, gen. sales mgr., Canada Cement Company, Montreal, Que.

Transferred from the class of Associate Member to that of Member

BRONSON, Frederick Erskine, B.Sc., (McGill Univ.), managing director, Bronson Company, Ottawa, Ont.

CAMERON, Donald Roy, B.Sc.F., (Univ. of Tor.), Dominion Forest Service, Dept. of the Interior, Ottawa, Ont.

MARSHALL, Nathaniel, inspr. of boilers and machinery for Alberta Govt., Dept. of Public Works, Lethbridge, Alta.

McFAUL, William Lawrence, B.A.Sc., (Univ. of Tor.), city engr. and mgr. of waterworks, Hamilton, Ont.

MEEK, Victor Maitland, B.Sc., (McGill Univ.), Water Power and Reclamation Service, Dept. of the Interior, Ottawa, Ont.

Transferred from the class of Student to that of Associate Member

TOMKINS, John, B.Sc., (Queen's Univ.), Riordon Pulp Corpn., Ltd., Timiskaming, Ont.

Transferred from the class of Student to that of Junior

MARLATT, Charles Ewart, B.Sc., (Queen's Univ.), instr'man., West Kootenay Power & Light Company, Bonnington, B.C.

McKAY, Hugh Alexander, B.A.Sc., (Univ. of Tor.), manager, London Bridge Works, London, Ont.

NORRIS, Charles Adam, B.A.Sc., (Univ. of Tor.), engr. in charge of constrn., Bremner Norris & Co. Ltd., located at Montreal, Que.

SIMPSON, Richard Landon, B.Sc., (McGill Univ.,) squad leader, Dept. of Highways, Commonwealth of Pennsylvania, Pittsburgh, Pa.

The following students were admitted:—

BIRKETT, Charles Blair, (Grad. R.M.C.), 845 University Street, Montreal, Que.

COLEMAN, Sheldon William, 19 Homewood Avenue, Hamilton, Ont.

MERRITT, Gerald M., 74 Chesterfield Avenue, Westmount, Que.

TAYLOR, Willard Davidson, 161 Stanley Street, Montreal, Que.

Recent Graduates in Engineering

Congratulations are in order to the following Students of *The Institute* who have recently completed their courses at the various universities.

University of Alberta

Special Prize

William McCartney Davidson, Edmonton, Alta., The Association of Professional Engineers of Alberta Prize, for civil engineering.

Degree of B.Sc.

Davidson, William McCartney, B.Sc., (Ci.), Edmonton, Alta.
Tames, John Alexander, B.Sc., (El.), Edmonton, Alta.

Dalhousie University

Degree of B.Sc.

Cave, William Kenneth, B.Sc., St. John's, Nfld.
Grierson, Cyrus Arthur William, B.Sc., Weymouth, N.S.

Diploma of Engineering

Crease, Charles Edward, Amherst, N.S.
Grierson, Cyrus Arthur William, Weymouth, N.S.
Meaney, Daniel Ignatius, St. John's, Nfld.

University of Manitoba

Gold Medals

F. T. Robertson, Winnipeg, Man., Joseph Lonsdale Doupe Gold Medal for highest aggregate on examinations of third and fourth years in civil engineering.

Dudley, S. A. Young, Winnipeg, Man., University Gold Medal in electrical engineering.

Degree of B.Sc.

Argue, H. E., B.Sc., (El.), Winnipeg, Man.
Eggertson, E. G., B.Sc., (El.), Winnipeg, Man.
Robertson, F. T., B.Sc., (Ci.), Winnipeg, Man.
Sillers, T. G. A., B.Sc., (El.), Winnipeg, Man.
Steeves, S. M., B.Sc., (Ci.), Winnipeg, Man.
Young, D. S. A., B.Sc., (El.), Winnipeg, Man.
Young, R. A., B.Sc., (Ci.), Winnipeg, Man.

University of Toronto

Degree of B.A.Sc. (with honours)

Jenkins, Thomas Harding, B.A.Sc., Toronto, Ont.
Somerville, Karl Roger, B.A.Sc., Toronto, Ont.
Wellwood, Frank Elvin, B.A.Sc., Windsor, Ont.

Degree of B.A.Sc.

Beaman, Asahel Edwin, B.A.Sc., Toronto, Ont.
Burpee, Lawrence Hanington, B.A.Sc., Toronto, Ont.
Davidson, Philip Cheyne, B.A.Sc., Toronto, Ont.
Hubbard, Edward Beane, B.A.Sc., Toronto, Ont.
Lloyd, David Stevenson, B.A.Sc., Sault Ste. Marie, Ont.
Moffat, Bruce Fulford, B.A.Sc., Weston, Ont.
Wilford, Harold James Deacon, Jr.E.I.C., B.A.Sc., Lindsay, Ont.
Wright, William Elmer, B.A.Sc., Port Credit, Ont.
Wyatt, Digby, B.A.Sc., Toronto, Ont.

McGill University

Honours in the Graduating Class, Medals, Certificates and Prizes.

Arthur John Chabot, Outremont, Que., Association Medal; Montreal Light Heat and Power, Consolidated, First Prize; Undergraduates Society's Second Prize for Summer Essay; Electrical Club Prize for Summer Essay.

William Alexander Turner Gilmour, Hamilton, Ont., British Association Medal.

Francis Arthur Albert Bailey, Montreal, Que., Honours in Electrical Engineering.

Frederick Wykeham Bradshaw, Oxford, England, Honours in Chemical Engineering.

Christopher Fisher Campbell, St. John's, Nfld., Honours in Electrical Engineering.

Arthur John Chabot, Outremont, Que., Honours in Electrical Engineering.

William Alexander Turner Gilmour, Hamilton, Ont., Honours in Mechanical Engineering.

Harry Greenberg, Montreal, Que., Honours in Chemical Engineering.

Abbott, Arthur Caldwell, B.Sc., (Me.), Montreal, Que.
Bailey, Loring Withall, B.Sc., (El.), Quebec, Que.
Baily, Francis Albert, B.Sc., (El.), Montreal, Que.
Balleny, James Lister, B.Sc., (El.), Grand Falls, Nfld.
Berridge, Winston William, B.Sc., (Me.), Montreal, Que.
Bostock, William Norman, B.Sc., (Ci.), Monte Creek, B.C.
Boulton, Beverley Knight, B.Sc., (El.), Quebec, Que.
Bradshaw, Frederick Wykeham, B.Sc., (Chem.), Oxford, England.
Brown, Colin Blair, B.Sc., (El.), Quebec, Que.
Campbell, Christopher Fisher, B.Sc., (El.), St. John's, Nfld.
Chabot, Arthur John, B.Sc., (El.), Outremont, Que.
Chalker, Chauncey Richard, B.Sc., (Me.), St. John's, Nfld.
Conner, Gordon Myron, B.Sc., (Me.), Sherbrooke, Que.
Dentith, Francis William Hubert, B.Sc., (Chem.), Spryfield, N.S.
Farrar, Norman, B.Sc., (Ci.), Melbourne, Que.
Fleming, Canmore Drake, B.Sc., (Me.), Windsor, Ont.
Fraser, John Douglas, B.Sc., (Me.), Halifax, N.S.
Gilmour, William Alexander Turner, B.Sc., (Me.), Hamilton, Ont.
Graham, Walter White, B.Sc., (Me.), Montreal, Que.
Gray, Donald Alexander, B.Sc., (Me.), Montreal, Que.
Greenberg, Harry, B.Sc., (Chem.), Montreal, Que.
Hamilton, Robert McLean Prior, B.Sc., (Met.), Westmount, Que.
Hovey, Lindsay Mansur, B.Sc., (El.), Winnipeg, Man.
Logan, Robert Samuel, B.Sc., (Me.), Westmount, Que.
McNab, Archibald Hubert, B.Sc., (Mi.), Waldo, B.C.
Malone, Willis Peyton, B.Sc., (Me.), Westmount, Que.
Miller, John James Hutchison, B.Sc., (Me.), Westmount, Que.
Ogilvy, Robert Forrest, B.Sc., (Ci.), Hamilton, Ont.
Prudham, William Merrill, B.Sc., (El.), Drayton, Ont.
Ree, Alexander, B.Sc., (Mi.), St. Anne de Bellevue, Que.
Riva, Ronald Herrick, B.Sc., (Ci.), Montreal, Que.
Shortall, Wilbert Joseph, B.Sc., (El.), Montreal, Que.
Shotwell, Jr.E.I.C., John Stuart Glasham, B.Sc., (Chem.), Ottawa, Ont.
Smith, Donald Flannery, B.Sc., (Me.), Sutton, Que.
Stevens, Walter Oscar, B.Sc., (Me.), Winnipeg, Man.
Timmins, Leo Henry, B.Sc., (Mi.), Westmount, Que.
Velasco, Edward Marmanillo, B.Sc., (Me.), Montreal, Que.
Vickerson, George Locker, B.Sc., (Ci.), Montreal, Que.
Wardleworth, Theophilus Hatton, B.Sc., (Ci.), Westmount, Que.
Wood, James, B.Sc., (Me.), Victoria, B.C.

Nova Scotia Technical College

Medal

John Albert Rogers, Halifax, N.S., Alumni Medal.

Degree of B.Sc.

Brownell, George Wilson, B.Sc., (El.), Halifax, N.S.
Crease, Charles Edward, B.Sc., (El.), Amherst, N.S.
Davison, John Laurence, B.Sc., (El.), Halifax, N.S.
Fear, James, B.Sc., (Mech.), Halifax, N.S.
Lusby, Gerald Winkworth, B.Sc., (Mech.), Halifax, N.S.
MacDonald, Frank Sanborn, B.Sc., (Mech.), Halifax, N.S.
Moore, Alexander Glydon, B.Sc., (Elec.), Hazelbrook, P.E.I.
Rogers, John Albert, B.Sc., (Mech.), Halifax, N.S.
Sutherland, George Mackenzie, B.Sc., (Mech.), Malagash, N.S.

University of Saskatchewan

Degree of B.Sc.

Titus, Ernest Moulton, B.Sc., (Ci.), Saskatoon, Sask.
White, Jos. James, B.Sc., (Ci.), Saskatoon, Sask.

Queen's University

Kenneth, Roy MacGregor, Eganville, Ont., Sir Sandford Fleming Practical Science Prize.

Degree of B.Sc. (with honours)

Dilworth, Edwin Leslie, B.Sc., (Me.), Kingston, Ont.
Henderson, Gordon Roberts, B.Sc., (Ci.), Orient Bay, Ont.
Minter, Harry John Duncan, B.Sc., (El.), Ottawa, Ont.

Degree of B.Sc.

Cole, Eric John, B.Sc., (Me.), Kingston, Ont.
Donnelly, William David, B.Sc., (Me.), Kingston, Ont.
Henderson, Walter A., B.Sc., (El.), Kingston, Ont.
Higgins, Joseph Alexander, B.Sc., (Ci.), Kemptville, Ont.
Hopkins, Arthur Douglas, B.Sc., (Me.), Kingston, Ont.
Leadlay, Francis Robert, B.Sc., (Ci.), Kingston, Ont.
Lee, Frank Spencer, B.Sc., (Me.), Kingston, Ont.
Lewis, William Milton, B.Sc., (Me.), Napanee, Ont.
Murray, John David, B.Sc., (El.), Ottawa, Ont.
McBean, James Melville, B.Sc., (El.), Kingston, Ont.
MacGregor, Kenneth Roy, B.Sc., (Ci.), Eganville, Ont.
McKellar, Archibald Franklyn, B.Sc., (Me.), Hawkesbury, Ont.
MacKinnon, William Duncan, B.Sc., (Me.), Kingston, Ont.
MacLachlan, Ian, B.Sc., (Ci.), Kingston, Ont.
Penney, Gerald, B.Sc., (Chem. and Met.), Kingston, Ont.

Abstracts of Papers read before the Branches

The Welland Ship Canal

E. G. Cameron, A.M.E.I.C.

Kingston Branch, March 27th, 1925

The Welland Canal is one of the principal links in the great chain of navigation extending from the Straits of Belle Isle to Duluth, a distance of 2,339 miles, and connects Lake Erie with Lake Ontario, whose difference in level is 326½ feet. The canal crosses the Niagara Peninsula about ten miles west of Niagara Falls.

The First Canal

On November 30th, 1924 there was unveiled, at Allanburg, a cairn marking the spot where, just one hundred years before, the first sod of the original Welland Canal was turned by Mr. George Keefer, first president of The Welland Canal Company.

The first canal was built as a private enterprise by the Welland Canal Company, formed by the late Honorable William Hamilton Merritt, and was completed in 1829, when two schooners, one British and one American, were taken through the waterway. It was built via the Twelve Mile Creek from Port Dalhousie, on Lake Ontario, to Port Robinson, on the Chippawa Creek. At Port Robinson, boats descended the Creek to the Niagara River, and thence to Lake Erie. It had forty wooden locks, each 110 feet long, 22 feet wide with 8 feet depth of water on the sills. It was connected by a feeder canal to the Grand River at Dunnville and later was extended from Port Robinson to Port Colborne, on Lake Erie. This section was opened to navigation in 1833 and was located on what is now the site of the present canal, between Port Colborne and Allanburg (the Summit level) but was fed from the Grand River. This canal was 27½ miles long from lake to lake.

The Second Canal

In 1841, the Legislature of Upper Canada purchased the canal and decided to enlarge it to nine foot draft and to complete the St. Lawrence Canals. The forty wooden locks were, by increasing the lifts, reduced to twenty-seven locks, which were built of cut stone, each 150 feet long, 26½ feet wide, with 9 foot depth on the sills. The Port Maitland, Dunnville branch was built at this time, and this route, or second canal, was opened to traffic in 1845. The section of the canal between the feeder junction (Welland) and Port Colborne was then enlarged and opened for navigation in 1850. This canal remained in operation after the present canal was completed, being used for power purposes, and all its locks are still in existence. In 1853 the navigable depth was increased to 10 feet by raising the banks and the walls of the locks, but it was not until 1881 that the Canal was fed from Lake Erie at Port Colborne. The original cost of construction, including the first enlargement, or the total expenditure prior to Confederation (1st July 1867) was $7,693,824.03. That portion of the second or old canal, as it is now called, between Allanburg and Port Dalhousie, ceased to be used for navigation about 1890.

The Third Canal

Twenty-two years after Upper and Lower Canada had completed the nine-foot navigation between Lake Erie and Montreal, the Dominion government took up the question of inland navigation, and the commission of 1870 recommended a uniform scale of navigation for the St. Lawrence route and the Welland Canal with locks 270 feet long, 45 feet wide, and 12 feet of water on the sills. This depth of water was later increased to 14 feet. The work of enlarging the Welland Canal was carried on to these dimensions. The present canal, i.e. third canal, leaves Lake Ontario at Port Dalhousie and climbs the escarpment east of the second or old canal to Allanburg. From the latter place to Port Colborne it follows the route of the second canal. Its locks are built of cut stone, with lifts of 12 to 14 feet. It is carried over the Chippawa Creek, at Welland, by a cut stone aqueduct. This third canal, 26¾ miles long, was opened to traffic for 14-foot navigation, in 1887, and the St. Lawrence River Canals in 1901; when the Northwestern Steamship Company of Chicago placed a fleet of four steamers (2,000 tons capacity) in commission between Chicago and Europe. On more than one occasion the boats were loaded to slightly over the 14-foot limit. The third or present canal up to March 31st, 1924, cost for capital construction. $23,962,041.66 and $11,511,168.99 for repairs and maintenance. These amounts do not include the cost and maintenance of the Port Colborne breakwaters. The St. Lawrence and Welland Canals between Lake Erie and Montreal, cost Canada, up to 31st, March 1924, $36,066,957.01 on capital construction, and $26,814,687.83 for repairs and maintenance. These amounts do not include the original cost and maintenance of the Port Colborne breakwaters, and the aids to navigation between Port Colborne and Montreal, nor the expenditures to date on the Welland Ship Canal and the Montreal Quebec Channel.

In 1901 the total tonnage passing through the Welland Canal was only about 620,000 tons. In 1914 it had increased to 3,860,000 tons, indicating that since the completion of the 14-foot navigation system in 1901, the St. Lawrence route had gradually drawn more heavily, year by year, upon the Great Lakes Atlantic seaboard trade. As a result of the Great War taking many lake vessels into service on the high seas, traffic through the Welland Canal fell off from 3,860,000 tons in 1914 to 2,200,000 tons in 1918-19, but since this latter time traffic has been growing rapidly year by year, with a new maximum annual tonnage record of 5,037,412 tons, established in 1924. This vast increase in tonnage through the present Welland Canal, in the last five years, indicates that it is only a matter of a few years more until the present canal is taxed beyond its capacity.

In 1924 the approximate shipping through the Soo Canals was 91,000,000 tons. About 700 vessels were passed and of these only 250 were able to get through the Welland Canal. The Upper Lake type of vessel measures about 600 feet by 60 feet by 26 feet load draft and has a capacity of 450,000 bushels, while the canal type is about 260 feet by 42 feet by 14 feet load draft with a capacity of 90,000 bushels. Thus the cargoes of the oversize carriers must be transhipped to canal size in the ratio of 5 to 1, or be forwarded from Lake Erie to seaboard by rail.

The Fourth or Welland Ship Canal

The short sighted policy of 1870 left the Welland Canal as much out of date in 1887 as it was when the improvements were begun in 1873, whereas a moderate increase in the length of the locks alone would have enabled a large part of the fleet of 1901 to descend to Montreal, instead of being confined to the Upper Lakes. These canals, locks and river channels are entirely inadequate for use by the Great Lakes steamers of to-day, and can now be considered as of little more than barge size. The improvement of the Welland Canal and St. Lawrence Canal to such dimensions as would accommodate ships of at least 25-foot draft, has been contemplated for many years. During the past quarter of a century, exhaustive surveys have been made to determine the feasibility and cost of such a waterway and another has been carried out recently by the International Joint Commission. Following the opening of the St. Lawrence Route in 1901 for vessels drawing 14 feet of water, the Canadian government began improvements to the Port Colborne entrance of the Welland Canal, these consisting of deepening the harbour to 22 feet, constructing a million bushel modern concrete elevator (completed in 1908), and building a large breakwater. So great has been the increased movement of grain through the Welland Canal that the Federal government has twice found it necessary to add to the original elevator, first in 1912-13 and again in 1923-24, each addition increasing the capacity by one million bushels, and it is anticipated that the elevator and its extensions will be taxed to the limit of their 3,000,000 bushel capacity in 1925. During the season of 1923-24 this elevator handled about 70,000,000 bushels and was full practically the year round

The ship canal, as located, follows the valley of the Ten Mile creek, between its mouth (Port Weller) about three miles east of Port Dalhousie, and Thorold, crossing the present canal below Lock 11, where the water level of both canals will be at elevation 382.0 above mean sea level. Between Thorold and Allanburg a new cut will be made for the purpose of straightening the alignment of the canal between these points. The ship canal will again cross the present canal below lock 25, where the water levels of the two will again coincide, at elevation 569.0. From Allanburg to Port Robinson the present canal and the ship canal is now completed, the present canal section having been widened to 200 feet bottom width, with a draft of 25 feet.

From Port Robinson to Welland the ship canal takes a much straighter and more direct course, to the East of the present canal, following closely the valley of the Chippawa Creek, which is to be diverted. The aqueduct under the present canal for the Chippawa creek, is to be replaced with a much larger structure under the ship canal, just north of the city of Welland.

From Welland to Humberstone, the present and ship canals again coincide, and here the widening and deepening as between Allanburg and Port Robinson is to be affected.

Leaving the present canal again just north of Humberstone, the ship canal continues a straight alignment into the harbour at Port Colborne — thus eliminating a very sharp curve in the present canal, known as Rameys Bend. As it is desired to keep the summit level, from Port Colborne to Thorold, on the ship canal, at a regulated level of 569.0, a guard lock (No. 8) is to be built at Humberstone, through which vessels will be passed from the constantly fluctuating level of lake Erie to the regulated summit level, extending north to Thorold. This will effect a vast improvement in present navigation conditions existing in the present canal summit level, now subject to all the fluctuations of lake Erie.

The total length of the ship canal will be 25 miles, and for all practical purposes of navigation it is a straight line throughout. The difference in level between the lakes will be overcome by seven locks of 46½ feet lift each. The direct line of the canal down the face of the escarpment, and the topography of the lower plateau, permitted the adoption of these high lifts, which constitute a peculiar feature of the design of the canal, and have no precedent in actual construction for locks of their size. Locks Numbers 1, 2 and 3, starting from Port Weller are single, locks numbers 4, 5 ana 6 are in fllight, and double, while lock number 7 is single with guard gates and emergency weir at head of summit level — maintained at El. 569, The canal will be 200 feet wide on the bottom, with two on one slopes and the sections of the work let by contract in 1921 have been excavated to a depth of 25 feet; the balance of the sections being excavated to a depth of 27½ feet. All structures, however, will be built for 30 feet draft. On account of the larger boats to be accommodated, curves in alignment are not allowed to exceed 1 degree, 30 minutes and this is used only once, curves being maintained at 1 degree.

Dimentions and Notable Features

Some of the dimensions and notable features of the ship canal are as follows:

Number of lift locks, including guard lock 8.

(Three of above are twin locks in flight similar to the Gatun locks of the Panama Canal).

Useable length of locks	820 ft.
Useable width of locks	80 ft.
Depth of water on sills	30 ft.
Lift of locks	46½ ft.
Height of lower mitre gates	82 ft.
Width on bottom of prism	200 ft.
Width at water line	310 ft.
Navigable depth-minimum	25 ft.
Approx. weight of each leaf lower gate	425 tons.
Total estimated weight of metal in lock gates and machinery	12,300 tons.
Total estimated weight of metal in valves of locks and weirs and machinery	3,200 tons.
Estimated connected motor load for operating canal and Port Colborne elevator	11,200 h.p.
Time required to fill lock	8 min.
Estimated time for vessel to pass canal	8 hours
Total lift	326½ ft.
Length	25 miles.
Number of railway and highway bridges across canal	22

Quantities

Earth excavation	cu. yds.	45,000,000
Rock excavation	"	9,800,000
Concrete (all kinds)	"	3,300,000
Watertight embankments	"	4,500,000
Steel reinforcement	lbs.	21,600,000
Foundation piling (wood)	long feet	900,000
Steel sheet piling	lbs.	21,700,000

The large size of the locks necessitates considerable storage or feeder capacity above each lock or series. Since the design of all the locks are identical, all equipment is standardized.

The harbour at Port Colborne is being deepened to 26 feet inside and 27 feet outside and a breakwater 2,000 feet long constructed, to protect against southwest gales. At Port Weller on Lake Ontario, there was originally no harbour at all, and an artificial one is being built, using the material taken from the canal excavation. Embankments are being built with rock protection, the entrance and shore connections being of cribwork.

Owing to the Great War, the work on the ship canal was stopped from 1917-1919. In 1919 the work was again started as a means of relieving unemployment, but it was not until 1921 that there was much accomplished, when construction was put back on a contract basis. The whole undertaking was divided into eight sections, seven of which are now under contract and the eighth is to be let very shortly.

Though the Welland Canal has been more or less under construction for about 100 years now, it is anticipated that the new ship canal will be open for traffic by 1930, at the present rate of progress now being effected.

The expenditure on the ship canal to the end of March 1925 will approximate $50,000,000, including purchase of right of way and engineering costs. The total estimated cost of the completed canal approximately $110,000,000.

The Development of Power Transformers

C. E. Sisson, M.E.I.C.

Montreal Branch, April 23rd, 1925.

Mr. Sisson dealt with the early use of electricity describing the efforts put forward in connection with electric lighting. Attention was called to the series transformers or "Secondary Regenerators" as first built by Mr. Goulard, French engineer, about 1884. This scheme was used in both England and America, American transformers being imported from Europe.

About this time Mr. Stanley became associated with Mr. George Westinghouse and in the winter of 1885-1886 produced the first transformer used on a multiple alternating current system. This installation was at Great Barrington, Mass. A slide was shown showing this transformer which is now in the possession of the A.I.E.E., in New York City. Higher voltages were employed in Europe earlier than in America, a great deal of the pioneer work in England being done by Dr. Ferranti. They had a 10,000-v., system operating in 1889.

Attention was called to the different methods of cooling and insulating determined by the increase in voltage and capacity. A curve was shown showing the increase in potentials used, this increase, of course, being necessitated by the increase in the length of transmission systems and the development of larger generating stations located at strategic points remote from centers of population. The highest voltage used up to the present time is 220,000. Projecting of the curve to 1935 gave a voltage of about 330,000. Curves were also shown indicating increase in capacity and by projecting this curve it was pointed out we might anticipate ratings of 40,000 or 50,000 kv.a. The largest unit built up to the present time is about 25,000 kv.a. This indicates a marvelous growth in the voltage and capacity of transformers in less than forty years. A curve was shown showing the relative cost per kilovolt ampere of different sizes with different voltages. These curves distinctly indicated points below which it is not economical to produce small transformers of different voltages particularly the higher voltages. The relative efficiencies of transformers was also shown indicating that in order to maintain desirable efficiency on high voltage systems it is necessary to use large capacity units. A curve was also shown giving the cost of water-cooled units as compared with self-cooled which indicated that at a capacity of about 400 kv.a. there was very little economy in the first cost of a water-cooled unit although at a much larger kilovolt ampere the water-cooled unit would cost approximately 60 per cent of the self-cooled.

The necessity of ventilating rooms or buildings in which self-cooled apparatus was installed was emphasized and a calculation given showing that with a 5° rise of room temperature over the incoming air we find that rooms varying from 10 to 35 feet in height require an opening area varying from 1.96 to 1.05 square feet per kilowatt loss. In general it was claimed that 1.5 square foot might be taken as a safe constant, which with the very large units would result in very large openings indicating that the proper place for large self-cooled apparatus is outdoors. Slides were used to show the different types of self-cooled apparatus.

In anticipation of the inquiry as to the effect of extremely cold weather on the oil in transformers with external cooling features curves were produced covering the results obtained in an experiment on a transformer subjected to extremely cold weather and then loaded. It was found that at no point did the apparatus reach a temperature at all dangerous and that the whole unit was very quickly operating as though the oil had not been frozen. The tendency towards outdoor water-cooled transformers was called attention to as well as forced oil-cooled units. The claim for combination water and self-cooled transformers was made as an economy in water consumption during extremely cold weather.

Some of the features entering into the design of transformers were called attention to, stress being laid on the necessity for the proper appreciation and the necessary precautions to be taken in connection with the very severe mechanical strains to which many transformers are subjected due to the capacity of the systems on which they are used. In describing the insulation used emphasis was placed on the necessity of the use of a reliable grade of oil, the most important feature of which was its freedom from sludging. As a means of preventing oxidation of oil the conservator tank has been adopted. This requires the transformer tank proper to be completely filled, the expansion and contraction being provided for in the conservator where but a very small surface is exposed to the air and where the oil is normally cool and therefore less subject to oxidation. The filling of the transformer tank also insures against the development of excessive pressures due to an explosion of arc gases and air. The device used to prevent injury due to the evolution of gases by fault in a transformer was described as a Relief Vent having a fragile material located at a point in the vent so that any undue pressure would be relieved by the shattering of this diaphragm. The inert gas cushion was also briefly called attention to.

The several steps taken in providing for the changing of ratio were described and photographs and diagrams shown showing the more recent developments of equipment used for changing the taps while the transformer was under load. An illustration of a 220,000-volt transformer was given and attention called to the ease with which we have passed into the use of 220,000-volt transmission so far as transformers were concerned. The necessity for three-winding transformers was briefly touched on.

Economic Aspects of the Dye Industry

G. Durgin.

Sault Ste. Marie Branch, April 24th, 1925.

The dye-stuff industry originated with Perkin in England in 1856 and most of the pioneer work in establishing coal tar products was done in England during the decade following Perkin's discovery.

From 1866 on the German interests set about to develop dye-stuffs, recognizing the advantage from the national standpoint. The litigation in respect of the Levenstein case in 1882 added distinct leverage to the German industry and the organization of the Vertical Trust in 1904 made the German domination of the industry complete.

The World War demonstrated clearly the hold which the German industrialists had obtained and the introduction of gas warfare indicated clearly the advantages that were derived from the national fostering of an industry which could be rapidly converted from peace time pursuits to the manufacture of high explosives and lethal gases.

So essential is the dye-stuff industry to national welfare that the British and American governments have taken definite steps to protect and re-establish the coal tar industry. This has been accomplished through what is in essence a protective tariff though in England it is carried on under a licensing system.

The development from 1918 to date in England and the United States has clearly demonstrated the possibility of maintaining in both countries an industry capable of producing colours equal in every respect to the pre-war German product; at the same time providing a nucleus for the rapid production of either explosives or lethal gases should occasion require.

The situation in Canada is that there is no quantity of dye-stuffs manufactured. Intermediates when made are exported either to England or the United States or utilized for other purposes. With growing population and with increased development of the coal fields it seems that a real basis for the development of this industry exists and that such development would be of value to the Dominion as a producer of revenue in time of peace and as a nucleus for munitions manufacture in the time of war.

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Back Numbers of Engineering Journal

The Secretary will be pleased to receive spare copies of the September 1922, January 1924, May 1924, and April 1925, issues of the Journal to complete library sets.

BRANCH NEWS

Border Cities Branch

F. Jas. Bridges, A.M.E.I.C., Secretary-Treasurer.

Engineering Problems and Traffic on the Great Lakes

Due to the regular monthly meeting night of the Border Cities Branch falling on Good Friday, the date was put forward a week and so on April 17th a large number of the members turned out to a dinner-meeting held in the Prince Edward hotel, Windsor.

At the conclusion of the dinner the Chairman, J. Clarke Keith, A.M.E.I.C., introduced the guest and speaker of the evening, Lt.-Col. H. J. Lamb, D.S.O., M.E.I.C., supervising district engineer for Ontario of the Dominion Public Works Department. The Colonel chose as his subject "Engineering Problems and Traffic on the Great Lakes", and illustrated it with slides. The first slide was one of the Great Lakes showing the relation to each other and a description was given about their areas, etc. A brief history of the development of the traffic on the Great Lakes was given and the speaker said that the main problems encountered in accomplishing this development were briefly as follows:—

1. Establishing the boundary line between the United States and Canada.
2. Charting the system and establishing aids to navigation.
3. Construction of harbours.
4. The construction of canals and locks to overcome the two great barriers, Niagara falls and St. Mary's falls.
5. The improving of connecting channels in the Detroit, St. Clair and the St. Mary's river.

The speaker then went on, in reference to the first of these problems, to show how the first International Boundary had been laid out under the treaty of Ghent in 1814, and how, in more recent years, it has been revised so that it now consists of a series of tangents. The turning points of these tangents are referenced by bearings and distances to lighthouses and concrete monuments.

The second problem, charting the Great Lakes, has been most efficiently accomplished through surveys made by the Department of Marine and Fisheries of Canada and the United Lakes Survey Office.

In reference to the matter of the construction of harbours in Canada on the Great Lakes, the Colonel briefly described and also showed slides of many of the larger harbours. In concluding his remarks on this subject the speaker rather amazed the members when he said that the Dominion has since confederation (1867) expended approximately 50 million dollars on these harbours and approximately 155 million dollars on the Welland and St. Lawrence canal systems.

In order to more easily explain the canal systems of the Great Lakes as mentioned in item No. 4, a slide was shown of a profile of the Great Lakes which clearly showed the different levels of the several lakes. A most comprehensive description was here given of that wonderful engineering achievement, the Welland ship canal which, when completed, will cost nearly $100,000,000.

Views and descriptions were also given of the entrance harbours of the canal, Port Colborne and Port Weller at the lake Erie and lake Ontario entrances respectively. A brief resumé of the history of the canal was also given.

The next canal system to be discussed was that of the Sault Ste. Marie, which has been built to overcome the barrier of the St. Mary's falls. Several views were shown accompanied by descriptions of the a locks and the compensating dam. At this point the Colonel dropped casual statement that made even the most wise of those present sit up and take notice. The Colonel stated that through these five locks there passed in 1923, tonnage of freight that considerably exceeded the combined freight tonnage that passed through the Suez canal, the Panama canal and the Manchester canal during the same period.

The Colonel here apologized for describing the different works and improvements in the Detroit river as he felt that engineers of the Border Cities probably knew more about these works than he did. However, he gave a most interesting description of these works. Following this description the members were taken through the 800 feet wide dredged channel across lake St. Clair and up through the familiar St. Clair Flats ship canal. This canal, to be more precise, is made up of two channels each about 300 feet wide, extending out into lake St. Clair for a distance of approximately 17,450 feet.

The next river to be encountered in the Great Lakes system is the St. Mary's. Improvements in this river include the Hay lake route and also the West Neebish channel.

Several slides were then shown of the different types and designs of harbour protection works in use in the Canadian ports of the Great Lakes. These included views of Goderich, Port Arthur, Port Stanley, Port Hope and Hamilton. Typical cross-sections were shown of the breakwaters at Port Stanley, Goderich, Port Arthur and Toronto harbour. An interesting description accompanied by several views was given of the concrete caissons as used in the Goderich breakwater.

Interesting as well as amazing figures were here presented of the traffic through the Sault Ste. Marie canals. During the season 1923 there passed through these canals 91,379,658 short tons, 71,000,000 tons of these passing east. Of this total tonnage 59 million tons were iron ore bound almost entirely for the United States Lake Erie Ports, while over 18 million tons of coal were moved westward from these ports. The principal tonnage moved east was over 370 million bushels of grain, 300 million of these being Canadian grown grain. This grain was shipped from the Canadian twin harbours of Port Arthur and Fort William. Pictures of the different elevators at these ports were shown and their capacities given. To handle these large cargoes of grain from these ports has necessitated the expenditure to date of nearly 12 million dollars.

The traffic on the Detroit river during the season of 1923 was 18,855 bulk freighters and 7,988 other vessels passing the Border Cities carrying an estimated tonnage of 92 million tons valued at over one billion dollars. In addition there are two passenger ferry lines and four railroad ferry lines, the former carrying 10 million passengers during 1923 and in 1924, 750,000 automobiles.

In concluding this most interesting talk the Colonel said that he thought that it was with pardonable pride that we may pause to realize what a great part those of the engineering profession have played and are in fact playing to-day in the improvement and development of this Great Lakes system of waterways.

After a general discussion the Colonel was given a most hearty vote of thanks.

May Meeting

The final meeting of the season of the branch, before the suspension of meetings for the summer. was held Friday evening May 8th, in the Prince Edward hotel, Windsor. This was a dinner-meeting, after which the members spent a most enjoyable time playing cards and smoking.

London Branch

E. A. Gray, A.M.E.I.C., Secretary-Treasurer.

The May meeting of the London Branch was held in the board room of the Public Utilities Commission, Tuesday, May 12th at 8.15 p.m., with Chairman Miller, presiding.

The speaker of the evening, Col. H. C. Boyden, B.SC., C.E., of the Portland Cement Association of Chicago, delivered a most interesting illustrated address on "Concrete", dealing particularly with the sampling and control of proportions in the field.

Following the meeting, light refreshments were served in the dining room.

Moncton Branch

M. J. Murphy, A.M.E.I.C., Secretary-Treasurer.

The monthly meeting of the Moncton Branch was held in the City Hall on April 20th, F. O. Condon, chairman of the branch presiding. An illustrated lecture was delivered by Harold S. Johnson, B.Sc., M.E.I.C., hydraulic engineer with the Nova Scotia Power Commission. Mr. Johnson spoke on hydro development in Nova Scotia, with special reference to power plants located near Sheet Harbour.

Taking into consideration its size, population and industries, Nova Scotia has, during the past four years, made remarkable progress in the development of its water powers. At the present time the Nova Scotia Power Commission is operating 24,000 h.p., and this is to be increased in future years. As in New Brunswick, the developments are grouped into systems, each system covering territory within reasonable reach. It is the ultimate intention to join up these groups so that one may feed into another and provide power with greater economy. In Nova Scotia, at present, there are three separate systems in operation. The St. Margaret's Bay system with 10,000 h.p., supplies the city of Halifax and town of Dartmouth. The Mush-a-mush system with 800 h.p., supplies the town of Lunenburg and surrounding district. The Sheet Harbour system with 12,000 h.p., has two separate stations which supply power to five towns in the county of Pictou, over a 55 mile transmission line, and also over a two mile line to the newly constructed ground wood plant of the A.P.W. Pulp and Paper Company, at West River, Sheet Harbour.

A hearty vote of thanks was accorded Mr. Johnson at the conclusion of his lecture, on motion of Professor McKiel, seconded by C. S. G. Rogers.

Montreal Branch

C. K. McLeod, A.M.E.I.C., Secretary-Treasurer.
Stanley A. Neilson, A.M.E.I.C., Branch News Editor.

Transformers

C. E. Sisson, M.E.I.C., transformer engineer for the Canadian General Electric, read a paper before the Montreal Branch on the subject of "Transformers"* on the evening of April 23rd, 1925.

A short discussion followed, after which a vote of thanks was tendered to the speaker by the chairman for the evening, P. S. Gregory, M.E.I.C.

Preservation of Forest Products

An interesting address on the above subject was given before the Montreal Branch, on April 30th, 1925, by Dr. Herman von Schrenk, of St. Louis, Mo.

Dr. von Schrenk, who is a consulting engineer to a number of the leading American railways, brought to his audience the results of years of experience in the science, dealing particularly with the preservation of railroad cross-ties and the timber used in trestles. His remarks were illustrated with lantern slides showing the differences in material that had been properly treated and that which had been neglected.

The discussion which followed was entered into by Prof. Lloyd, of McGill University, E. H. Finlayson, B.SC.F., director of forestry for the Dominion of Canada, and others. P. B. Motley, M.E.I.C., was the chairman of the meeting and tendered a vote of thanks at the conclusion of the meeting to the speaker.

Concrete

Through the courtesy of the Rotary Club, the members of the Montreal Branch had the opportunity of listening to Col. H. C. Boyden, of the Lewis Institute of Chicago, on the subject of the proper mixing and curing of concrete. Col. Boyden's talk was full of good practical advice mixed in with humorous anecdotes, the mix being in accordance with all the standard specifications. While no formal vote of thanks was given to the Rotary Club by the Montreal Branch, the members of the latter showed their appreciation by attending in large numbers.

Visit of Past-President of Institution of Electrical Engineers

On May 21st, 1925, a luncheon was tendered to Mr. Frank Gill at the University Club, Montreal, at which the following were present:

Frank Gill, R. A. Ross, D.Sc., M.E.I.C., W. C. Adams, M.E.I.C., Julian C. Smith, LL.D., M.E.I.C., P. S. Gregory, M.E.I.C., J. L. Busfield, M.E.I.C., J. Robertson, M.E.I.C., C. K. McLeod, A.M.E.I.C., J. R. Donald, A.M.E.I.C., R. H. Mather, A.M.E.I.C., Geo. R. MacLeod, M.E.I.C., Sir Alex. Bertram, M.E.I.C., O. O. Lefebvre, M.E.I.C., K. B. Thornton, M.E.I.C., Paul Sise, M.E.I.C., J. D. Hathaway, M.E.I.C., N. M. Lash, F. C. Laberge, M.E.I.C., S. A. Neilson, A.M.E.I.C., E. A. Ryan, A.M.E.I.C., D. C. Tennant, M.E.I.C., Fraser S. Keith, M.E.I.C., C. J. DesBaillets, M.E.I.C., J. B. Challies, M.E.I.C., C. E. Sise, and Mr. Pike.

Since 1884 Mr. Gill has been constantly employed with telephone problems. In the employ of the National Telephone Company, Great Britain, he advanced to the position of engineer-in-chief of that company, which position he held from the time of his appointment in 1902 until 1911, when the activities of the National Telephone Company were taken over by the British Post Office. Mr. Gill then went into consulting engineering work, which he continued until August 1914, at which time he placed his services unreservedly at the disposal of the War Office; later he joined the Ministry of Munitions and in 1919 became the comptroller of the central store in that ministry, the department employing 19,000 people. Upon returning to civilian life, Mr. Gill entered the employ of the International Western Electric Company as their European chief engineer, a position which he has filled most creditably, and still holds.

Dr. R. A. Ross, M.E.I.C., in introducing Mr. Gill, stressed the need of better communication between the engineers of the Old Country and of Canada.

Mr. Gill opened his remarks by reading a letter from the Institution of Electrical Engineers in which he was asked to convey to *The Engineering Institute of Canada* their heartiest good wishes for continuous progress.

Mr. Gill then dwelt on the need of research in industry, outlining the steps that had been taken in England and pointing out that so far research had only been applied to materials and not to their assembly and uses. He spoke of the American method of tackling industrial problems and said that he wished that some of the other industries could follow in the footsteps of the telephone industry.

Julian C. Smith, M.E.I.C., who moved the vote of thanks, and Dr. R. A. Ross, M.E.I.C., who tendered it to the speaker spoke of the value of research. They also asked Mr. Gill to carry back to the Old Country heartiest greetings from the engineers of Canada.

Niagara Peninsula Branch

R. W. Downie, A.M.E.I.C., Secretary-Treasurer.
C. G. Moon, A.M.E.I.C., Branch News Editor.

The annual spring outing was by automobile to Hamilton, where a party of about seventy-five members visited the modern plant of the Hamilton Coke and By-Products Ltd. Through the courtesy of the president, P. V. Byrnes, and Mr. Mullis, managing editor of the Hamilton *Spectator*, the following interesting information was obtained.

Coke Fuel

The coal used is Elkhorn coal from the mines of the Consolidation Company of Kentucky and also Pocohontas coal from the Pocohontas Coal and Fuel Company of West Virginia. These two are the highest grades of coal mined in the United States being the lowest in sulphur and ash.

The coal is delivered to Sandusky or Toledo and from there shipped by the Lake Erie Navigation Company to Erieau where it is loaded on cars and transported by rail to Hamilton. The local company carries in stock at Erieau between 50,000 and 60,000 tons of coal to provide for winter shipments.

Alberta coal has not been tried out at the local coking plant. Coal from four or five mines in Nova Scotia and New Brunswick has been tested in the ovens. Results of these tests can be secured from the government bureau of mines which had charge of the tests when they were made in January, 1924.

The retail price of coke, delivered to the consumer, is $13 per ton.

By-products are gas, tar, and sulphate of ammonia. As soon as another battery of ovens can be installed, which will be in the near future, light oil, benzol, and several other by-products will be taken from the coke. The capacity of the present battery is not sufficient to warrant the expense involved in securing these by-products.

The cost of the plant to date, exclusive of land is $2,500,000.

The capacity of the plant is 450 tons of coal every 24 hours on an 11-hour coking time basis. Coke produced from this runs about 74 per cent by weight and carries a content of only about 7 per cent ash.

Following the inspection of the plant, a dinner meeting was held at the Royal Connaught hotel. An informal discussion took place as to the merits of coke as a fuel and the meeting wound up with the presentation of a silver-mounted carving set to the retiring branch editor, J. Hogg, Jr.E.I.C., who has performed so faithfully what is undoubtedly an arduous task.

Superannuation for Government Employees

If a man be employed for some construction work estimated to last five years and if through certain uncontrollable circumstances,—say war for instance —, the aforesaid work drags along over a period of twenty years, then is this man now middle aged, a temporary or a permanent employee?

Again, if a man be shifted by the government from one job to another, — temporary or otherwise —, throughout the better part of his life is he justified in claiming that his work is permanent and that he is as much entitled to superannuation benefits as any clerk who may reside at all times in the capital?

As long as there is government work to be done and as long as the man elects to serve the government there is no reason in the world why he should not be classed as permanent and be entitled to subscribe to the superannuation fund.

If work fails or if he desire to leave the service then an equitable adjustment can be made with ease, but why discriminate against a faithful employee merely because he has not been in a position to get into what some department at Ottawa interprets as "permanent service"?

These are questions that are of great interest to a number of members of *The Institute* in this district. A branch committee has been pressing this matter since the last annual meeting and now it is gratifying to hear that the Professional Institute of the Civil Service has prepared a memorial which has been presented to the Cabinet.

Ottawa Branch

F. C. C. Lynch, A.M.E.I.C., Secretary-Treasurer.

Structural Steel

The wonders of steel and iron, and some witty and forceful advice on hidebound conservatism in industry, was given on the evening of April 30th, to the members of the Ottawa Branch, at the University Club, by Lee H. Miller, chief engineer of the American Institute of Steel Construction. The meeting was attended by members of *The Engineering Institute*, and by architects, contractors, steel fabricators, bankers, investors, and others interested in construction.

In engineering as in other technical lines, Mr. Miller said man was a creature of prejudice and convention. Modern people laughed at those of an age which persecuted Roger Bacon because he invented the magnifying glass, and made another scientist take an oath that the world wasn't round, and yet they still persecuted their fellows every day by prejudice. Mr. Miller condemned the use of vague and "highbrow" terms in engineering. There was nothing, even the fourth dimension, stated the speaker which couldn't be expressed in simple language, and made as plain as the multiplication table.

Mr. Miller said that the movement for economy throughout the industry which has been undertaken by the fabricators, was one of the most striking instances of what can be accomplished through standardization that has been furnished by any industry. He pointed out that the benefits of this kind of group co-operation pervade every phase of the industry, and the economies are shared by the buyer, the seller, the investor and the public generally.

Mr. Miller strongly urged the use of standard specifications. Exceptions had been found to be the most expensive things in the world. In the use of structural steel, he said that present specifications give 16,000 pounds to the square inch as the maximum allowable tension.

The lecture was well attended, and was presided over by A. F. Macallum, M.E.I.C., chairman of the Ottawa Branch.

Field Control of Concrete

Despite the fact that the art of making concrete is centuries old, concrete made from modern or Portland cement celebrates its one hundredth birthday this year, stated Col. H. C. Boyden, engineer for the Portland Cement Association, addressing the Ottawa Branch at the University Club on the evening of May 16th.

The concrete made from American Portland cement, however, said Col. Boyden, was only 50 years old. He laid stress on the immense amount of concrete which was utilized each year without any scientific or efficient control. In a single year of about 120 million cubic yards, representing 700 million barrels of cement, not less than 100 million cubic yards were mixed and placed without any attention to control. This resulted in a huge financial loss and was disastrous in many cases to the permanent structures involved. It meant waste in every way but principally through faulty construction and poor economy in the use of materials.

It was claimed by the speaker that the modern well built concrete structure was probably the most durable of all types of building. The course of time would prove it even more lasting than the most durable structures of the past.

Presentation of Gzowski Medal to D. W. McLachlan, M.E.I.C.

The Gzowski medal was presented to D. W. McLachlan, M.E.I.C., of the Department of Railways and Canals, at a joint smoker of the *Engineering Institute* and the Professional Institute of the Civil Service at the Chaudiere Golf Club, April 24th. Mr. McLachlan was awarded the medal for his paper on "The St. Lawrence River Problem". The presentation was made by A. F. MacCallum, M.E.I.C., who referred briefly to the number of times Ottawa had been represented in this award by its prominent engineers and to the excellent nature of Mr. McLachlan's paper.

This medal was provided for by Colonel Sir Casimir Gzowski, A.D.C., K.C.M.G., late past-president of *The Engineering Institute of Canada*. The award is made for the best paper of the year presented before the society by one of its members. The first award was made in 1890. Mr. McLachlan's paper has been considered by prominent engineers a most valuable contribution to the literature of the engineering profession.

The smoker was a unique event, held under the joint auspices of two prominent institutes. Commander C. P. Edwards, A.M.E.I.C., past-chairman of the Ottawa Branch of *The Engineering Institute* and prominent in the affairs of the Professional Institute was in the chair. The programme was of excellent variety and greatly appreciated by the two hundred members present. The artists of the evening were Mr. N. T. Allen, Mr. C. Parker, Mr. W. Albright, Mr. Tom Hamilton and Mr. Chas. O'Reilly, pianist, and Mr. F. R. Byshe, clarinettist.

Moving pictures were provided by the Dominion Parks Branch and B. E. Norrish, A.M.E.I.C., of the Associated Screen News, Montreal,

Sault Ste. Marie Branch

A. H. Russell, Jr.E.I.C., Secretary-Treasurer.

A regular meeting of the Sault Ste. Marie Branch was held on Friday April 24th, 1925, following a dinner at the Y.W.C.A. with C. H. Speer, M.E.I.C., vice-chairman, presiding.

The chairman called the meeting to order and then introduced G. Durgin, superintendent operation-research of the Spanish River Pulp and Paper Mills Ltd., the speaker of the evening, who gave a paper on "The Economic Aspects of the Dye Industry".*

*An abstract of this paper appears on another page of this issue.

L. R. Brown expressed the feeling of all present when he moved a hearty vote of thanks to Mr. Durgin for his splendid and instructive paper. C. H. E. Rounthwaite, A.M.E.I.C., on behalf of the members and W. G. Atkin of the Board of Trade on behalf of the guests, seconded the motion.

St. John Branch

Annual Meeting

Once again the Saint John Branch ended another fiscal year by combining a dinner with the annual meeting. The event occurred on the evening of May 6th, at the Victoria hotel, when thirty-five persons enjoyed a splendid dinner. Mixed in between courses of the dinner, songs were sung and a local musician gave several solos.

Following the dinner a toast list was observed. After the toast to "The King", there followed one to the "City of Saint John", proposed by G. G. Hare, M.E.I.C., and replied to by His Worship Mayor F. L. Potts, of Saint John. His Worship spoke of the temporary business depression of the present and endorsed the "Made-in-the Maritimes" and the "Buy-in-Saint John" campaigns as measures to correct this condition.

The toast to "Our Guests" was proposed by A. Gray, M.E.I.C., and replied to by F. M. Sclanders, secretary of the Board of Trade. Mr. Sclanders mentioned his pleasure in renewing acquaintance with friends in Saint John after some years absence and of his recent connection with the Board of Trade at Windsor, Ontario.

The toast to "Kindred Professions" was proposed by W. R. Pearce, M.E.I.C., followed by H. O. McInerney, K.C., and C. F. Sanford, K.C. It was indeed fitting that Mr. Sanford be a guest of the branch at dinner in recognition of his work in launching the Admiral Beatty hotel to be opened here next month.

The toast to "*The Engineering Institute of Canada*" was fittingly proposed by G. G. Murdoch, M.E.I.C., member of Council from this branch, and replied to by F. P. Vaughan, M.E.I.C., past-councillor.

Following the banquet the guests retired and the business meeting was held. The minutes of the last meeting and the report of the executive for the year were read by the secretary. Reports were also given by the chairmen of all committees, showing that the work of the branch had advanced throughout the year.

The scrutineers reported the following officers elected:—

Chairman.......................... W. R. Pearce, M.E.I.C.
Vice-Chairman.................... A. R. Crookshank, M.E.I.C.
Executive.......................... E. A. Thomas, A.M.E.I.C.
S. R. Weston, A.M.E.I.C.

G. G. Hare, M.E.I.C., as retiring chairman spoke briefly thanking the members of the branch for their interest in *Institute* affairs during his term of office. After Mr. Pearce had been escorted to the chair, Messrs. A. R. Crookshank, M.E.I.C., and E. A. Thomas, A.M.E.I.C., were called on and thanked the members for election to office.

Votes of thanks were passed to the New Brunswick Telephone Company for use of assembly hall to hold branch meetings throughout the year and also to the press for consideration in publishing news of the branch.

The meeting adjourned about 11 p.m. after a very pleasant banquet and satisfactory business meeting.

Annual Report, April 30th, 1925

Gentlemen:—

Herewith is submitted the report of the executive for the year ending April 30th, 1925.

Five regular branch meetings and three dinners have been held in St. John, and a meeting in Fredericton. In detail, these occurred as follows:—

1924

May 16—Annual meeting and dinner.

May 30—Farewell banquet to E. G. Cameron, A.M.E.I.C.

Oct. 16—Paper on "The Construction and Operation of Queenston-Chippawa Power Development" (illustrated), by A. C. D. Blanchard, M.E.I.C.

Nov. 12—Dinner at Union Club. Address on "Wembley and the World Power Conference" (illustrated), by Fraser S. Keith, M.E.I.C.
Presentation of Branch Charter by F. A. Bowman, M.E.I.C., vice-president of The Institute.

Dec. 11—Paper on "Tests for Vocational Selection and Guidance", (with charts), by George J. Trueman, Ph.D.

1925

Jan. 15—Paper on "The Admiral Beatty Hotel" (illustrated), by R. H. MacDonald, vice-president, Ross and Macdonald, Inc., architects, Montreal.

Feb. 19—Branch meeting for transaction of business.

Apr. 1—Joint meeting with the Engineering Society of the University of New Brunswick, at Fredericton, N.B.; Paper on "The Teredo", (illustrated), by E. G. Evans, M.E.I.C., of Moncton, N.B. Paper on "Highway Construction in New Brunswick" (illustrated), by L. L. Theriault, M.E.I.C., of Fredericton. Paper on "Electrolysis of Lead Cable Sheaths and its Mitigation" (with charts), by C. L. Roach, Jr.E.I.C., of St. John.

Apr. 8—Paper on "Mechanical Features of the Mount Royal Hotel" (illustrated), by Walter J. Armstrong, M.E.I.C.

Institute members have maintained good interest in the affairs of the branch throughout the year. At meetings where addresses on subjects of general interest were discussed, the attendance by the general public has been good, and justifies the policy of the executive in throwing open to the public all branch meetings. All addresses delivered have been of a high standard. Branch members have read papers before other branches of *The Institute*, and this branch has in turn been favoured by addresses from members of sister branches, to the mutual advantage of the several branches. The action of several branch members in delivering addresses to other societies, on engineering subjects, is to be commended in that the general public may be properly informed on engineering works.

The only professional meeting branch members had an opportunity of attending during the past year was the annual and professional meeting at Montreal in January, last, when eleven members from this branch were in attendance.

The branch has been favoured with visits from F. A. Bowman, M.E.I.C., of Halifax, N.S., vice-president; Fraser S. Keith, M.E.I.C., of Montreal, general secretary; C. E. W. Dodwell, Hon.M.E.I.C., of Halifax. The charter was presented to the branch by Vice-President Bowman in November. The retirement of Fraser S. Keith, M.E.I.C., from the active duties of general secretary of *The Institute* has been properly noted in a suitable resolution of appreciation passed by this branch and forwarded to Mr. Keith.

A meeting was held at Fredericton jointly with the Engineering Society of the University of New Brunswick. This enables branch members resident in Fredericton and vicinity, and the students at the university, who could not otherwise do so, to attend a branch meeting.

For courtesies extended during the past year especial mention must be made of the kindness of the New Brunswick Telephone Company, Limited, in placing their assembly hall at the disposal of the branch for meetings. The press of Saint John have also been most generous with space in the newspapers.

The following have been officers of the branch for the past year:—

Chairman.......................... G. G. Hare, M.E.I.C.
Vice-Chairman.................... C. McN. Steeves, M.E.I.C.
Members of Executive........... W. R. Pearce, M.E.I.C.
A. R. Crookshank, M.E.I.C.
Geoffrey Stead, M.E.I.C.
ex-officio as Past-Chairman....... G. N. Hatfield, A.M.E.I.C.
ex-officio as Councillor:
(May to January)........... F. P. Vaughan, M.E.I.C.
(January to April)........... G. G. Murdoch, M.E.I.C.
Secretary-Treasurer.............. W. J. Johnston, A.M.E.I.C.

The chairmen of the various committees were as follows:—

Papers and Meetings............ W. R. Pearce, M.E.I.C.
Entertainment.................... G. G. Murdoch, M.E.I.C.
Membership....................... The Branch Executive.
Salaries............................ C. C. Kirby, M.E.I.C.
Employment...................... J. A. W. Waring, A.M.E.I.C.
Publicity........................... A. A. Turnbull, Jr.E.I.C.
Civic Building and By-laws....... J. N. Flood, A.M.E.I.C.
Concrete in Sea Water........... A. Gray, M.E.I.C.
Fuel................................ John Stephens, M.E.I.C.
Auditors........................... A. R. Crookshank, M.E.I.C.
J. A. W. Waring, A.M.E.I.C.
Representative on Nominating
Committee.................. C. C. Kirby, M.E.I.C.

The executive have attended to the business of the branch by meeting eleven times during the year.

Membership

The classification of the members is as follows:—

Grade	Resident	Branch District	Total
Members	16	10	26
Associate Members	28	11	39
Juniors	11	7	18
Students	7	0	7
Affiliates	2	0	2
Total	64	28	92
Branch Affiliates	3	0	3
Grand total			95

Application for transfer to higher grade being considered,—one.
Application for admission pending,—one.

Financial Statement
Year ending April 30th, 1925.

Receipts		
Balance in bank, April 30th, 1924	$135.37	
E.I.C. rebates and Branch News	212.66	
Branch Affiliates, dues and subscriptions	6.00	
Sale of July *Journal*	1.00	
		$355.03
Expenses		
E.I.C. *Journal* subscriptions for Affiliates	$ 4.00	
Printing	38.01	
Entertainment	56.75	
Hall and meeting	31.15	
Stenographer	10.00	
E.I.C., 12 copies July *Journal*	12.00	
Disbursements of secretary	185.01	
Four frames for branch welcome notices	10.00	
		$346.92
Balance in bank, April 30th, 1923		8.11
		$355.03
Assets		
Balance in bank, April 30th, 1925	$ 8.11	
Branch Affiliates, dues and subscriptions	12.00	
E.I.C., rebates and Branch News (estimated)	40.00	
		$ 60.11
Liabilities		
E.I.C. Headquarters, *Journal* subscriptions for Affiliates	$ 6.00	
Disbursements by treasurer	9.12	
		$ 15.12
Surplus, April 30th, 1925		$ 44.99
Surplus, April 30th, 1924		14.19

Respectfully submitted,
G. G. Hare, M.E.I.C., *Chairman.*
W. J. Johnston, A.M.E.I.C., *Secretary-Treasurer.*

Accounts checked and found correct,
J. A. W. Waring, A.M.E.I.C.,
A. R. Crookshank, M.E.I.C.,
Auditors.

Vancouver Branch

P. H. Buchan, A.M.E.I.C., Secretary-Treasurer.

The A. D. Swan Special Book Prize

In the year 1921, A. D. Swan, M.E.I.C., donated a sum of twenty-five dollars to the branch for the encouragement of student engineers as authors of meritorious papers. The first offer of this prize, which was made by the Branch Executive on November 21st of that year, did not meet with any response, owing to the conditions formulated by that body, consequently the money remained in the branch treasury.

Last year, however, it was decided to offer a twenty-five dollar book prize to students in the third year of the Faculty of Applied Science, University of British Columbia, for the best summer essay, under conditions somewhat similar to those of the "Walter Moberly Memorial Prize" for fourth year students, the main difference being that the award would be made for the current year only.

At the Tenth Congregation of the University, it was announced that the prize had been won by two students, each to receive books to the value of $12.50. Their names and the topics of their respective essays are as follow:

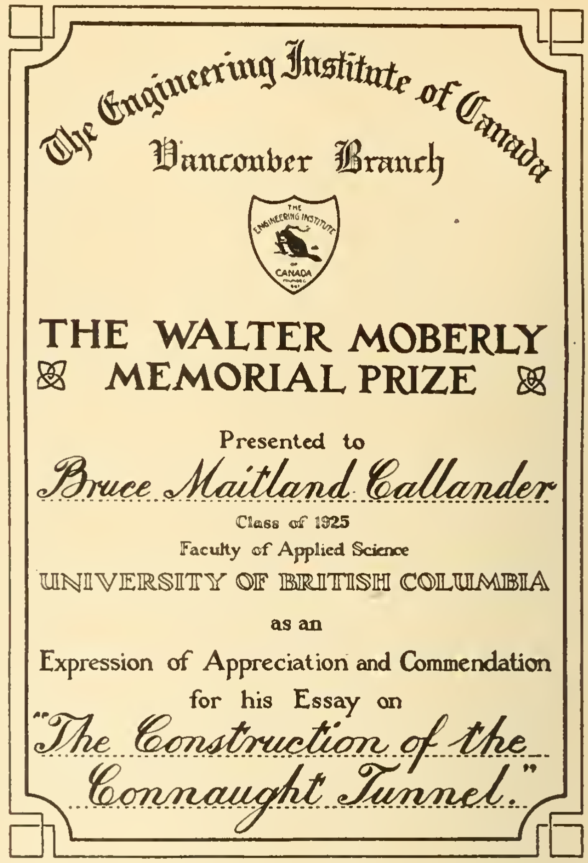
Harry Verney Warren, Class '26: "A Reconnaisance in the Whitesail District".

Alexander Morton Richmond, Class '26: "The History and Development of Copper Mountain, B.C."

The competitors for this prize numbered eleven.

The Walter Moberly Memorial Prize

The announcement at the Tenth Annual Congregation of the University of British Columbia on Thursday, May 7th, 1925, that the first award of "The Walter Moberly Memorial Prize" had been made to Bruce Maitland Callander, Class '25, Faculty of Applied Science, marked the culmination of much earnest effort on the part of the officers of the Vancouver Branch towards placing before the student engineers of the province, a fitting memento of the personality and achievements of the late pioneer engineer and explorer, Walter Moberly.



From time to time in the pages of *The Journal*, mention has been made of the "Moberly Fund", concerning which the branch reached a decision based on the report of a special committee, to use the fund to endow a memorial book prize for the best summer essay written by students in the graduation year of the Faculty of Applied Science, University of British Columbia. As has already been stated in these columns, the fund was reinvested in Dominion of Canada and City of Vancouver twenty and forty year bonds, yielding an income of thirty dollars per annum, from which it was decided to appropriate yearly the sum of twenty-five dollars for the purchase of the necessary books.

Although, for unavoidable reasons, the offer of the prize was not made known to the students until last November, twelve members of Class '25 entered their summer essays in the competition. Under the circumstances, the Executive of the Branch felt that a very encouraging start had been made, and one which augured well for the popularity of the prize in the years to come, when its significance would be better understood and appreciated.

In order to ensure a high standard of work in the essays entered for the competition, students are required to seek the approval of the Branch Executive, stating the topics of their essays, before they can be admitted as competitors. In the present instance, the operation of this rule has amply justified itself.

With regard to the choice of books for the prize, the policy adopted has been to allow the winner to make his own selection. Through the kind co-operation of Dean R. W. Brock, M.E.I.C., arrangements have been made to have the purchasing done through the library of the University, in order that the winner may enjoy the maximum benefit of his success.

The accompanying illustration shows the book plate which will be inserted inside the cover of each book presented to the winner of the prize. In this case it bears the name, Bruce Maitland Callander, and "The Construction of the Connaught Tunnel" as the title of his essay. Mr. Callander deserves the hearty congratulations of the branch for his success as first winner of "The Walter Moberly Memorial Prize".

Victoria Branch

E. P. Girdwood, M.E.I.C., Secretary-Treasurer.

Engineers Visit Local Observatory

Nearly sixty members of the Victoria Branch of *The Engineering Institute of Canada* called at the Gonzales Heights Observatory Saturday afternoon, where Mr. Napier Denison, the director, gave a lecture on the various types of seismograph instruments and the abnormal weather

Victoria Branch visits Gonzales Heights Observatory

conditions which sometimes strike the Pacific coast. Mr. Denison also explained the principles governing the new radio time broadcaster. The members of *The Institute* expressed much appreciation to Mr. Denison for his kindness in showing and explaining the many instruments of the observatory. Patrick Philip, M.E.I.C., moved a vote of thanks, which was seconded by J. N. Anderson, A.M.E.I.C., and enthusiastically carried.

Engineers Visit Ormond's

Members of the Victoria Branch visited Ormond's Limited factory on Friday afternoon. Mr. A. E. Ormond and staff showed the visitors, about sixty in number, including engineers and their friends, over the factory. The members were the interested observers of the various processes of mixing and making chocolates, biscuits, made both by machinery and by hand. The mysteries of "How the wheels go round" were revealed to the visitors.

Afternoon tea was served by the staff and was much appreciated by the party. The factory is a modern building employing about ninety hands. Products are shipped from this source to all parts of Canada and exported.

The visit was a great success and will certainly inspire the buying of home products. It was voted by all present, one of the most successful visits of the year, and all were unanimous in seconding the hearty vote of thanks proposed by the chairman, G. B. Mitchell, M.E.I.C.

CORRESPONDENCE

Puente del Inca, Argentine.
March 9th, 1925.

The Editor;
The Engineering Journal,
Dear Sir:—

You may be interested to hear that in company with Mr. M. F. Ryan, chief mechanical engineer of the Central Argentine Railway, and Messrs. Cockrane and Clayton, two other mechanical engineers of the same line, I went on a mountain climbing expedition in February. We had extraordinarily good luck and succeeded in climbing the following mountains near Inca:—

1. Torlosa—17,925 feet—All of us climbed this.
2. Almacen—17,567 feet—Ryan, the leader, Cockrane and self.
3. Aconcagua—23,265 feet—Ryan, the leader, Cockrane and self.

Almacen was, as far as we can make out, a first ascent. Aconcagua is of course the highest mountain in the world, outside of the Himalayas in India, and there have been only two other ascents of it officially known. The Fitzgerald expedition of 1897, which came out from England especially to climb it and Tupungato (22,000 feet) was successful in the first ascent of the mountain, the second member of the party, W. V. M. Vines and two Swiss-Italian guides getting up. Then again in 1908 it was climbed by a Swiss engineer, Hebling by name, who was out here for some years in the employ of the Argentine government.

Our ascent, the three of us, so far as we can definitely ascertain was the third. The time was four days from our Base camp at 14,000 feet. We brought back absolute proof of the ascent in the shape of Vine's maximum and minimum thermometer left by him in a cairn of stones at the summit in 1897, and mentioned by Fitzgerald in his book "The Highest Andes", I believe it is called. Aconcagua is not a hard mountain to climb nor dangerous, but on account of the tremendous winds, the great amount of loose Skree slopes, the great altitude, and the cold, difficult enough in all truth. Clayton fell out on account of the cold, and I found out afterwards that I had frozen my feet and fingers. We had to come back in the dark, a dangerous proceeding but absolutely necessary if we did not want to sleep on the mountainside, and the summit climb from our forward bivouac at 19,000 feet took us from 5 o'clock in the morning until 11 o'clock at night when the last two got into camp, one practically wandering in his mind, (Cockrane).

Torlosa from the pure climbing point of view was the best climb of all, as we had to rope, get up "chimneys", etc., and cross glaciers. It had been climbed once before, by some wellknown Russian Countess I understand. I must say that climbing is a great sport, this was my first experience of it. Mr. Ryan the leader is an experienced climber and one could not wish for a better chief.

If there are any members of *The Institute* coming down this way at any time, I trust you will ask them to get in touch with me, as I should be overcharmed to meet them and could even put one or two up for a few days in Inca. A trip across the Andes should be broken here in Inca, where there is a fine hotel, mineral baths, and a wonderful natural bridge, (Puente del Inca — the Bridge of the Inca).

I might mention about the climbs we made that we carried a Fortin type mercury barometer which with a base mercury barometer, both with verniers and attached thermometers allowed us to measure heights very accurately, in fact our recorded height for Aconcagua is within 185 feet of the survey figure made in 1897. Cockrane also did a fair amount of geologising and we of course took a great number of photos. The high Andes here are of course of very recent geological formation, and one finds seashells not far from Inca, and Charles Darwin in his "Voyage of the Beagle", speaks of finding at the top of some pass seashells and other clear indications that these mountains once formed a sea bottom.

It is always so interesting to get *The Journal* and read of the fine progress *The Institute* is making, not to mention notes about old friends. One gets lonely for a sight of good old Canada when living down here. Heartiest good wishes to *The Institute* and its members.

Yours faithfully,

C. B. R. MACDONALD.

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Preliminary Notice

of Applications for Admission and for Transfer

May 22nd, 1925.

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in June 1925.

R. J. DURLEY, Secretary.

*The professional requirements are as follows:—

A Member shall be at least thirty-five years of age, and shall have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office, or a term of instruction in a school of engineering recognized by the council. The term of twelve years may, at the discretion of the council, be reduced to ten years in the case of a candidate for election who has graduated from a school of engineering recognized by the council. In every case the candidate shall have held a position in which he had responsible charge for at least five years as an engineer qualified to design, direct or report on engineering projects. The occupancy of a chair as a professor in a faculty of applied science or engineering, after the candidate has attained the age of thirty years, shall be considered as responsible charge.

An Associate Member shall be at least twenty-seven years of age, and shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years. The occupancy of a chair as an assistant professor or associate professor in a faculty of applied science of engineering, after the candidate has attained the age of twenty-seven years, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council, shall be required to pass an examination before a board of examiners appointed by the council. The candidate shall be examined on the theory and practice of engineering with special reference to the branch of engineering in which he has been engaged. This examination may be waived at the discretion of the council if the candidate has held a position of professional responsibility for five or more years.

A Junior shall be at least twenty-one years of age, and shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the council, if the candidate for election has graduated from a school of engineering recognized by the council. He shall not remain in the class of Junior after he has attained the age of thirty-three years.

Every candidate who has not graduated from a school of engineering recognized by the council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects: geography, history, (that of Canada in particular), arithmetic, geometry, euclid (books I, IV and VI), trigonometry, algebra up to and including quadratic equations.

A Student shall be at least seventeen years of age, and shall present a certificate of having passed successfully an examination equivalent to the final examination of a high school or the matriculation of an arts or science course. He shall either be pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall not remain in the class of student for more than two years after graduation; or he shall be receiving a practical training in the profession, i which case he shall pass an examination equal to that prescribed for admission to the grade of Junior in the foregoing section and he shall not remain in the class of Student after he has attained the age of twenty-seven years.

An Affiliate shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience, qualify him to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

ADMISSIONS

BENOIT—PAUL SOUMANDE, Lieut.-Col., R.C.E., of Halifax, N.S. Born at Ottawa, Ont., July 6th, 1884. Educ., Grad. R.M.C., 1904. Attended School of Military Engrg., Chatham, England; 1904 to date, officer of the R.C.E., in charge of various engrg. works, at present dist. engr. officer, Mil. Dist. No. 6, Halifax, N.S.

References: H. F. H. Hertzberg, A. C. Caldwell, A. G. L. McNaughton.

BRUNNING—WILLIAM HENRY, of 244 Barrington Street, Halifax, N.S. Born at Ipswich, England, June 23rd, 1874; Educ., Articled to E. Dale, gen. bldg. contractor, Ipswich, England, 1891-94; 1895-1905, gen. bldg. constrn., in England; 1906-14, gen. bldg. constrn., in Canada and U.S.A.; Received Commission, Can. Engrs. Dec. 1914, serving in England and France until 1917; 1918-19, officer in charge dfting., Mil. Dist. No. 6, Halifax, N.S.; 1919 to date, works officer, Mil. Dist. No. 6, Halifax, N.S. (Capt. R.C.E. 1920).

References: A. C. Caldwell, H. F. H. Hertzberg, J. L. H. Bogart, C. E. W. Dodwell, R. W. McColough.

CLARKE—GEORGE GOOD, of 62 Strathearn Avenue, Montreal West, Que. Born at Falmouth, Jamaica, B.W.I., Dec. 19th, 1888; Educ., B. Eng. Liverpool Univ.; 1912; 1908 (summer), asst. engr., R.M.S. Port Henderson, Bristol to Jamaica; 1912-13, detailing on rly. and highway bridges, 1919-20, detailing on bldgs., Dominion Bridge Company; Part of 1914, on bridge erection, Intercolonial Rly. line between Three Rivers and Truro; 1920-23, design of Mount Royal Hotel and checking detail drawings of many large bldgs., etc., and from 1923 to date, in charge of and checking on contracts in the drawing office, Dominion Bridge Company, Montreal, Que.

References: D. C. Tennant, F. P. Shearwood, P. L. Pratley, J. Robertson, L. R. Wilson, A. Peden.

DICKENSON—GEORGE NEWTON, Brevet Capt., R.C.E., of Halifax, N.S. Born at Melbourne, Australia, Sept. 14th, 1894; Educ., London Univ. Martic. (1st Class), 1912. Grad. School of Military Engrg., Chatham, England, 1921; 1912-13, pupil, Midland Rly. Company; 1913-14, dftsman. and asst. surveyor, Cape Breton Coal, Iron & Rly. Co., Broughton, N.S.; 1916-19, overseas, Can. Engrs.; 1920, Commissioned, R.C.E.; 1922 (Feb.-Sept.), and June 1923-24, instructor in military engrg., Royal Military College, Kingston; At present asst. works officer, Mil. Dist. No. 6, Halifax, N.S.

References: A. C. Caldwell, H. F. H. Hertzberg, J. L. H. Bogart, L. F. Grant.

DUNBAR—JAMES BEVAN PLENDERLEATH, of Calgary, Alta. Born at Quebec, Que., August 20th, 1889; Educ., Grad. R.M.C., 1909; 1910-11, School of Military Engrg., Chatham, England; 1912-14, asst. to Commanding R.C.E., Mil. Dist. No. 3, Kingston, Ont.; 1914-15, Capt. and Asst. Adj., 1915-16, Capt. and Adj., 1st Can. Divn'l. Engrs.; 1916 (Feb.-Oct.), Major and O.C., 7th Field Co., C.E., 3rd Can. Divn.; 1916-17, Major and Adj., 3rd Can., Divn'l. Engrs., During battle of Vimy acted as C.R.E., 3rd Can. Divn.; 1918 (Mar.-May), A. Lieut.-Col. and chief instructor, Can. School of Military Engrg., England; 1918-19, O/C. 3rd Reserve Battn., C.E.; 1919-20, acting senior engr. officer, 1920-23, senior engr. officer, Mil. Dist. No. 3, Kingston, Ont.; April 1923 to date, district engr. officer, Mil. Dist. No. 13, Calgary, Alta.

References: C. J. Armstrong, H. F. H. Hertzberg, J. L. H. Bogart, G. H. Whyte, C. S. L. Hertzberg, F. K. Beach.

FRASER—ANDREW STACKWELL, of Cardinal, Ont. Born at Ottawa, Ont., Feb. 5th, 1897; Educ., 1916-17, Royal Mil. Coll. Kingston, B.Sc., McGill Univ. 1922; 1920 (6 mos.), Price Bros., Kenogami, Que.; 1921-22 (two 5 mos. periods), chemist with Dept. of Health; Dec. 1922 to Mar. 1924, with Corn Products Refining Co., Edgewater, N.J., and Argo, Ill.; March 1924 to date, asst. supt., Cardinal plant of the Canada Starch Co., Montreal, Que.

References: J. H. Hunter, R. Bickerdike, Jr., C. Thomson, A. Walker, A. H. Ross.

GIRARD—HENRI, of 2484 Belanger Street, Montreal, Que. Born at Montreal, Oct. 27th, 1899; Educ., C.E. Ecole Polytech., Montreal, 1924; 4 mos., surveying with M. Barclay, C.E., Montreal; 3 mos. surveying with Paul Beique, C.E., Montreal; 4 mos., geol. works, Federal Govt.; 4 mos., roads dept., Quebec Prov. Govt.; At present in the Technical Service Dept., City of Montreal.

References: H. A. Paquette, A. Frigon, P. L. Pratley, G. R. MacLeod, O. O. Lefebvre, H. Massue.

HAMILL—GEORGE JACOB, of Iroquois Falls, Ont. Born at Valcartier, Que., March 26th, 1895; Educ., 1 year science at college. I.C.S. Diploma, Civil Engrg.; 1913-14, rodman and tracer, Brompton Pulp & Paper Co.; 1915-17, dftsman., Butterfield Co., Rock Island, Que. and Can. Ingersoll-Rand, Sherbrooke, Que.; 1918-21, engrg. dftsman., Riordon Pulp & Paper Co., Hawkesbury, Ont.; 1922 to date, 2½ years, engrg. dftsman. and six months, material engr., Abitibi Power & Paper Co., Iroquois Falls, Ont.

References: G. D. MacKinnon, C. B. Thorne, C. B. Bate, W. B. Crombie, L. E. Kendall, C. B. Shaw.

HAMILTON—IRWIN ROBERT, of Montreal, Que. Born at Ottawa, Ont., Nov. 28th, 1887; Educ., B.Sc. McGill Univ. 1908. Long course, R.M.C., 1910. 1910-12, School of Military Engrg., Chatham, England; 1908-09, President's office and purchasing dept., C.P.R.; 1910, appointed Lieut., R.C.E., 1915, promoted Capt., 1916, promoted Brevet Major, 1920, promoted Major; At present dist. engr. officer, Military Dist. No. 4, Montreal, Que.

References: C. J. Armstrong, G. E. McCuaig, E. G. M. Cape, T. C. McConkey, W. D. Staveley.

HENSHAW—FREDERICK ROBERT, of Halifax, N.S. Born at Montreal, Que., Dec. 13th, 1890; Educ., Grad. R.M.C., 1911, 1911-13, School of Military Engrg., Chatham, England; 1914, divn. officer for the maritime provinces, Mil. Dist. No. 5; 1915, chief instructor, Can. Engrs. Training Depot, England; 1916-19, served with various Can. Engr. units in France and England; At present chief instructor, School of Military Engrg., Halifax, N.S.

References: H. F. H. Hertzberg, A. C. Caldwell, J. Houliston, C. S. L. Hertzberg.

HOLM—MOURITS JENSEN, of 213 Mountain Street, Montreal, Que. Born at Sondervinge, Togn., Denmark, March 29th, 1891; Educ., C.E. Univ. of Copenhagen, 1918; 1918 (Feb.-July), dftsman., gasworks, City of Copenhagen; 1918-19, a/s Girdenaacentralen, Denmark, designing re-inforced concrete for water power plant and bldgs.; 1919-22, bldg. roads, railroads and bridges for Wright, Thomsen & Larsen, Denmark; 1922-24, chief engr. for office in Copenhagen, for Yenseu & Tolstnip, Engrs. and Contractors, Denmark; At present with the Atlas Construction Company, Montreal, Que.

References: A. S. Dawes, E. W. Wall, F. B. Brown, J. L. Busfield, C. M. Morssen.

IRWIN—ROBERT HAMILTON, of Montreal, Que. Born at Ottawa, Ont., Nov 28th, 1887; Educ., B.Sc., McGill Univ. 1908. Long course, R.M.C., 1910. 1910-12, School of Military Engrg., Chatham, England; 1908-09, President's office and purchasing dept., C.P.R.: 1910, appointed Lieut., R.C.E., 1915, promoted Capt., 1916. promoted Brevet Major, 1920, promoted Major; At present dist. engr. officer, Military Dist. No. 4, Montreal, Que.

References: C. J. Armstrong, C. E. McCuaig, E. G. M. Cape, T. C. McConkey W. D. Staveley.

MacCRIMMON—DUNCAN DANIEL, P. O. Box 28, Isle Maligne, Que. Born at Lancaster, Ont., Dec. 16th, 1879; Educ., Short course, highway engineering, Univ. of Michigan, 1920; 1904-09, topog'r., dftsman., etc., G.T.P.Rly., headquarters at Winnipeg; 1909-10, dftsman., leveller, transitman, C.P.R., location party in Sask., Alta., and B.C.; 1911-12, res. engr., Estevan Branch, 1913, res. engr. in charge of ballasting, Moose Jaw South West Branch, 1913-14, res. engr., tracklaying and ballasting, C.P.R.; 1915, res. engr., Edmonton, Dunvegan and B. C. Rly.; 1916-19, overseas, with Rly. Troops, C.E.F., and B.E.F.; 1919-20, engr. in charge, constrn. of race track for J. K. L. Ross, at Laurel, Md., U.S.A.; 1920 (Apr.-July), engr., rock crushing plant, Deeks Quarry, near Smiths Falls, Ont., for Dominion Construction Co.; 1920 (July-Dec.), asst. engr., and 1921-23, res. engr., C.P.R.; At present on power development work, with Quebec Development Co., Isle Maligne, Que.

References: W. A. James, D. Hillman, C. W. P. Ramsey, C. L. Hervey, C. R. Crysdale, A. E. Sharpe, J. H. Forbes.

SCHMIDLIN—EDWARD JAMES CARSON, of Kingston Ont. Born at Brantford, Ont., August 18th, 1884; Educ., Diploma with Honours, R.M.C., 1905., 1905-07, School of Military Engrg., Chatham, England; 1908-10, locomotive shops, London and South Western Railway, Vauxhall, London, England, erecting and testing new engines; 1908-10, asst. locomotive officer, Raival Pindi Dist., North-Western Rly., India; 1910-12, in charge of topog'l. survey, Petewawa Military Reserve, under Survey Divn., Militia Dept.; 1912-14, in charge of all topog'l. field work under above Dept.; 1914-19, overseas, Lieut.-Col., Can. Engrs.; 1919-21, prof. of military engr., and 1921 to date, prof. of engrg. (civil and military), Royal Military College, Kingston, Ont.

References: A. Macphail, W. P. Wilgar, H. F. H. Hertzberg, E. C. Goldie, E. G. Cameron, A. G. L. McNaughton, H. J. Lamb.

FOR TRANSFER FROM CLASS OF ASSOCIATE MEMBER TO MEMBER

HAYWARD—JOSEPH WILLIAM, of Ste Anne de Bellevue, Que. Born at Winchmore Hill, England, Jan. 24th, 1875; Educ., B.Sc. (Honours), Manchester Univ., England, 1895. Victoria Univ. Scholarship, 1895, M.Sc. 1898; 1895-98, engr. ap'tice. McOnie Harvey & Co., Glasgow, and Beyer Peacock & Co., Manchester; 1898-1902, engrg. lab. asst., Armstrong College, Newcastle-on-Tyne; 1902-06, chief engrg. lab. asst., Central Technical College, South Kensington; 1906-08, asst. prof. of mech. engrg., McGill University, Montreal; 1911-12, report on harbour at Fanning Island, Pacific Ocean, for C. N. Armstrong, of Montreal; 1915-16, chief asst. res. engr., for Sir Douglas Fox and Partners during constrn. of Royal Naval Cordite Factory, Holton Heath, England; 1916-18, engr. of design and constrn., British Acetones Ltd., Toronto; 1918-19, designing engr. for the Canadian and American Electro Products Factories, Shawinigan Falls, Que.; 1920, report on Prince location and Spar Island Properties, Lake Superior, for George Durnford and others of Montreal; 1921-24, instructor in machine design College of the City of New York. At present engaged upon study of formation and movement of ice in the St. Lawrence River.

References: H. T. Barnes, R. S. Lea, J. C. Smith, F. A. Gaby, H. M. MacKay, R. J. Durley, J. T. Farmer.

MUDGE—ARTHUR LANGLEY, of 67 Duggan Avenue, Toronto, Ont. Born at Montreal, Que., October 17th, 1873; Educ., B.A.Sc. (Mech. Engrg.), McGill Univ. 1894. 1 year elect'l. engr., McGill, graduating in 1895; 1895-99, engrg. office work, teaching, testing, estimating, constrn., etc., with Can. Gen. Elec. Co., Peterborough, Ont.; 1899-1901, elect'l. engr., lines east of Detroit, G. T. Ry.Co.; 1901-04, constrn. foreman, Stanley Elec. Mfg.Co.; 1904-07, sales and estimating engr., Allis Chalmers Co. and Allis Chalmers Bullock Ltd.; 1907-08, constrn. foreman and office engr., Canadian Crocker Wheeler Co.; 1908-25, chief elect'l. engr., Smith Kerry & Chace, later Kerry & Chace, and at present power plant engr., on staff of Canadian Section, Joint Engineering Board, St. Lawrence Deep Waterways Project.

References: J. G. G. Kerry, D. W. McLachlan, W. A. Bucke, S. B. Clement, J. Murphy.

WARDLE—JAMES MOREY, of Ottawa, Ont. Born at Chilliwack, B.C., June 26th, 1888; Educ., B.Sc. Queens' Univ. 1912; 1908-11, one season, Dom. land surveying and mining work, two seasons rly location and constrn., in B.C.; 1911-12, asst. to div. engr. on constrn., Can. Nor. Pac. Rly., Hope, B.C.; 1912-13, asst. to city and municipal engr., Chilliwack, B.C.; 1914, asst. highway engr., 1915-18, acting chief highway engr., Dominion Parks Branch, Dept. of the Interior; 1918-20, supt., Banff National Park, Banff, Alta.; 1920 to date, chief engr., Canadian National Parks Branch, Dept. of the Interior, Ottawa, Ont.

References: C. R. Coutlee, A. E. Foreman, P. Philip, J. Murphy, W. K. Gwyer, C. B. Brown, E. E. Brydone-Jack.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

ALBERGA—ALBERT MILLER, of 73 Albert Street, Ottawa, Ont. Born at Black River, Jamaica, B.W.I., Jan. 1st, 1894; Educ., Awarded Jamaica Island Scholarship ($3,000.00), 1912. B.Sc. (C.E.), McGill Univ. 1916; 1916 (Apr.-Sept.), asst. to chief inspr., Munitions Dept., Canada Cement Co., Montreal.; 1916-19, overseas, Sgt., Can. Forestry Corps; 1919-22, private tuition, maths & physics, Montreal; 1920 (Feb.-Nov.), asst. engr. to chief forester, Wayagamack Pulp & Paper Co., Three Rivers, Que.; April 1922 to date, with engineering service, Canadian National Parks Branch, Dept. of the Interior, Ottawa, at present senior engrg. clerk.

References: H. M. MacKay, E. Brown, G. H. Herriot, A. C. Tagge, J. M. Wardle, T. S. Mills, A. A. Wickenden.

BURNS—EEDSON LOUIS MILLARD, of Kingston, Ont. Born at Montreal, Que., June 17th, 1897; Educ., R.M.C. Kingston, 1915. Course at School of Military Engrg. Chatham, England; 1915, Lieut., R.C.E., Canada; 1916-18, overseas, with 4th Signal Co., and on staff; 1919-20, works officer, Mil. Dist. No. 7; 1920-21, Sch. of Mil. Engrg., Chatham; 1922, instructor, Sch. of Mil. Engrg., Halifax, N.S.; 1923, in charge field party, topog'l. surveys branch, Dept. National Defence; 1924, asst. to A. D. Mil. Surveys, Dept. National Defence, and in charge field parties in Quebec; Sept. 1924 to date, asst. professor of military engrg., Royal Military College, Kingston, Ont.

References: J. B. Cochrane, A. C. Caldwell, H. F. H. Hertzberg, J. L. H. Bogart.

FERRIS—CECIL BRUCE, Capt., D.C.M., Croix de Guerre, of 94 Sherwood Avenue, Toronto, Ont. Born at Kingston, Ont., July 15th, 1885; Educ., B.A.Sc., Univ. of Toronto, 1921; 1908, survey and office, 1909, constrn., roadways dept., Toronto; 1912-14, asst. to representative of Henry Holgate, M.E.I.C., Montreal, Dam, pulp plant and transmission line survey and constrn.; 1914-19, overseas, Capt., Can. Engrs.; 1920, research on concrete proportions, properties, surface area, etc., with Mr. R. B. Young, Hydro-Electric Power Commission; 1921, engrg. staff, Chippewa Canal, concrete lining plants and concreting of whirlpool trapezoidal section; 1923 to date, adjustment, payment and costs of variations in constrn. contracts, architect's dept., Board of Education, Toronto. Ont.

References: T. R. Loudon, H. E. T. Haultain, C. H. Mitchell, C. S. L. Hertzberg, R. B. Young, J. H. Curzon.

JOYAL—JULES, P. O. Box 249, Chicoutimi, Que. Born at St. François du Lac, Que., Oct. 6th, 1894; Educ., B.A.Sc. C.E., Univ. of Montreal, 1920; 1916-17, rodman, Quebec Streams Commn.; 1918-19, Chaudiere Survey Party; 1920-21, in charge of survey party, Price Bros. & Co. Ltd.; 1921-22, in charge of survey parties, Lake Megantic Pulp and The Montmorency Lumber Co.; 1922 (May-Dec.), divn. engr., Road Dept., Quebec; Dec. 1922 to date, logging divn. Price Bros. & Co. Ltd., Chicoutimi, Que.

References: G. E. LaMothe, A. B. Normandin, J. A. Lefebvre, O. O. Lefebvre, H. B. Pelletier.

PASSY—PHILIP deLACY DEARE, Major, R.C.E., of Ottawa, Ont. Born at Hastings, Neb., U.S.A., March 28th, 1887; Educ., Grad. R.M.C., 1907; 1907 (July-Sept.), topog'r., survey divn., Dept. National Defence; 1908-09, Under instruction, defence lights, and mtce. of bldgs., Halifax, N.S.; 1909-10, divn. officer, R.C.E., in charge mtce. of bldgs., Wellington Barracks, Halifax, N.S.; 1911, officer, in charge of topog'rs., 1912-14, officer in charge reproduction and publication of maps, Dept. National Defence; 1914-15, asst. director of military surveys; 1915-18, Commanding R.C.E., Quebec; 1918-19, Commanding R.C.E., Kingston, Ont.; 1920-24, senior engr. officer, Mil. Dist. No. 1, London, Ont.; At present attached to Survey Division, Dept. National Defence, Ottawa, Ont.

References: A. G. L. McNaughton, H. F. H. Hertzberg, G. Roy, J. B. Cochrane, A. C. Caldwell.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

CLIFFORD—JAMES LAWRENCE, of 287 George Street, Peterborough, Ont. Born at London, England, Aug. 26th, 1899; Educ., 1 year. Univ. of Tor. (1919-20), D. S. C. R. Course, struct'l. engrg. 1914-16 and 1918-19, ap'ticeship, mech. engrg. 2 years, night school, Toronto Central Tech. Inst.; 1920-21, dftsman. and asst. to engr., field and office work, and 1921-24, asst. engr. in charge of mtce. of way and structures, mtce. of overhead lines and substations, Toronto & York Radial Rly; At present dist. supt., Peterborough Hydro-Electric Rlys., charge of operation and mtce. of rolling stock, track and overhead.

References: C. P. Van Norman, J. Hole, B. L. Barns, P. Manning, E. R. Shirley.

O'SULLIVAN—LOUIS LEO, of 15 Ingleside Avenue, Westmount, Que. Born at Valleyfield, Que., May 14th, 1898; Educ., B.Sc. (Civil), McGill Univ. 1921. Q.L.S., 1925; Summers: 1918-19, instr'man., W. J. Francis & Co., 1920, engr. on constrn., Montreal Water Board; 1921-23, on constrn. of new aqueduct; Feb. 1923 to date, designing steel and concrete bldgs., etc., Montreal Light, Heat & Power Cons., Montreal, Que.

References: R. M. Wilson, C. J. Desbaillets, J. L. Busfield, C. K. McLeod, H. B. Pope, G. P. Hawley, F. Y. Dorrance.

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A

ABRASIVE WHEELS

Mounting and Balancing. Mounting and Balancing of Grinding Wheels, C. H. Reynolds. Machy. (Lond.), vol. 25, no. 649, Mar. 5, 1925, pp. 722-725, 12 figs. Deals only with wheels used upon precision machines of cylindrical and surface grinding types.

ACCIDENT PREVENTION

Industrial Plant. Accident Prevention That Prevents, L. W. Thompson. Factory, vol. 34, no. 3, Mar. 1925, pp. 426-429, 502 and 504, 8 figs. Methods and safeguards employed for safety of workers.

AERONAUTICS

Problems. Aerial Surveying Equipment—Helicopters—Production Airplanes of Metal. Mech. Eng., vol. 47, no. 4, Apr. 1925, pp. 266-270. Discussion of papers on these subjects at A.S.M.E. annual meeting, December 1924.

Theoretical, Advances in. A Résumé of the Advances in Theoretical Aeronautics Made by Max M. Munk, Jos. S. Ames. Nat. Advisory Committee for Aeronautics—Report, no. 213, 1925, 46 pp., 15 figs. General principles of hydrodynamics; problems more specially concerning airships, and those concerning airfoils and airplanes; propeller theory.

AIR CONDITIONING

Spray-Type System. The Cooling and Conditioning of Air, H. J. Macintire. Chem. & Met. Eng., vol. 32, no. 10, Apr. 1925, pp. 437-442, 7 figs. Development of method of calculating refrigeration required by air-conditioning system of spray type.

AIRPLANE ENGINES

Bristol Variable-Timing Gear. Increasing Aero-Engine Power at Altitude. Flight, vol 17, no. 8, Feb. 19, 1925, pp. 99-100, 3 figs. Description of Bristol "Jupiter" variable-timing gear. See also Aeroplane, vol. 28, no. 8, Feb. 25, 1925, pp. 182 and 185, 3 figs.

Cirrus. The 60 hp. "Cirrus" Light Plane Engine. Flight, vol. 17, no. 9, Feb. 26, 1925, pp. 107-109, 10 figs. Description of new 4-cylinder air-cooled engine produced by Aircraft Disposal Co.; weighs 260 lb. See also Aeroplane, vol. 28, no. 8, Feb. 25, 1925, p. 178, 4 figs.

Compression Ratio, Changes in. The Effect of Changes in Compression Ratio upon Engine Performance, S. W. Sparrow. Nat. Advisory Committee for Aeronautics—Report, no. 205, 1925, 22 pp., 25 figs. Report, based upon engine tests made at Bureau of Standards, shows that increase in brake horsepower hour usually results from increase in compression ratio; there is no evidence that change in compression ratio produces appreciable, consistent change in friction horsepower, volumetric efficiency, or in range of fuel-air ratios over which engine can operate; ratio between heat loss to jacket water and heat converted into brake or indicated horsepower decreases with increase in compression ratio.

Magnetos. *See Magnetos.*

Pistons. *See Pistons.*

Reliability of Design. Reliability of Aircraft Engines, J. D. Siddeley. Roy. Aeronautical Soc.—Jl., vol. 29, no. 171, Mar. 1925, pp. 132-140, 1 fig. It is considered that improvement which has been obtained in degree of reliability of power unit is due to: (1) clearer conception of problems involved, advantageously reflected in design, (2) use of materials with higher physical values, more uniform in structure; (3) improvements in manufacture; it is suggested that no deviation is necessary from path which has been followed and progress will result rather from broadening of these channels; what most reliable form of power unit will probably be.

AIRPLANE PROPELLERS

Pistolesi Variable-Pitch. The Pistolesi Variable-Pitch Airscrew. Flight, vol. 17, no. 11, Mar. 12, 1925, pp. 145-146, 3 figs. Particulars of airscrew which is being developed by Società Idrovolanti Alta Italia of Sesto Calende. Consists of a central metal portion carrying the two wooden blades, roots of which are set in steel muffs.

AIRPLANES

Airfoils. Aerodynamic Characteristics of Airfoils at High Speeds, L. J. Briggs, G. F. Hull and H. L. Dryden. Nat. Advisory Committee for Aeronautics—Report, no. 207, 1925, 17 pp., 40 figs. Experimental investigation carried out jointly by Bureau of Standards and Ordnance Department, U. S. A.; lift, drag, and centre of pressure measurements were made on 6 airfoils of type used by Air Service in propeller design, at speeds ranging from 550 to 1,000 ft. per sec.; results show definite limit to speed at which airfoils may efficiently be used to produce lift.

Commercial. New Travel Air Commercial Plane. Aviation, vol. 18, no. 15, Apr. 13, 1925, pp. 406-407, 3 figs. Three-seater single-bay, tractor biplane with OX5 motor shows fine performance and load-carrying ability; ailerons are on top wing only and are balanced; tail surfaces are of steel with exception of stabilizer; fuselage is fabric-covered.

De Havilland. The De Havilland 54. Aeroplane, vol. 28, no. 10, Mar. 11, 1925, pp. 230, 232 and 234, 5 figs. Particulars of commercial 12-passenger airplane equipped with 600-hp. Rolls-Royce Condor III engine; span 68 ft., length 51 ft., height 14 ft. 9 in., fuel capacity 4 hours.

The De Havilland "Moth". Flight, vol. 17, no. 10, Mar. 5, 1925, pp. 126-129, 5 figs. 60-hp. "Cirrus" engine; length 23 ft. 5½ in., span 29 ft. See also Aeroplane, vol. 28, no. 9, Mar. 4, 1925, p. 204, 6 figs. partly on pp. 206 and 208.

Flying Boats. *See Flying Boats.*

Heinkel H. E. 18. The Heinkel H. E. 18 Sports Monoplane. Flight, vol. 17, no. 13, Mar. 26, 1925, pp. 175-177, 4 figs. Particulars of a new German low-power two-seater machine; low wings with vee bracing struts; 75-hp. Siemens engine; maximum speed 93.7 m.p.h.; span 34 ft. 5 in.; length (seaplane) 25 ft. 1 in., (land machine) 23 ft. 7½ in.; wing area 188.3 sq. ft.

Mail. The Aerial Mercury Air Mail Plane, N. Meadowcroft. Aviation, vol. 18, no. 13, Mar. 30, 1925, pp. 342-343, 2 figs. New plane especially designed for mail service, equipped with standard 400-hp. Liberty, 12-cylinder engine mounted in steel tube frame, having adjustable ends, and ball joints at junction to longerons.

The Curtis "Carrier Pigeon". Aviation, vol. 18, no. 12, Mar. 23, 1925, pp. 318-319, 2 figs. Curtiss Aeroplane & Motor Corp. produces mailplane using Liberty engine which shows marked advance on previous types.

Military. Recent Metal Military Airplanes (Les avions de chasse métalliques récents), Ch. Dantin. Génie Civil, vol. 86, no. 8, Feb. 21, 1925, pp. 185-189, 8 figs. Design and construction of monoplane Wibault, type 7 C. I; 420-hp. Gnome-Rhône-Jupiter engine; armed with four machine guns of 500 cartridges each.

Pander. The Pander Light Monoplane. Flight, vol. 17, no. 8, Feb. 19, 1925, pp. 93-95, 4 figs. Description of monoplane of cantilever type being built by Pander & Zonen, of the Hague, Holland; length overall 16 ft. 3 in., wing span 26 ft. 3 in., wing area 116.3 sq. ft., top speed 81 m.p.h.; 30-h.p. "Y" type Anzani engine.

Paris Show. The Airplanes Exhibited at the Ninth Paris Aeronautical Show (Die Flugzeuge auf der neunten Pariser Luftfahrt-Ausstellung), F. Gosslau. Zeit. des Vereines deutscher Ingenieure, vol. 69, no. 14, Apr. 4, 1925, pp. 425-432, 26 figs. Discusses most important airplanes exhibited as well as separate parts; improvements in French design during last six years; apparency of German influence in use of metal construction and in building of giant planes; with regard to speed physical limits have been reached.

Seaplanes. *See Seaplanes.*

Stability and Controllability. Stability and Controllability of Airplanes, B. V. Korvin-Kroukovsky. Aviation, vol. 18, nos. 10, 11 amd 12, Mar. 9, 16 and 23, 1925, pp. 266-269, 296-297 and 320-322, 6 figs. Mar. 9: Longitudinal stability and controllability. Mar. 16: Tailplane and elevator. Mar. 23: Summary of longitudinal stability. See also appendices in nos. 13, 14, 15 and 16, Mar. 30, Apr. 6, 13 and 20, 1925, pp. 347-348, 380-381, 411-412 and 436-438, 3 figs.

Struts. The Strength of Struts: A Review of Progress Made in Theory and Experiment During the War, R. V. Southwell. Aeronautical Research Committee (Great Britain), Reports & Memoranda, No. 918, Sept. 1924, 43 pp., 20 figs. partly on supp. plates. Reprint of series of articles published in Aircraft Eng., Jan.-May 1920. Reviews progress made during war and states present position.

Take-Off Characteristics. Take-Off Characteristics of the DH-4. Air Service Information Circular, vol. 5, no. 480, Oct. 1, 1924, 19 pp., 13 figs. Calculations and tests made to determine take-off characteristics of DH-4.

Wings. Preliminary Investigation of the Effect of a Rotating Cylinder in a Wing, E. B. Wolff. Nat. Advisory Committee for Aeronautics—Tech. Memorandums, no. 307, Mar. 1925, 12 pp., 3 figs. Into leading edge of wing with arbitrary cross-section, there is introduced a cylinder, which can be rotated by electric motor by means of a cord; observations made in wind tunnel on how lift at different wind velocities was affected by rotating this cylinder. Translated from Ingenieur, no. 49, Dec. 6, 1924.

AIRSHIPS

Hooking Airplane to. Hooking an Airplane to an Airship. Aviation, vol. 18, no. 14, Apr. 6, 1925, pp. 378-379. Experiments conducted by Army Air Service at Langley Field and Scott Field show practicability of both landing at and taking off an airship.

Mooring-Spindle Deformation. An Analysis of the Deformation of the Mooring Spindle of the "Shenandoah", L. B. Tuckerman and C. S. Aitchison. U. S. Bur. Standards, Technologic Paper no. 270, Jan. 9, 1925, pp. 609-618, 8 figs. partly on supp. plates. Results of examination and tests of mooring spindle of U. S. Navy airship which was bent when airship was torn loose from her mooring mast during a storm on night of Jan. 16, 1924; object of examination and tests was to determine actual wind forces which acted upon ship at time she broke away; an approximate method of analysis and examination was developed applicable to any axially symmetrical deformed structure.

Semi-Rigid. Water Model Tests for Semirigid Airships, L. B. Tuckerman. Nat. Advisory Committee for Aeronautics—Report, no. 211, 1925, 14 pp. Report based on study made by writer as member of Special Committee on Design of Army Semirigid Airship RS-1.

ALCOHOL

ETHYL. Multiple-Effect Distillation of Ethyl Alcohol, Geo. Galingaert. Chem. & Met. Eng., vol. 32, no. 9, Mar. 1925, pp. 362-363, 3 figs. New application of well-known principle promises savings in alcohol production.

ALLOYS

ALUMINIUM. *See Aluminum Alloys.*
BRASS. *See Brass.*
BRONZES. *See Bronzes.*
CHROME-NICKEL-MOLYBDENUM. The Ternary System Chrome-Nickel-Molybdenum (Das Dreistoffsystem Chrom-Nickel-Molybdän), E. Siedschlag. Zeit. für Metallkunde, vol. 17, no. 2, Feb. 1925, pp. 53-56, 7 figs. Chrome-nickel-molybdenum alloys with high nickel content show mixed-crystal formation and have valuable physical and chemical properties.
COPPER. *See Copper Alloys.*
HIGH TEMPERATURES USE AT. Engineering Requirements of Alloys for Use at High Temperatures, R. W. Bailey. Brit. Non-Ferrous Metals Research Assn.—Bul., no. 14, Mar. 1925, pp. 8-14. Points out that research is needed to determine qualities required in metals to resist erosive action of steam, clean and otherwise, and thereby assist in discovery of alloys of high resistance to this action; data on behavior of metals at high temperatures.
MOLYBDENUM-NICKEL-SILICON. The Ternary System Molybdenum-Nickel-Silicon (Ueber das Dreistoffsystem Mo-Ni-Si), Pfautsch. Zeit. für Metallkunde, vol. 17, no. 2, Feb. 1925, pp. 48-52, 9 figs. Changes in structure and properties of Mo-Ni system by addition of silicon; investigations of conditions of relationship for fixing limit of sphere of technical importance.

ALUMINUM ALLOYS

ALUMINUM-ZINC. On the Equilibrium Diagram of the Aluminium-Zinc System, T. Isihara. Inst. Metals—advance paper, no. 10, for mtg., Mar. 11-12, 1925, 17 pp., 10 figs. Investigation undertaken to find correct equilibrium diagram by means of electric-resistance method; microscopic investigations, dilatometric method, and X-ray analysis being used as supplementary.

AMMONIA

ABSORPTION. Absorption of Ammonia in Towers, O. L. Kowalke, O. A. Hougen and K. M. Watson. Chem. & Met. Eng., vol. 32, no. 10, Apr. 1925, pp. 443-446, 12 figs. Experimental determination of transfer coefficients of absorption in open and various types of packed towers.
RECOVERY FROM COAL CARBONIZATION. European Efforts to Increase Ammonia Recovery, C. H. S. Tupholme. Chem. & Met. Eng., vol. 32, no. 9, Mar. 1925, pp. 360-361. Various methods are being tried to increase yield of fertilizer from coal-carbonization processes.
SYNTHETIC. Hydrogen for Synthetic Ammonia Production. Chem. Age (Lond.), vol. 12, no. 299, Mar. 7, 1925, pp. 244-245, 2 figs. Description of a Knowles electrolytic plant for supply of hydrogen to a Claude synthetic ammonia works; plant was installed by Int. Electrolytic Plant Co., Ltd., Chester, Eng., at Bussi works of Societa Italiana di Elettrochimica.

AMMONIA COMPRESSORS

ROTARY. Tests on a Rotary Ammonia Compressor, H. I. Macintire. Refrig. Eng., vol. 11, no. 9, Mar. 1925, pp. 325-330, 9 figs. Object of tests was to find capacity and horsepower per ton of refrigeration for certain type of rotary ammonia compressor. (Abstract.) Paper presented before Eastern Ice Assn.

APPRENTICES, TRAINING OF

GRADUATES, CAREERS OF. What Becomes of Apprentice Graduates? Am. Mach., vol. 62, no. 13, Mar. 26, 1925, p. 486. Records of positions held by its graduates, kept by manufacturing establishment conducting an apprentice school, show that only 12 out of 808 men who completed their course had definitely left trade for which they had been trained.
RAILWAY. Apprenticeship With the Paris-Orleans Railway (Le développement de l'apprentissage à l'atelier, sa réalisation à la Compagnie du Chemin de fer de Paris à Orléans. Les projets d'organisation de l'apprentissage en France et la taxe d'apprentissage), M. Lacoin. Société d'Encouragement pour l'Industrie Nationale—Bul., vol. 123, no. 10, Dec. 1924, pp. 811-863, 12 figs. Discusses organization and training in the railway shops, technical instruction, curriculum, examination and promotion.

ARCHES

DESIGN. The Use of Influence Lines in the Design of Small Arches, A. C. Hughes. Surveyor & Mun. & County Engr., vol. 17, no. 1731, Mar. 20, 1925, pp. 313-315, 9 figs. Describes simplified method of finding stresses under all conditions of loading in arches up to about 50 ft. span; can be used for preliminary design in larger arches.

ASBESTOS

PRODUCTION STATISTICS. Asbestos in 1923, E. Sampson. U. S. Geol. Surv., no. II:28, 1925, pp. 339-350. Production statistics, review by states; prices; imports and exports; statistics of production in other countries.

AUTOMOBILE ENGINES

CARBURETORS. *See Carburetors.*
EIGHT-CYLINDER-IN-LINE. History of the Straight-Eight. Autocar, vol. 54, no. 1533, Mar. 6, 1925, pp. 393-397, 7 figs. History of modern eight-cylinder-in-line engine, review of present situation, and notes on some of the technical points involved.
LUBRICATION. Lubrication of the Automobile Engine, N. MacCoull. Am. Petroleum Inst.—Bul., vol. 5, no. 75, Dec. 31, 1924, pp. 126-135, 14 figs. Recent developments which tended to decrease fuel expense by increasing volume of gasoline produced from supply of crude oil; and developments covering phase of reducing expense due to depreciation of cars; by analyzing typical lubricating system author shows that it has many inherent defects, which to some extent prevent very low depreciation which should be realized; these defects can be eliminated by simple expedients.

AUTOMOBILE FUELS

FRANCE. French Automobile Fuels, Chaleur et Industrie, Supp. to Dec. 1924 Number, 263 pp., 3 figs. Account of Congrès des Carburants, 1924 (Automobile Fuels Congress, 1924), containing addresses presented, including Historical Review of Berthelot Hydrogenation Process, C. Roszak; Production of Liquid Fuels by Bergius Process, A. Kling; Production of Synthetic Petroleum from Vegetable and Animal Oils, M. Mailhe; Andry-Bourgeois and Olivier process of synthetic petroleum production, E. Goutal; Theory in Connection With Synthetic Fuels, A. Gueselin; Alcohol as Automobile Fuel, M. Barbet; High- and Low-Temperature Production of Fuel, P. Appell; Use of Vegetable Oils, M. Lumet; Producer-Gas Farm Trucks and Tractors, J. Auclair; Colloidal Fuels, F. Gramme; and others.
GASOLINE. *See Gasoline.*
HEAVY OILS. Synthetic Heavy Oil and Modernization of National Equipment (L'huile lourde synthétique et la modernisation de l'outillage national), M. de Coninck. Chaleur & Industrie, vols. 5 and 6, nos. 54, 56 and 57, Oct. and Dec. 1924, and Jan. 1925, pp. 507-510, 634-637 and 29-33. Argues replacing of railways by motor vehicles; drawbacks of explosion engines as against heavy-oil engines; criticizes urban and interurban transportation; colonial railways and internal navigation; marine transportation; aviation; etc.

AUTOMOBILE MANUFACTURING PLANTS

MACHINE-SHOP OPERATIONS. Possible Economies in Automotive Machine-Shop Operations. Soc. Automotive Engrs.—Jl., vol. 16, no. 4, Apr. 1925, pp. 460-464. Discussion of paper by A. L. De Leeuw, printed in Nov. 1924 Journal.

AUTOMOBILES

BODY-WELDING METHODS. Special Body Welding Methods Cut Labor Costs to Minimum, J. E. Schipper. Automotive Industries, vol. 52, no. 15, Apr. 9, 1925, pp. 652-655, 9 figs. Heavy steel jigs used in sub-assemblies at Budd body plant; spot welding has almost displaced riveting except where light part is attached to heavy one.
BRAKES. Compressed Air Brakes for Motor Cars. Eng. Progress, vol. 6, no. 2, Feb. 1925, pp. 25-26, 2 figs. Account of trial trip made with Daag high-speed motor truck with trailer running on pneumatic tires and equipped with compressed-air brake plant designed by Knorr Bremse A. G., Berlin.
DONNET-ZEDEL. The 13:9 H.P. Donnet-Zedel Car. Auto-Motor Jl., vol. 30, no. 12, Mar. 19, 1925, pp. 239-242, 9 figs. French vehicle; four-wheel brakes; 4-cylindered engine with bore of 75 mm. and stroke of 120 mm.
ELECTRIC GENERATORS. New Bosch Electric Generators Have Voltage Control, P. M. Heldt. Automotive Industries, vol. 52, no. 13, Mar. 26, 1925, pp. 576-578, 4 figs. Magnetic vibrator cuts resistance into and out of circuit; other additions to line are starter with magnetic shift and combined generator and magneto.
GWYNNE. 14-H.P. Gwynne Motor-Car Chassis. Engineering, vol. 119, no. 3090, Mar. 20, 1925, p. 351, 13 figs. partly on supp. plates. Rear springing is of cantilever type, gear box is entirely separate unit, and front end of torque tube is forked and anchored independently of gear box; comparison with 8-hp. model of same make.
HEADLIGHTS. New Types of Automobile Headlights (Les nouveaux types de phares d'automobiles), F. Collin. Génie Civil, vol. 86, no. 6, Feb. 7, 1925, pp. 134-138, 14 figs. Discusses new French regulations on control of glare and describes Parallux, S. E. V. and Bernard types of headlights constructed to meet them, also some foreign types, including Ryland and Zeiss.
HEAT TREATMENT OF PARTS. Quality Parts Produced by Continuous Heat Treating. Automotive Mfr., vol. 66, no. 11, Feb. 1925, pp. 5-8, 4 figs. Describes conveying equipment of continuous heat treating furnaces of Hupp Motor Co., Detroit.
MARMON. The New Marmon. Auto-Motor Jl., vol. 30, no. 13, Mar. 26, 1925, pp. 261-264, 12 figs. Particulars of latest type of an American vehicle; 6-cylindered engine, with bore of 3¼ in. and stroke of 5— in.
RICKENBACKER. The Rickenbacker Straight-Eight Chassis. Automobile Engr., vol. 15, no. 200, Mar. 1925, pp. 64-72, 15 figs. Features of low-priced American model; the eight cylinders and crankcase are cast in one piece; among interesting features are oil rectifier, air cleaner, oil cooler, oil baths for camshaft and valve gear, etc.
VAUXHALL. The 23-60 H.P. Vauxhall. Auto-Motor Jl., vol. 30, no. 10, Mar. 5, 1925, pp. 197-200, 10 figs. Vibrationless power plant; overhead valves; four-wheel braking.
VULCAN. The 12 H.P. Vulcan Car, Auto-Motor Jl., vol. 30, no. 11, Mar. 12, 1925, pp. 219-222, 10 figs. Develops as much as 18 b.hp. at 2000 r.p.m., and is highly economical of fuel.
WHEEL RIMS. Wheel Rims Reduced to Comparatively Few Forms at Present Time, P. M. Heldt. Automotive Industries, vol. 52, no. 15, Apr. 9, 1925, pp. 656-658, 11 figs. Forms for both clincher and straight side tires have been standardized; differences occur in methods used to hold demountable rims on wheels.

B

BALANCING

MACHINE ROTORS. Accurate Balancing of Machine Rotors, C. R. Soderberg. Power Plant Eng., vol. 29, no. 7, Apr. 1, 1925, po. 388-389, 3 figs. Method of balancing rotative machine parts which gives greater accuracy than old cut and try method.

BEAMS

OVERHANGING, DEFLECTION OF. Deflection of Overhanging Beams, S. M. Milbourne. Concrete & Constr. Eng., vol. 20, no. 3, Mar. 1925, pp. 133-140, 6 figs. Investigates from mathematical standpoint deflection of overhanging beams of constant cross section, under influence of point and distributed loads.
REINFORCED-CONCRETE. Beams and Columns, Chas. E. Nichols. Boston Soc. Civ. Engrs.—Jl., vol. 12, no. 2, Feb. 1925, pp. 66-71, 2 figs. Describes changes it is proposed to make in accepted practice of design. Discussion of report of Joint Committee on Standard Specifications for Concrete and Reinforced Concrete.
Bond and Anchorage in Beams, W. W. Clifford. Boston Soc. Civ. Engrs.—Jl., vol. 12, no. 2, Feb. 1925, pp. 77-79. Discussion of report of Joint Committee on Standard Specifications for Concrete and Reinforced Concrete.
Diagonal Tension and Shear in Beams, H. Sutherland. Boston Soc. Civ. Engrs.—Jl., vol. 12, no. 2, Feb. 1925, pp. 71-76, 4 figs. Discussion of report of Joint Committee on Standard Specifications for Concrete and Reinforced Concrete.

BEARINGS

DEVELOPMENTS. Changes that Have Taken Place in Bearings, L. A. Hillman. Indus. Engr., vol. 83, no. 3, Mar. 1925, pp. 127-130, 4 figs. Traces developments that have taken place from ancient times up to and including present-day designs in sleeve, ball, and roller bearings.

BELT DRIVE

OPERATION. Belt Transmission (Les transmissions par courroies), L. Lecornu. Technique Moderne, vol. 17, no. 3, Feb. 1, 1925, pp. 78-81. Criticizes paper by Auclair, Boyer-Guillon and Coulmeau, on technical and experimental research on operating belt drives.

BISMUTH

USES and SOURCES OF SUPPLY. Bismuth. Can. Min. Jl., vol. 46, no. 12, Mar. 20, 1925, pp. 307-308. Its occurrence, uses and sources of supply.

BITUMINOUS SANDS

ALBERTA, CANADA. Bituminous Sands of Alberta, S. C. Ells. Can. Inst. Min. & Metallurgy—Bul., no. 155, Mar. 1925, pp. 290-293. Production; prospective producing areas; methods of preparation for market; processes for recovery of hydrocarbons.

BLAST-FURNACE GAS

UTILIZATION. Tests Carried out With Blast-Furnace-Gas Apparatus (Essais de réglage effectués aux appareils consommateurs de gaz des hauts-fourneaux: Cowpers, Moteurs à gaz et Chaudières), M. Steffes. Chaleur & Industrie, vol. 6, no. 57, Jan. 1925, pp. 3-10, 11 figs. Discusses tests carried out with blast-furnace gas operation at Belval plant in cowpers, gas engines and boilers, with a view to greatest efficiency and economy.

BLAST FURNACES

Air Heaters. Regenerative Air Heaters for Blast Furnaces (Om varmapparater för masugnar), A. Hallbäck. Jernkontorets Annaler, vol. 109, no. 2, 1925, pp. 55-90, 11 figs. Describes several designs of reheating furnaces, explains theory, and computes heat balances; investigates economical importance of improved reheating furnaces and shows that a modern furnace will pay for itself in a little more than one year.

Chargers. Recent Mechanical Chargers for Blast Furnaces, J. M. Ringquist. Iron & Coal Trades Rev., vol. 90, no. 2973, Feb. 20, 1925, pp. 293-295, 16 figs. on pp. 313-316. Examples of chargers recently completed and put into commission and outstanding characteristics of each. From paper read before Cleveland Instn. Engrs.

Feeding Method. Feeding Blast-Furnaces to Save Coke, F. E. Lathe. Can. Inst. Min. & Metallurgy—Trans., vol. 28, Mar. 1925, 5 pp. Describes method employed at Nickelton plant of British America Nickel Corp.; chief requisits for saving coke is keep heat down and tonnage up, and method described for handling furnace indicates means of restoring cool top as often as necessary.

Records and Calculations. Probable Error in Blast-furnace Records and Calculations Therefrom, T. T. Read. Am. Inst. Min. & Met. Engrs.—Trans., no. 1446-C, Mar. 1925, 15 pp., 1 fig. Sets forth that nearly every measuring operation involved in securing blast-furnace records involves possible error of 5 per cent or more, and quantities commonly measured with greater accuracy than this have to be multiplied or divided by figures involving possible error of 5 or 10 per cent; in interpreting curves or tabular summaries, possible error should be always kept in mind.

BOILER FEEDWATER

Evaporating vs. Softening. Evaporating v. Softening for Make-Up, F. J. Drover. Power Engr., vol. 20, no. 229, Apr. 1925, pp. 131-132, 1 fig. Discusses reasons which have made use of evaporators so popular in new plants for furnishing make-up water necessary for boiler feed.

Regulators. Automatic Feed-water Regulation, Walter Smith. Mech. World, vol. 77, no. 1988, 1990 and 1992, Feb. 6, 20 and Mar. 6, 1925, pp. 88-89 118-119 and 149-150, 10 figs. Reviews reasons for and against automatic feed-water control; types of regulators and their salient features.

BOILER FIRING

Low-Grade Coal. Advantages of Using Low-Grade Coal, (Advantages que présente l'emploi du charbon maigre dans l'industrie), L. Clerget. Chaleur & Industrie, vol. 6, no. 57, Jan. 1925, pp. 34-41. Discusses tests carried out at Ostricourt mines to determine under what conditions low-grade coal may be used in place of mixed.

Natural-Gas. Boiler Firing with Natural Gas, R. Tullis. Power, vol. 61, no. 13, Mar. 31, 1925, pp. 494-495, 2 figs. Simple safety rules which should be observed.

Pulverized-Coal. *See Pulverized Coal, Boiler Firing.*

BOILER FURNACES

Arches. Flat Suspended Arches, E. K. Scott. Combustion, vol. 12, no. 4, Apr. 1925, pp. 273-274, 2 figs. Features and advantages of such arches.

Liquid and Gaseous Fuels, Use of. Use of Liquid and Gaseous Fuels. Power Plant Eng., vol. 29, no. 7. Apr. 1, 1925, pp. 384-386, 8 figs. Construction of furnace floors; changes made in settings; results of tests on oil-fired boiler; combination of gas and oil firing.

BOILER HOUSES

Costs Analysis. Reducing Costs in the Boiler House, C. H. S. Tupholme. World Power, vol. 3, no. 16, Apr. 1925, pp. 215-217. Analysis of costs; fixed, operating and repair costs.

BOILER PLANTS

Pulverized-Coal. New Plant Uses Powdered Coal. Black Diamond, vol. 74, no. 12, Mar. 21, 1925, pp. 328-329 and 348, 4 figs. Describes boiler plant of Uxbridge Woolen Co., Uxbridge, Mass.; many economies and advantages claimed; efficiency and dependability are unusual.

BOILER ROOMS

Heat Balancing. Boiler-Room Practice, J. Bruce. Elec. Rev., vol. 95, no. 2457, Dec. 26, 1924, and vol. 96, nos. 2458, 2459, 2460 and 2461, Jan. 2, 9, 16 and 23, 1925, pp. 964-966, 31-32, 71-72, 111-112 and 149-150, 6 figs. Discusses balancing of boiler-room heat. Makes calculations.

BOILER TUBES

Seamless Steel. Report on Comparative Investigations of Seamless Steel Tubes for Water-Tube Boilers (Bericht über vergleichende Untersuchungen von nahtlosen Stahlrohren für Wasserrohrkessel), M. V. Schwarz. Zeit. des Bayerischen Revisions-Vereins, vol. 29, no. 3, Feb. 15, 1925, pp. 26-30, 14 figs. Results of investigations to provide specifications for acceptance of such tubes, and means of judging defects in tubes.

BOILERS

Design. Steam Boiler Designed on the Theory of the Combustion Furnace Based on Laws of Hydraulics (Une chaudière à vapeur construite conformément à la théorie des fours à flammes basée sur des lois de l'hydraulique), W. E. Groume-Grjimailho. Chaleur & Industrie, vol. 5, no. 56, Dec. 1924, pp. 611-613, 2 figs. Details of boiler designed on author's theory of combustion furnace, a modified Bradlovsky or Wiekes boiler, consisting of two vertically superposed cylinders parallel to axis of tubes.

End Plates, Cracks in. Difficulties of Cracks in the Stays of Boiler end Plates (Au sujet des difficultés que présente la découverte des criques de congés dans les fonds emboutis des chaudières), A. Grard. Chaleur & Industrie, vol. 5, no. 56, Dec. 1924, p. 633. Discusses danger of faults or cracks in stays and proposes machining or sand blasting them to expose them.

Ends, Tests on. Tests on Resistance and Deformations of Boiler Ends (Versuche über die Widerstandsfähigkeit und Formänderungen von Kesselböden), C. Bach. Zeit. des Vereines deutscher Ingenieure, vol. 69, no. 12, Mar. 21, 1925, pp. 367-368, 5 figs. Results of tests on ends of elliptical form, of usual shape, and of Klöpper design.

Findlay. The Findlay Boiler. Eng. & Boiler House Rev., vol. 38, no. 9, Mar. 1925, pp. 372 and 375-376, 2 figs. Principal feature of this new design is inclusion of fire tubes in usual water tubes in upper portion of tube bank.

Internal-Combustion. The Internal Combustion Boiler, O. Brunler. Chem. & Industry, vol. 44, no. 8, Feb. 20, 1925, pp. 187-190, 3 figs. Discusses principles of Brunler steam generator and developments since first experiments were made by author's father to solve problem of burning open flame in liquids; use of boiler for power production, in chemical industry, and for drying peat.

Oil-Burning. Oil Burning Under Steam Boilers. Mech. Eng., vol. 47, no. 4, Apr. 1925, pp. 276-281, 1 fig. Discussion dealing with atomizers, draft, oil characteristics, refractories, heating of oil, combustion data, hazards of industrial oil burning, etc.

Waste-Heat. Waste-Heat and Gas-Fired Boilers, J. W. Reber. Gas Wld., vol. 82, no. 2120, Mar. 7, 1925, pp. 184-189, 12 figs. Deals with two types of apparatus for steam raising. Describes utilization of waste heat for generation of steam, mainly in conjunction with coal-carbonizing plants; deals with generation of steam by gaseous firing, with special reference to a new type of gas-fired boiler. General summary of practical side of installation of waste-heat and gas-fired boiler plants, and description of chief points which are essential for their efficient working. Abstract of paper read before Midland Jr. Gas Assn. See also Gas Jl., vol. 169, no. 3225, Mar. 4, 1925, pp. 529-533, 4 figs.

BOILERS, WATER-TUBE

Bigelow-Hornsby. The Bigelow-Hornsby Water Tube Boiler, B. H. Snow. Universal Engr., vol. 41, no. 3, Mar. 1925, pp. 36-37, 5 figs. Notes on boiler which has combined good features of a number of water-tube boilers on market, and is designed along correct theoretical lines of an economical heat-absorbing apparatus.

BOLTS

Quenching, Increasing Strength by. Drastic Quenching Imparts Surprising Properties to Bolts and Rivets, E. L. Shaner. Iron Trade Rev., vol. 76, no. 14, Apr. 2, 1925, pp. 871-874, 6 figs. Describes latest device for providing rapid and controlled quench, representing practical application of investigations of Roy H. Smith, of Lamson & Sessions Co., which indicated that steel of 0.15 per cent or less carbon responds in remarkable way to sudden quenching; tensile strength as high as 160,000 lb. per sq. in. can be obtained on low-carbon steel by means of this equipment.

BORING MACHINES

Ball-Bearing Fixtures. Some Ball-Bearing Boring Fixtures, H. O. Schultz. Am. Mach., vol. 62, no. 13, Mar. 26, 1925, pp. 503-504, 3 figs. Reasons for using ball bearings on bearing boring fixtures; details of bar and fixture; action and design of reamer for reaming bearings in place.

BRAKES

Air. Precipitation of Water in Compressed Air Systems, D. W. Lloyd. Ry. Mech. Engr., vol. 99, no. 4, Apr. 1925, pp. 215-216. Effect of temperature and pressure on moisture-carrying capacity of air; effect of increased temperatures and pressure; collection of moisture in brake system; length of radiating pipe. (Abstract.) Paper read before Manhattan Air Brake Club.

The Relation of Air Brakes to Train Control, G. H. Wood. Ry. Rev., vol. 76, no. 15, Apr. 11, 1925, pp. 692-694, 1 fig. Present air-brake system is foundation upon which each element of automatic device must depend. (Abstract.) Paper presented before Am. Ry. Assn.

Foundation, Design of. Foundation Brake Design, Installation and Maintenance, W. H. Clegg. Can. Ry. Club—Official Proc., vol. 24, no. 2, Feb. 1925, pp. 20-27 and (discussion) 27-41, 7 figs on supp. plates. Review of different designs and advantages claimed for them.

Kunze-Knorr. German State Railway's Brake Tests. Ry. Mech. Engr., vol. 99, no. 4, Apr. 1925, pp. 209-212, 7 figs. Comparative tests are made with Westinghouse and Kunze-Knorr types in order to obtain shorter braking distances.

Street-Railway-Car. The Maley Electro-Pneumatic Braking and Control System. Tramway & Ry. Wld., vol. 57, no. 8, Feb. 12, 1925, pp. 73-75, 3 figs. Describes Maley brake system for street-car motors, designed to obtain 100 per cent braking efficiency with complete absence of skidding; air is used to apply shoes acting on rails.

BRASS

Composition, Foundry Control of. Controlling the Composition of 60/40 Brass in the Foundry. Metal Industry (Lond.), vol. 26, no. 12, Mar. 20, 1925, pp. 283-284, 2 figs. Advocates micrographic control of melts, relative proportion of alpha and beta constituents estimated immediately prior to casting being used to adjust zinc content; method can be easily carried out by foundry foreman.

Density and Constitution. The Density and Constitution of the Industrial Brasses, G. L. Bailey and R. Genders. Inst. Metals—advance paper, no. 3, for mtg. Mar. 11-12, 1925, 13 pp., 5 figs. Values were obtained for crystal density of brasses in equilibrium over range of composition used industrially.

Lead and Tin, Influence of. The Influence of Lead and Tin on the Brittle Ranges of Brass, D. Bunting. Inst. Metals—advance paper, no. 6, for mtg., Mar. 11-12, 1925, 10 pp., 12 figs. Investigation of effect of small percentages of lead and tin; apparatus employed for determining variations in brittleness was Izod machine. See (abstract) in Engineering, vol. 119, no. 3090, Mar. 20, 1925, pp. 368-370, 12 figs.

Red Stains, Removal from. The Removal of Red Stains from Brass, E. A. Bolton. Inst. Metals—advance paper, no. 5, for mtg. Mar. 11-12, 1925, 16 pp., 5 figs. Oxidation and staining of brass; electrochemical factors affecting pickling; use of sulphuric-nitric solutions; use of dichromate-sulphuric acid solutions. See (abridgment) in Metal Industry (Lond.), vol. 26, no. 11, Mar. 13, 1925, pp. 264-268, 5 figs., and (discussion), no. 12, Mar. 20, 1925, pp. 290-291.

BRICKMAKING

Plants. A Modern Brick Plant, J. T. Robson. Am. Ceramic Soc.—Jl., vol. 8, no. 3, Mar. 1925, pp. 159-170, 15 figs. Detailed description of layout and construction of a shale brick plant. This plant fires its ware in a tunnel kiln and is built to conform accordingly.

BRIDGE ERECTION

Reconstruction. Bridge Reconstruction Work of the Ministry of Transport. Engineering, vol. 119, nos. 3087 and 3091, Feb. 27 and Mar. 27, 1925, pp. 250-253 and 262, and 377-379, 23 figs. Feb. 27: As example of work of Ministry of Transport, strengthening of Waterloo Bridge at Bettwy-y-Coed is described, originally constructed in 1815, and consisting of 3 inner and 2 outer cast-iron ribs. Mar. 27: Describes arch bridge having virtual hinges at springings which has been erected over White Cart River at Glasgow; and St. Stephens bridge at Bournemouth, consisting of reinforced concrete beams with main span of 26½ ft.

BRIDGE PIERS

Concrete Pipe Piles. Deep-Water Bridge Foundation of Concrete Pipe Piles. Eng. News-Rec., vol. 94, no. 14, Apr. 2, 1925, pp. 568-570, 6 figs. Special methods devised for constructing piers of Stockholm harbour bridge at depths up to 180 ft.

BRIDGE STRENGTHENING

Lattice Girders. Strengthening the Balawali Ganges Railway Bridge, India, L. H. Swain. Ry. Engr., vol. 46, no. 542, Mar. 1925, pp. 84-88, 6 figs. Account of strengthening of lattice girders of railway bridge on Oudh and Rohikhand Ry.

BRIDGES, CONCRETE

Highway. Rib-Arch Concrete Highway Bridge Over Rock River, Ill., W. S. Todd. Eng. News-Rec., vol. 94, no. 16, Apr. 16, 1925, pp. 643-644, 4 figs. New bridge has 12 open-spandrel arches; unfinished spans on falsework in winter; brick parapets.

Railway. Continuous Three-Span Concrete Railway Bridge. Eng. News-Rec., vol. 94, no. 13, Mar. 26, 1925, pp. 516-517, 2 figs. Triple-girder through spans built as 150-ft. monolithic structure; wood stringers on floor carry track rails.

BRIDGES, RAILWAY

Arch. Michigan Central R.R. Completes Niagara Arch. Ry. Rev., vol. 76, no. 10, Mar. 7, 1925, pp. 448-458, 20 figs. New 640-ft. arch span over Niagara gorge, second longest in America, replaces cantilever span; construction difficulties; preparing foundation; anchor tunnels; locating piers; approaches; erection of first permanent bent; erection of arch; etc.

High-Level, Hudson River. Planning and Construction of New York Central Lines' New Hudson River Bridge, H. T. Welty. Eng. News-Rec., vol. 94, nos. 12, and 14, Mar. 19 and Apr. 2, 1925, pp. 466-475, 11 figs.; and 561-567, 8 figs. Channel span of all-riveted type; concrete slab deck on approach viaducts; eliminating secondary stresses; foundations; viaduct superstructure; truss spans. Long spans erected by progressive cantilever method; staying pile foundations; driving long rivets; known as Alfred H. Smith Memorial bridge.

Reconstruction. Reconstruction of the N. & N.W. Ry. Bridge Over the Missouri River Near Blair, Neb., O. F. Dalstrom. West. Soc. Engrs.—Jl., vol. 30, no. 2, Feb. 1925, pp. 50-69, 10 figs. Describes new and old structures; new structure, capable of carrying twice load was built on old piers; construction details; river rectification.

BRIDGES, STEEL

Decks. Deck Planking of Reinforced Concrete for Iron Bridges (Fahrbahntafeln aus Eisenbeton für eiserne Brücken), A. Rohn. Beton u. Eisen, vol. 24, no. 4, Feb. 20, 1925, pp. 41-43, 6 figs. Design and construction of planking for Kirchenfeld bridge over Aare at Bern, Acheregg bridge near Stanstead, and Lanche bridge near Matzingen.

Railway. Bridge Over the Second Narrows, B.C., P. Ward. Can. Engr., vol. 48, no. 13, Mar. 31, 1925, pp. 353-354, 5 figs. Particulars of single deck steel bridge at Burrard Inlet, British Columbia, which will carry single railway track and roadway; designed for Cooper's E-50 loading; one opening span of Strauss Bascule type, 185 ft. long; construction of pier cylinders.

BRONZES

Malleability. Temperature Limits of Malleability of Bronze with 20 Per Cent Tin (Temperaturgrenzen der Bildsamkeit von Bronze mit 20 vH. Zinn), O. Bauer and O. Vollenbruck. Zeit. für Metallkunde, vol. 17, no. 2, Feb. 1925, pp. 60-61, 3 figs. Forging and hot-compression tests; limits of best workability.

BUILDING CONSTRUCTION

Cost Keeping. How to Keep Costs on Construction Work, A. L. Hartridge. Eng. News-Rec., vol. 94, no. 12, Mar. 19, 1925, pp. 479-482, 1 fig. Essentials of classification of accounts; labour, materials, quantities, costs and records considered; simple system applicable to large or small work. (Abstract.) Paper delivered before joint mtg. of engineering societies.

Industrial Buildings. Simplifying the Design and Construction of Industrial Buildings, D. C. McGiehan. Am. Welding Soc.—Jl., vol. 4, no. 2, Feb. 1925, pp. 25-33, 9 figs. Deals with putting up steel, runways and balconies, stairways, putting up electric conduit, chutes and hoppers, guards, supports, and door frames.

Profit Checking. Checking Up on Profit During Construction, B. Lawrence. Eng. News-Rec., vol. 94, no. 13, Mar. 26, 1925, pp. 518-522, 2 figs. Method allows for effect of variation of work and materials; actual example worked through; probable profit checked at any time during operation.

Steelwork Specifications. A Canadian Standard Specification for Steel Structures for Building. Contract Rec., vol. 39, nos. 8 and 11, Feb. 25 and Mar. 18, 1925, pp. 182-184, and 258-259 and 266, 2 figs. on pp. 272-273. Specifications drawn up by Can. Eng. Standards Assn. governing structural steel construction with a view to establishing uniformity of practice.

C

CABLES, ELECTRIC

Fireproofing Materials for. Fire Resistance of Cable Fireproofing. Elec. World, vol. 85, no. 13, Mar. 28, 1925, pp. 671-672, 2 figs. Tests as conducted by Brooklyn Edison Co. on various materials; comparison made of heat-conducting properties of samples.

Pirelli 130,000-Volt. The New 130,000-Volt Pirelli Cable, P. Torchio. Elec. World, vol. 85, no. 12, Mar. 21, 1925, pp. 603-605, 10 figs. Successful results obtained by Italian engineers from experimental installation; new design for high-voltage cable; relation between dielectric strength of impregnated paper and its resistivity to passage of gas.

CARBURETORS

Hunter. A Novel Carburetter. Autocar, vol. 54, no. 1533, Mar. 6, 1925, p. 440, 1 fig. Particulars of Hunter carburetor; body consists of a vertical cylinder in which slides choke tube surrounding jet and diffuser; choke tube also acts as a throttle.

CARS

Dynamics. The Dynamics of Vehicles on Rails (Zur Dynamik der Gleisfahrzeuge), F. Meineke. Organ für die Fortschritte des Eisenbahnwesens, vol. 80, no. 3, Feb. 15, 1925, pp. 49-53, 11 figs. partly on supp. plate. Gives a simplified theory of elastic suspension of car bodies; discusses arrangement and proper selection of carrying springs.

Dynamometer. N. Y. C. All-Steel Dynamometer Car. Ry. Mech. Engr., vol. 99, no. 4, Apr. 1925, pp. 202-206, 7 figs. Complete facilities for obtaining wide range of operating data are provided and conveniently arranged; dynamometer apparatus; driving transmission; special features.

Hot Boxes. Analysis of Causes and Remedy for Hot Boxes, M. L. Harger. Ry. Mech. Engr., vol. 99, no. 3, Mar. 1925, pp. 157-159. Points out that coöperation in maintenance and intelligent selection of lubricants are important preventative measures.

Repairing, Welding for. Locomotive and Car Repair, H. D. Adell. Welding Engr., vol. 10, no. 2, Feb. 1925, pp. 19-20, 3 figs. How Missouri & Northern Arkansas Ry. uses welding for reconditioning fireboxes, engine frames and other car parts.

CARS, FREIGHT

Automobile. Missouri Pacific Automobile Cars. Ry. Mech. Engr., vol. 99, no 3, Mar. 1925, pp. 155-157, 4 figs.; also Ry. Age, vol. 78, no. 15, Mar. 14, 1925, pp. 711-712, 3 figs. New design arranged to provide special hoisting facilities; steel roofs and ends; staggered doors are 10 ft. wide.

Trucks for Transportation of. Using Transit Trucks on Narrow-Gage Lines (L'utilization des trucks-transporteurs sur les chemins de fer à voie étroite), L. Petit. Génie Civil, vol. 86, nos. 11 and 12, Mar. 14 and 21, 1925, pp. 259-262 and 284-286, 12 figs. Design and operation of trucks used to transship full-gage freight cars over narrow-gage lines to save cost of unloading and reloading. Examples of application in street-car and local lines.

Unit Containers. Unit Containers in Freight Transportation. Ry. Rev., vol. 76, no. 12, Mar. 21, 1925, pp. 557-562, 11 figs. Developments indicate that this equipment is suitable conveyance for everything and anything now shipped.

CARS, PASSENGER

All-Steel Suburban. Suburban Cars for the D. L. & W. Ry. Mech. Engr., vol. 99, no. 4, Apr. 1925, pp. 223-226, 7 figs. All-steel construction with seating capacity of 82 passengers; total light weight 106,000 lbs. See also Ry. Age, vol. 78, no. 17, Mar. 28, 1925, pp. 843-845, 5 figs.

Articulated. Jakob's Articulated Car (Der Jakobs-Gelenkwagen), W. Jakobs. Verkehrstechnik, vol. 42, no. 10, Mar. 6, 1925, pp. 129-131, 7 figs. Describes cars built by author for Berlin Street Ry. Co.

Light Suburban. Boston & Albany Acquires Light Suburban Cars. Ry. Age, vol. 78, no. 19, Apr. 11, 1925, pp. 935-936, 4 figs. Vestibule ends economically constructed; weight of 101,500 lb. gives approximately 1000 lb. for each seated passenger.

CARS, TANK

A. R. A. Class IV. Improved Design of A. R. A. Class IV Tank Car. Ry. Rev., vol. 76, no. 16, Apr. 18, 1925, pp. 729-733, 5 figs. Special attention given to construction to effect low cost of maintenance and safety in operation.

Loading and Unloading. Safeguarding Tank Car Shipments of Light Oils, R. W. Kelly. Nat. Safety News, vol. 11, no. 4, Apr. 1925, pp. 29-30, 2 figs. Regulations suggested and which are being enforced by several large companies, for loading and unloading tank cars, and handling casing-head gas.

CASE-HARDENING

Valve-Motion Parts. Case Carburizing and Hardening Valve Motion Parts, J. E. Burns, Jr. Ry. Mech. Engr., vol. 90, no. 4, Apr. 1925, pp. 231-234, 3 figs. Essential factors are steel, carburizing agent, temperature and time element.

CAST IRON

Flake Graphite in. Flake Graphite in Cast Iron (Garschaumgraphit im Gusseisen), J. Freygang. Giesserei-Zeitung, vol. 22, no. 3, Feb. 1, 1925, pp. 70-71. Origin of flakes and means of preventing its occurrence in foundry practice.

Malleable. Malleable Cast Iron, J. J. Clarke. Iron & Steel of Canada, vol. 8, no. 3, Mar. 1925, pp. 53-58. Brief account of its properties, uses, and how it is manufactured.

Pearlitic. Carbon Control Gages Strength, Jas. Ward. Iron Trade Rev., vol. 76, no. 15, Apr. 9, 1925, pp. 944-945, 3 figs. Notes on properties of pearlitic iron.

Refining with Alloys. Refining of Cast Iron by Addition of Alloys (Die Gusseisenveredelung durch Legierungszusätze), E. Piwowarsky. Stahl u. Eisen, vol. 45, no. 9, Feb. 26, 1925, pp. 289-297, 3 figs. Discusses influence of aluminum, titanium, nickel, chromium, nickel and chromium, vanadium, tungsten, molybdenum on properties of gray cast iron; critical discussion of results.

Strength Calculation. The Strength of Cast Iron and Other Metals (Ueber Festigkeit von Gusseisen und anderem Metall). Zeit. für die gesamte Giessereipraxis, vol. 46, nos. 9 and 10, Mar. 1 and 8, 1925, pp. 103-104 and 126-128, 10 figs. Discusses use and application of strength coefficients, and importance of strength calculations in foundry practice.

Strength Properties. A Logical Attack upon the Strength Properties of Cast Iron. Foundry Trade Jl., vol. 31, no. 448, Mar. 19, 1925, p. 237. Editorial comment suggesting that as basis of research it should be taken for granted that quantity and condition of graphite in cast iron are main factors in controlling its strength properties, and it should not be insuperable task to discover factors for ensuring commercial minimum of graphite distributed in its least harmful condition in normal cast iron.

Structural Composition. A note on the Structural Composition of Cast Iron, J. E. Fletcher. Foundry Trade Jl., vol. 31, no. 446, Mar. 5, p. 196. Notes on method of expressing chemical analyses of cast iron in terms of structural composition.

CASTINGS

Inspection. The Inspection of Castings, W. J. Hiscox. Foundry Trade Jl., vol. 31, no. 446, Mar. 5, 1925, p. 202. Points out that for inspection to be effective, it should be handled in three phases: (1) as soon as practicable after casting, (2) immediately after finishing and just prior to sending to dispatch room, and (3) while castings are being loaded for dispatch.

Valve, Defective. Defective Valve Castings. Foundry Trade Jl., vol. 31, no. 447, Mar. 12, 1925, p. 228. Author's experience with number of valve castings showed that wrought-iron grid was to blame for defects; lesson taught is, not that wrought-iron grids are inferior to cast grids, but that careful discrimination and judgment should be used.

CATALYSIS

Chemical Reactions and. Velocity of Chemical Reactions and Catalysis, H. I. Schlesinger. Soc. Automotive Engrs.—Jl., vol. 16, no. 4, Apr. 1925, pp. 433-441 and (discussion) 441-443. Author undertakes to clarify subject of catalysis in general, and after showing experimentally various chemical reactions and catalytic effects, discusses from viewpoint of scientist, reactions that take place within cylinder of automobile, special reference being made to detonation and retonation waves that are produced and to knock; he reasons that material may be found, which, when deposited on sides of cylinder or on spark plug, would act as permanent catalyst, or that alloy may be discovered from which cylinders may be constructed that will have continuous catalytic effect on fuel mixture.

CEMENT

Pelumina. Pelumina Cement, Jas. Watson. Power Engr., vol. 20, no. 229, Apr. 1925, pp. 125-126, 3 figs. Notes upon developments in cement making; Pelumina cement is Portland cement, but varies from usual composition in that alumina content is increased; also higher percentage of lime is used.

CENTRAL STATIONS

Boston, Mass. Pioneer Engineering at Weymouth Station. Elec. World, vol. 85, no. 16, Apr. 18, 1925, pp. 808-815, 14 figs. 1200-lb. steam-pressure installation coördinated with 375-lb. system to insure maximum plant economy; electrical features designed to realize unusual reliability and flexibility of service.

Weymouth Power Station of the Edison Electric Illuminating Company of Boston. Power, vol. 61, no. 15, Apr. 14, 1925, pp. 561-567, 9 figs. partly on supp. plate which also contains tabular data on principal equipment of station. Features of design and equipment. Includes introductory statement by I. E. Moultrop of Edison Electric Illuminating Co.

Design Tendencies. Some Tendencies in Modern Power Plant Design, W. M. Keenan. Power Plant Eng., vol. 29, no. 8, Apr. 15, 1925, pp. 429-431. Deals with buildings, coal and ash handling, methods of firing, boilers and settings, economizers, air preheaters, turbine sizes, condensers and auxiliary drive. (Abstract.) Paper presented before Rochester Section of A.S.M.E.

Diesel-Engined. Municipal Diesel Operation at Low Rates, P. S. Joy. Elec. World, vol. 85, no. 15, Apr. 11, 1925, pp. 757-759, 4 figs. How two 550-hp. engines installed in Michigan plant generate electrical energy at average cost of $1.63 cents per kw-hr.

Great Britain. Power Station Efficiency in Britain. World Power, vol. 3, no. 16, Apr. 1925, pp. 223-226, 4 figs. Details of Wallasey station, consisting of 5 boilers with chain grate stokers and economizers, two 3000-kw. turbo sets and one 5000-kw. turbo set.

HOUSTON, TEXAS. Deepwater Steam Power Station. South Engr., vol. 43, no. 2, Apr. 1925, pp. 35-44, 16 figs. Description of station of Houston Lighting & Power Co.; ultimate plans call for total of 180,000 kw.; energy generated is three-phase, 60-cycle, at 12,000 volts; turbines use steam at a pressure of 325 lb. and a temperature of 625 deg. Fahr.

ST. PAUL, MINN. St. Paul Island Station. Elec. World, vol. 85, no. 13, Mar. 28, 1925, p. 664. New 25,000-kva. plant of St. Paul Gas Light Co. uses powdered fuel dried by flue gases and 325-lb. pressure.

SOUTH AFRICA. The Pretoria Municipal Power Station. Engineering, vol. 119, no. 3090, Mar. 20, 1925, pp. 349-350, 9 figs. on supp. plate. Station, which has capacity of 10,000 kw., supplies d. c. distribution network in center of city and also gives supply to street cars through converting substation.

CHEMISTRY

CHEMICAL AFFINITY. The Nature, Division and Distribution of Chemical Force, B. Flürscheim. Chem. & Industry, vol. 44, no. 10, Mar. 6, 1925, pp. 246-250. Nature of chemical affinity; directive effect; applications.

CIRCUIT BREAKERS

OIL. The Selection and Testing of Oil Circuit Breakers for Large Rupturing Capacities, W. H. Gregory. Elec. Engr., vol. 1, no. 10, Jan. 1925, pp. 369-372, 5 figs. Discusses points that should be noted and taken into consideration when selecting oil circuit breakers for a specified service.

CITY PLANNING

REGIONAL TRANSPORTATION PLANNING. The Influence of the Automobile on Regional Transportation Planning, Geo. A. Damon. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 4, Apr. 1925, pp. 636-643. Notes on regional planning; expansion and contraction; decentralization; place for limitations and applications of motor coach; zoning and automobiles; regional-planning specifications; business sub-centres; set-back line proposal; grade elimination.

COAL

CONSTITUTION. The Constitution of Coal R. Thiessen. Am. Inst. Min. & Met. Engrs.—Trans., no. 1438-I, Mar. 1925, 30 pp. In study of coal, all evidence points to fact that coals have been formed in similar manner as have peat beds of to-day; thus study of peat is essential; in turn, for study of peat, considerable knowledge of chemistry of plants and of decay is essential; outlines components and products of plants, gives brief review of mechanism of decay, and decay of wood; shows that all plant products went into peat bog, but elimination of certain components and concentration of other stook place through decay.

The Constitution of Coal, F. V. Tideswell and R. V. Wheeler. Am. Inst. Min. & Met. Engrs.—Trans., no. 1429-I, Mar. 1925, 7 pp. Constitution of ulmins and their contribution to coal: comparison between peat and coal; authors consider that there are ample grounds for conclusion that vitrain is similar to, though not identical with, dopplerite; this supports proof of close analogy between peat and coal.

EXHIBITS OF. Exhibition of Coal and Coal Products at Victoria Memorial Museum, Ottawa, B. R. MacKay. Can. Inst. Min. & Metallurgy—Bul., no. 155, Mar. 1925, pp. 192-202, 5 figs. Two to five exhibition cases contain representative collection of specimens from every important coal field in Canada; third case contains graphical representation of Canada's coal reserves by provinces; another case illustrates origin and geological relation of coal, and fifth displays in cognate manner numerous products derived from coal.

HYDROGENATION AND LIQUEFACTION. The Hydrogenation and Liquefaction of Coal, H. G. Shatwell and J. I. Graham. Fuel, vol. 4, nos. 1, 2 and 3, Jan., Feb. and Mar., 1925, pp. 25-30, 75-81 and 127-131, 3 figs. Investigations to ascertain to which types of British coals, and how far, the Bergius method of hydrogenation is applicable. Jan.: Hydrogenation and destructive distillation of clarain. Mar.: Hydrogenation and liquefaction of durain, fusain, and of coal of high carbon content.

MICROSTRUCTURE. The Microstructure of Coal, C. A. Seyler. Am. Inst. Min. & Met. Engrs.—Trans., no. 1428-I, Mar. 1925, 10 pp., 18 figs. Aim of investigation is to attempt to infer from results observed: (1) plant tissues from which coal has originated or which have contributed to it, and to trace effect of tissues on composition and characters of coal; (2) nature of processes, biochemical or chemical, by which plant cells have been reduced to their present condition.

NITROGENOUS CONSTITUENTS. Nitrogenous Constituents of Coal, J. W. Cobb. Am. Inst. Min. & Met. Engrs.—Trans., no. 1432-I, Mar. 1925, 4 pp. In this summary attempt is made to bring together results obtained by British workers.

RESOLUTION BY OXIDATION. The Resolution of Coal by Oxidation, W. Francis and R. V. Wheeler. Am. Inst. Min. & Met. Engrs.—Trans., no. 1430-I, Mar. 1925, 10 pp. Shows that alkali-soluble ulmins can be regenerated from bituminous coal by mild oxidation; if coal is a vitrain, it consists almost solely of ulmins; bituminous coal consists of insoluble ulmins in which are dispersed morphologically organized plant tissues that have escaped ulmification.

COAL DEPOSITS

FORMATION OF. Coal Deposits and How They Were Formed, H. H. Wuestner. Power, vol. 61, no. 14, Apr. 7, 1925, pp. 526-528. Story of origin of coal and what influences were at work during formative periods to affect its quality; structure of coal vein; lignites or brown coals; forming of anthracite; volatile matter; effects of sulphur in coal.

COAL DUST

INVESTIGATIONS. Review of Coal-dust Investigations, Geo. S. Rice. Am. Inst. Min. & Met. Engrs.—Trans., no. 1435-F, Mar. 1925, 32 pp., 5 figs. Historical review of investigations prior to 1801 and subsequently; British views; watering in mines; French anti-coal-dust explosibility conclusions; German gallery testing; review of mine explosions in United States and Europe; testing at Altofts gallery; work of Bureau of Mines; testing of experimental mine; progress of rock dusting in United States; future explosion and prevention investigation; effect of rock dust on health.

COAL HANDLING

METHODS. The Control of Power Production, Chas. L. Hubbard. Factory, vol. 34, no. 3, Mar., 1925, pp. 431-437, 514, 516 and 518, 17 figs. How best to handle coal and ashes.

COAL INDUSTRY

BELGIUM. Belgian Coal, Iron and Steel Industries in 1924. Iron & Coal Trades Rev., vol. 110, no. 2977, Mar. 20, 1925, p. 469. Statistics.

COAL MINES

ROCK DUSTING. Rock Dust as a Preventive Measure Against Explosions in Coal Mines, E. Steidle. Safety Eng., vol. 49, no. 1, Jan. 1925, pp. 12-16. Rock dusting most reliable and economical means of preventing coal dust explosions; theory of coal dust explosions and of rock dusting; means for reducing hazards.

ROCK DUSTING. Recommended Standard Practices for Rock Dusting Coal Mines to Prevent Coal Dust Explosions. Min. & Metallurgy, vol. 6, no. 220, Apr. 1925, p. 191. Recommendations which are being made public for purpose of arousing further interest and suggestions before final adoption.

SAFETY PRACTICES. Rocky Mountain Region Has Many Mine Safety Practices, D. Harrington. Coal Age, vol. 27, no. 11, Mar. 12, pp. 389-393, 4 figs. Difficult conditions induce careful dusting, sprinkling, ventilation and haulage; new electric precautions taken; mines are sectionalized for safety.

SPONTANEOUS COMBUSTION. Spontaneous Combustion in Coal Mines, E. O. Simcock. Fuel, vol. 4, no. 3, Mar. 1925, pp. 131-134. Discusses theories regarding spontaneous combustion and methods of dealing with it.

COAL MINING

COAL CUTTERS. Experience with Compressed-Air Coal Cutters (Emploi des haveuses à air comprimé aux mines Victor-Ickern (Westphalie), P. Bonnefoy. Revue de l'Industrie Minérale, no. 97, Jan. 1, 1925, pp. 15-22, 4 figs. Information concerning construction, operation, and performance of Knapp bar-type compressed-air coal cutter, as used in Victor-Ickern mines, Westphalia; comparisons are made between these machines and chain-type cutters used in the Sarre; Knapp machine weighs 4620 lbs. and is provided with 4 single-acting cylinders, each pair being in line and operating on opposite sides of common crank on longitudinal main shaft of machine; organization of shifts for cutting and removing coal; cost data.

M. and C. Coal-Cutters and Conveyor. Colliery Guardian, vol. 129, no. 3350, Mar. 13, 1925, pp. 635-636, 7 figs. Operation and tests of Arcwall and Midget coal cutters and low type face conveyor.

CUTTING AND LOADING MACHINE. Machine Alternately Cuts and Loads Coal, N. D. Levin. Coal Age, vol. 27, no. 14, Apr. 2, 1925, pp. 499-501, 7 figs. Describes Jeffrey 43-A Shortwaloader, which undercuts coal in exactly same manner as shortwall machine, yet it will cut a place in much shorter time; undercuts face and loads out bug dust; conveyors take coal from machine and enable it to work in single place shift after shift.

MACHINE LOADING. At Pocahontas Fuel Co.'s Mines, Machines Load Forty per Cent of Output, A. F. Brosky. Coal Age, vol. 27, no. 13, Mar. 26, 1925, pp. 459-463, 10 figs. Twenty-two machines loaded 1,500,000 tons; each consistently yields 300 to 350 tons per 9-hr. shift; drawslate found in 90 per cent of area and is frequently quite thick; mines are located in West Virginia and Virginia.

MECHANICAL EQUIPMENT. What is the Matter with the Coal Industry? W. M. Dake. Min. & Metallurgy, vol. 6, no. 220, Apr. 1925, pp. 186-190, 4 figs. Discusses reasons why bituminous coal mines of United States, generally speaking, are being operated at loss; points out that loading machines supplies missing link in chain of continuous mechanical production; conveyor methods adopted underground.

STEEPLY PITCHING VEINS. Method of Mining a Steeply Pitching Anthracite Vein by Successive Skips, J. S. Miller. Am. Inst. Min. & Met. Engrs.—Trans., no. 1426-F, Mar. 1925, 5 pp., 4 figs. Method of mining seam on heavy pitch in Orchard vein in No. 1 Tunnel of Lehigh Coal & Navigation Co.; method is said to avoid all objectionable features of pillar-breast, pillar-skip, or pillar-chute methods.

SYSTEMS IN WASHINGTON. Systems of Coal Mining in Western Washington. Am. Inst. Min. & Metallurgy—Trans., no. 1411-A, Mar. 1925, 39 pp., 22 figs. Methods used in mining and conditions that affect efficiency of these methods; details of underground methods that have been tried and found successful as well as those that have not proved successful.

COAL WASHING

RHEOLAVEUR PROCESS. A Study of Rheolaveurs (Contribution à l'étude des rhéolaveurs), A. France-Focquet. Revue de l'Industrie Minérale, no. 98, Jan. 15, 1925, pp. 23-42, 17 figs. Author is primarily concerned with controversing criticisms made by C. Wolf in earlier paper published in same journal (May 15, 1924); investigates whole question of rheolaveurs, dealing with theoretical advantages of apparatus, and with results so far obtained in practice.

COBALT

PRODUCTION AND USES. Cobalt: Its Production and Some of Its Uses. Chem. & Industry, vol. 44, no. 8, Feb. 20, 1925, pp. 191-197, 4 figs. Use of cobalt salts as driers in manufacture of paints and varnishes; use of cobalt in form of smalt for blue coloring of enamels; metallic cobalt; cobalt and iron; alloys of cobalt and chromium; cobalt steels; effect of addition of cobalt to magnet steels; corrosion; non-ferrour alloys; electroplating with cobalt.

COKE MANUFACTURE

EUROPEAN DEVELOPMENTS. Post-War Continental Coking Developments, R. Ray. Gas Wld., vol. 82, no. 2120, Mar. 7, 1925, pp. 12-17 (Coking Sec.). Discusses co-operation between colliery oven and furnace managers; coal washeries,crushing and blending, advantages of concentration of plant, importance of combustibility, from charcoal to by-product coke, progress of narrow oven, etc. Paper read before Coke Oven Mgrs.' Assn.

COKE OVENS

DESIGN. New Coke-Oven Types, O. Peischer. Iron & Coal Trades Rev., vol. 90, no. 2972, Feb. 13, 1925, pp. 249-251, 5 figs. Discusses carbonizing capacity, temperature distribution and heat consumption.

OTTO. By-Product Coke-Oven Practice, R. A. Mott. Fuel, vol. 4, no. 3, Mar. 1925, pp. 118-126, 5 figs. Chief points of two types of Otto oven are: waste-heat type, with its system of underfiring, enables good control to be effected over distribution of gas; design is simple, gas and air supplies are independent for each oven, and ovens are easily worked separately or as battery. Regenerative type, with system of underfiring also allows for good control over gas; transverse regenerators and large double sole flues allow of good distribution of air to each vertical flue.

COLUMNS

SUPPORTING, METHODS FOR. New Method for Supporting Building Columns, Geo. E. Goodall. Eng. News-Rec., vol. 94, no. 4, Jan. 22, 1925, pp. 145-146, 1 fig. Reinforced-collars gunited around base of columns provide shoulders that rest on steel needle beams; plan was evolved in San Francisco when it became necessary to underpin 7-story concrete office building whose interior columns had begun to settle due to subsidence of foundation.

COMPRESSED AIR

MEASUREMENT. A New Form of Air Meter and the Measurement of Compressed Air, E. J. Laschinger. S. African Instn. Engrs.—Jl., vol. 23, no. 7, Feb., 1925, pp. 360-369, 8 figs. Enumerates the various types of well-known air meters; describes theory of F. M. L. flow recorder.

CONCRETE

MAKING OF. The Making of Concrete, D. Peabody. Boston Soc. Civ. Engrs.—Jl., vol. 12, no. 2, Feb. 1925, pp. 63-66. Describes changes it is proposed to make in accepted practice of design. Discussion of report of Joint Committee on Standard Specifications for Concrete and Reinforced Concrete.

CONCRETE CONSTRUCTION

TRACK ELEVATION WORK. Large Concrete Plant Employed on Track Elevation Work. Ry. Age, vol. 78, no. 16, Mar. 21, 1925, pp. 781-784, 7 figs. Special hopper cars deliver material to forms over distance of 9,000 ft. on Cleveland project of Pennsylvania R.R.

CONDENSERS, STEAM

AUXILIARIES, DRIVE OF. Efficiency in Driving Condenser Auxiliaries (Beitrag zur Frage des Kondensationsantriebes bei Dampfturbinen), F. Ebel. Glückauf, vol. 61, no. 9, Feb. 28, 1925, pp. 241-245, 3 figs. Acceptance tests on number of mixed-pressure turbines show that capacity of low-pressure stage for receiving exhaust steam from other sources (winding engines) is reduced appreciably by exhaust from steam-driven condenser auxiliaries; in cases where live steam required by steam-driven auxiliaries overloads boiler plant electric drive is to be preferred for auxiliaries; from investigation of heat-drop conditions it is shown that steam driving becomes less economical as live steam pressure is raised; when steam drive is used, conditions can be improved by use of higher back pressure in auxiliary turbine.

TUBES. Condenser Failure—Causes and Prevention, F. J. Drover. Powership, vol. 36, no. 429, Mar., 1925, pp. 291-292. Failure in practically every case is due to failure of tubes and ferrules; enumeration of most modern methods to prevent or lessen chances of serious breakdown; steps taken to counteract or retard tube corrosion.

Manufacture of Brass Condenser Tubes, with Some Notes on an Alternative Alloy, G. H. Whiteman and A. Spittle. Foundry Trade Jl., vol. 3, no. 338, Mar. 19, 1925, pp. 249-251, 2 figs. Casting shells; tube drawing; British Admiralty specification; alternative which is being increasingly adopted on land and sea is use of alloys tougher than brass and free from zinc; cupronickel is one of foremost metals of this class, and so far has justified its adoption wherever it has been used. Paper read before Instn. Engrs. & Shipbldrs. in Scotland.

Methods of Preventing Corrosion of Condenser Tubes, J. Austin. Mar. Engr., vol. 48, no. 570, Mar., 1925, pp. 111-113, 4 figs. Describes a method of spraying condenser tubes with a protective solution for prevention of corrosion. Abstract of paper read before Liverpool Eng. Soc.

CONVEYORS

ROPEWAYS. Handling of Road Materials by Aerial Ropeways. Surveyor & Mun. & County Engr., vol. 17, no. 1730, Mar. 13, 1925, pp. 293-294, 4 figs. Description of installation at Rotherhan corporation's highway department (England), for handling road materials at depot. Ropeway is about 300 ft. long overall, made on double rope system, with separate carrying ropes and hauling rope, and has capacity of 15 tons per hour; loading, driving and tension terminal placed below ground level, and underground loading hopper provided so that railway cars, standing on track above hopper, can be discharged directly into it, and from there material is loaded into ropeway carrier boxes by gravity, specially designed loading shoots and valves being provided for purpose.

COOLING TOWERS

REINFORCED-CONCRETE. Modern Cooling Tower Construction, Barck. Eng. Progress, vol. 6, no. 2, Feb., 1925, pp. 33-35, 3 figs. Describes cooling tower which, including chimney, is built of reinforced concrete; static conditions and details of design; advantages of reinforced concrete for cooling towers. See description (in German) in Zeit des Vereines deutscher Ingenieure, vol. 69, no. 1, Jan. 3, 1925, pp. 18-20, 5 figs.

COPPER

GRAIN SIZE AND HARDNESS. The Effect of Grain-Size upon Hardness and Annealing Temperature, H. T. Angus and P. F. Summers. Inst. Metals—advance paper, no. 1, for mtg. Mar. 11-12, 1925, 21 pp., 13 figs. In coarse-grained, hard-worked copper and bronze an increase in hardness is obtained after annealing for one hour at temperatures of 150 and 200 deg. cent.; in fine-grained metal, annealing at 150 and 200 deg. cent. for one hour will cause progressive fall in hardness; relation between grain-size and hardness is similar for copper and bronze, and for 68:32 brass.

COPPER ALLOYS

COPPER-ZINC. The Alpha Phase Boundary in the Copper-Zinc System, R. Genders and G. L. Bailey. Inst. Metals—advance paper, no. 9, for mtg., Mar. 11-12, 1925, 9 pp., 17 figs. Data obtained from experimental work indicate that alpha phase extends considerably beyond limit shown in diagram of Shepherd as modified by Matthewson and Davidson; modified equilibrium of copper-zinc system over range of 75-55 per cent copper, constructed from experimental results, is presented.

COPPER DEPOSITS

MANITOBA. Oiseau and Maskwa Copper and Copper-Nickel Deposits, Southeastern Manitoba, J. F. Wright. Can. Inst. Min. & Metallurgy—Bul., no. 155, Mar. 1925, pp. 220-231, 1 fig. History of prospecting; physical features and geology; origin of deposits.

COPPER METALLURGY

LEACHING. Some Principles of Modern Copper Leaching, G. D. van Arsdale. Min. & Metallurgy, vol. 6, no. 220, Apr. 1925, pp. 174-177, 6 figs. Discussion of principles on which leaching is based, from which idea can be had of present development of art, and of possibilities of its application to ore-treatment problems and conditions, which have not yet been worked out. Prepared in Spanish for Pan-American Engineering Congress.

SMELTING. The Tacoma Copper Smelter and Refinery, G. J. Young. Eng. & Min. Jl.-Press, vol. 119, no. 14, Apr. 4, 1925, pp. 557-562, 8 figs. Describes Tacoma smelter of Am. Smelting & Refining Co., at Point Defiance, 6 miles from Tacoma, Wash.; unusual ore-weighing and conveyor system; unloading of ore ships; reverberatory and blast-furnace smelting; electrolytic copper refining; copper-casting equipment.

CORES

BALANCING AND SETTING. Accurate Balancing and Setting of Cores, J. Edgar and B. Shaw. Can. Foundryman, vol. 16, no. 3, Mar. 1925, pp. 16-17, 9 figs. Describes devices adopted to obtain efficiency in rapid coring of molds.

COTTON MILLS

ELECTRIC DRIVE. Electric Drive in the Cotton Industry, F. B. Holt. Electrician, vol. 94, no. 2441, Feb. 27, 1925, pp. 232-234, 7 figs. How problem has been solved; pre-eminence of squirrel-cage motor; analysis of load conditions.

The Electric Driving of Large Cotton Spinning Mills. Elec. Rev., vol. 96, no. 2469, Dec. 20, 1925, pp. 459-461, 9 figs. Cannon Bros. Stanley Mills at Bolton, England, excellent example of what can be achieved with efficiency in conversion, with extensive additions, to electric from seam drive of large power-driven mills and how electric drives can be utilized so as to reduce to a minimum space not used directly for productive work.

CRANES

INGOT-STRIPPER. Modern Ingot Strippers (Neue Stripper), Kessner and Ebinghaus. Zeit. für die gesamte Giessereipraxis, vol. 46, no. 6, Feb. 8, 1925, pp. 74-76, 7 figs. Describes modern types; stationary pendulum stripper; stripper tongs, etc.

CRANKSHAFTS

MACHINING. Modern Crankshaft Practice. Machy. (Lond.), vol. 25, no. 649, Mar. 5, 1925, pp. 709-714, 11 figs. How crankshafts are made at plant of Lincoln Motor Co.

CUPOLAS

OPERATING PROCESS. Cupola Practice and a New Cupola Operating Process (Ueber den Kupolofenbetrieb und über ein neues Kupolofenbetriebsverfahren), F. Braun. Zeit. für die gesamte Giessereipraxis, vol. 46, no. 5, Feb. 1, 1925, pp. 61-63. Describes new method consisting in admission of certain quantities of water through nozzles into melting zone, whereby the water reaches red-hot coke in its natural state and not in form of steam.

STEEL MELTING IN. Peep into Cupola When Melting Steel, J. Grennan. Foundry, vol. 53, no. 8, Apr. 15, 1925, pp. 314-317 and 325, 11 figs. Gives results of experiments conducted at University of Michigan to investigate what actually happens when steel is melted in cupola. Paper presented before Am. Foundrymen's Assn.

CUTTING TOOLS

RESEARCH COMMITTEE. Cutting Tools Research Committee, E. G. Coker. Engineering, vol. 119, nos. 3090 and 3091, Mar. 20 and 27, 1925, pp. 363-364 and 403, 12 figs. Report on the action of cutting tools presented at Instn. Mech. Engrs. (Abridged.)

D

DAMS

BARRAGE. Calculation of Barrage Dams of Great Height (Sur le calcul des barrages de très grande hauteur), A. Auric. Technique Moderne, vol. 17, no. 3, Feb. 1, 1925, pp. 81-83, 3 figs. Proposes widened profiles so as to equalize as far as possible the maximum compressions on the two faces.

CONCRETE, SOLIDIFYING. Preserving Faulty Concrete, J. V. Schaefer. Elec. World, vol. 85, no. 12, Mar. 21, 1925, pp. 618-619, 5 figs. Describes unusual piece of work in solidifying and protecting against further damage heavy concrete gravity dam.

CONCRETE AND MASONRY. Pennsylvania Constructs Large Dam to Insure Water Supply, Chas. Haydock. Ry. Eng. & Maintenance, vol. 21, no. 4, Apr. 1925, pp. 139-142, 8 figs. Completion of work at Tipton practically doubles storage capacity in Altoona district; construction details; grouting cut-off trench; piping and controlling valves; organization of project.

GRAVITY. Design for Cellular Gravity Dam, R. Ryves. Engineer, vol. 139, no. 3610, Mar. 6, 1925, pp. 279-280. Type, designed by E. de Gaetani, to reduce cost due to great thickness of costly masonry or concrete, especially for very high dams, and reduce also upward pressures occurring when water under reservoir head penetrates between dam and rock. Abstract translated from Annali dei Lavore Pubblici.

HYDRAULIC-FILL. Garza Dam for Dallas Water-Works Will Impound 63 Billion Gallons. Eng. News-Rec., vol. 94, no. 16, Apr. 16, 1925, pp. 630-633, 5 figs. Hydraulic fill utilizing floating equipment dredging in sand, gravel and clay layers carefully prospected; puddle core trenches with steel sheet piles; double set of spillways.

ROCK-FILL. World's Largest Rock-Fill Dam Built on Dix River, Geo. W. Howson. Eng. News-Rec., vol. 94, no. 14, Apr. 2, 1925, pp. 548-552, 9 figs. 2,000,000 yards of loose rock dam Kentucky gorge 300 feet deep, forming reservoir 36 miles long and holding 300,000 acre-feet.

DIE CASTING

EQUIPMENT AND METHODS. Equipment and Methods in Die-Casting, D. L. Colwell. Iron Age, vol. 115, nos. 15 and 16, Apr. 9 and 16, 1925, pp. 1052-1054 and 1123 and 1171, 6 figs. Present stage of development in casting of metals in permanent dies under high air pressure; comparison of die castings with machined parts. Lead-, tin-, zinc- and aluminum-base alloys for die casting; saving by reducing machining work; importance of inspection. Paper presented before Chicago section of A.S.M.E.

PRINCIPLES. The Principles of Die Casting, H. C. Skinner. Am. Mach., vol. 62, nos. 11, 12, 13, 14 and 15, Mar. 12, 19, 26, Apr. 2 and 9, 1925, pp. 413-415, 453-455, 487-490, 527-528 and 577-579, 33 figs. Mar. 12: Definition of die castings; plunger and air types of casting machines; permanent-mold equipment; scope of die castings. Mar. 19: Die making; materials used in dies; methods of machining; hobbing; operation of dies in die-casting and permanent-mold processes. Mar. 26: Problem of undercuts in design; examples of dies used in casting parts with and without undercuts. Apr. 2: Die-casting alloys; physical properties; formulas for compositions of various classes. Apr. 9: Use of inserts in die casting; examples of castings made with inserts successfully employed.

DIELECTRICS

PHENOMENA. Some Dielectric Phenomena, F. Fernie. World Power, vol. 3, no. 16, Apr. 1925, pp. 192-194. Results from extension of Franklin's experiment; electrons in dielectric; gas condenser; dielectric coefficients; alternating stresses; Langmuir's octet theory; electric breakdown.

DIES

HEADER, SALVAGING. Salvaging Header Dies Affords Larger Unit Production, A. L. Greene. Iron Trade Rev., vol. 76, no. 15, Apr. 9, 1925, pp. 941-943, 4 figs. Gives examples showing simplicity in design and operation of many of tools used with automatic and semi-automatic machines in bolt and nut manufacturing.

DIESEL ENGINES

BURMEISTER & WAIN. The Burmeister & Wain 4-Stroke Cycle Double-Acting Diesel Engine, H. H. Blache. Mar. Engr., vol. 48, no. 570, Mar., 1925, pp. 97-100, 3 figs. Characteristics and working mechanism of main engines of new Swedish-American liner "Gripsholm", being built by W. G. Armstrong Whitworth & Co.

FUEL-MEASURING PUMPS. Factors in Design of Fuel Measuring Pumps for Diesel Engines, J. E. Canoose. Am. Soc. Nav. Engrs.—Jl., vol. 37, no. 1, Feb., 1925, pp. 37-74, 18 figs. Deals with generation of vacuum in fuel-pump cylinders; possibilities of supercharging fuel-pump suction; pressures to be considered in designing, as shown by indicator cards; blow-down effect in discharge valves; residual oil effect on governor action; effect of design on tappet-clearance variation effects; practical design factors.

OPERATION. Operation of Diesel Engines, R. Hildebrand. Power, vol. 61, nos. 13 and 15, Mar. 31 and Apr. 14, 1925, pp. 490-491, 4 figs. and 571-573, 3 figs. Mar. 31: Engines frames and cylinder liners. Apr. 14: Causes of crankshaft troubles and how to avoid them.

DIRECTION FINDING

MARCONI MARINE DIRECTION FINDER. The Marconi Marine Radio Direction Finder, H. de A. Donisthorpe Inst. Radio Engrs.—Proc., vol. 13, no. 1, Feb. 1925, pp. 29-47, 11 figs. Describes circuits, construction, installation, and use of Marconi Bellini-Tosi marine radio direction finder; explains method of determining "sense" as well as "line of direction" of distant station; various forms of errors in reading and methods of reducing or eliminating these; describes number of cases where Marconi direction finder has contributed to safety of life at sea in stormy weather.

DOMES

CALCULATION. Calculation of Cupolas and Arches (Le calcul des coupoles et des réservoirs), P. Caufourier. Génie Civil, vol. 86, no. 7, Feb. 14, 1925, pp. 165-166, 3 figs. Discusses calculation of architectural domes and arches such as for St. Lazare station in Paris, in steel or reinforced concrete.

DRILLING MACHINES

PORTABLE. G. & L. Portable Universal Drilling Machines. Am. Mach., vol. 62, no. 13, Mar. 26, 1925, pp. 514-515, 2 figs. Details of universal boiler and firebox drill and radial drilling machine, both of which are portable so that they, rather than the work, can be moved.

DUST

PNEUMATIC CONVEYING. Pneumatic Conveying of Dust, H. P. Vowles. Power Engr., vol. 20, no. 229, Apr., 1925, pp. 128-129. Discusses merits of this system; boiler-flue cleaning; constructional details; points of design; ash removal.

E

ECONOMIZERS

CAST-IRON. Investigations of Cast-Iron Economizers (Ueber Untersuchungen an Gusseisernen Vorwärmern), R. Baumann. Zeit. des Bayerischen Revisions-Vereins, vol. 29, no. 21, Mar. 15, 1925, pp 45-51, 22 figs. Results of tests on economizer elements.

HEAT-TRANSFER CALCULATION. Economizer Heat Transfer Calculations, E. S. Sutton. Combustion, vol. 12, no. 4, Apr., 1925, pp. 285-286, 1 fig. Shows how equations may be developed and applied to problem of economizer operation.

ELECTRIC CIRCUITS

CALCULATION. Tables for the Calculation of the Mutual Inductance of Circuits With Circular Symmetric About a Common Axis, F. W. Grover. U. S. Bur. Standards, Scientific Paper no. 498, Dec. 5, 1924, pp. 1-18. Gives tables which do away with necessity of selecting a formula, and inductance is obtained by taking product of geometric mean of radii and a factor taken by interpolation from a table. An accuracy of 1 part in 10,000 in value of mutual inductance is readily attained.

ELECTRIC CURRENTS

SHORT CIRCUITS. Finding Single-Phase Short-Circuit Currents on Calculating Boards, R. D. Evans. Elec. World, vol. 85, no. 15, Apr. 11, 1925, pp. 760-765, 4 figs. Discusses use of calculating boards on single-phase short-circuit problems; explanation of phase-sequence system and its use to simplify calculations; practical examples in tabulated form.

ELECTRIC DISTRIBUTION SYSTEMS

GROUND DETECTORS. Development and Use of Ground Detectors, E. R. Stauffacher. Elec. World, vol. 85, no. 15, Apr. 11, 1925, pp. 770-771, 5 figs. Progress in development and application of various types of instruments for this service; value of ground detection.

ELECTRIC FURNACES

BRASS-MELTING. Induction Furnace Produces Superior Brass, Geo. C. Heisterman. Elec. World, vol. 85, no. 12, Mar. 21, 1925, p. 617. Installation at plant of Chicago Extruded Metals Co., Cicero, Ill., includes battery of Ajax induction furnaces of 66 kw. rating and hearth capacity of 800 lb. each; extrusion process is used.

BRONZE. Electric Bronze Furnace, Save $3 per Ton, F. C. Heath. Elec. World, vol. 85, no. 14, Apr. 4, 1925, pp. 722. Producing 23,000 lb. of bronze a day from 5 Detroit rocking-type are electric furnaces, Federal-Mogul Corp., Detroit, has estimated saving of $3 per ton over coke fires; advantages of electric furnaces.

ELECTROMAGNETIC FORCES AVAILABLE IN. Electromagnetic Forces Available in Electric Furnaces, C. Hering. Am. Electrochem. Soc.—advance paper, no. 7, for mtg. Apr. 23-25, 1925, pp. 93-97. Discusses various mechanical forces produced by current-carrying conductors, bringing data up to date; presents quantitative value of longitudinal or "stretching force" for first time, and discusses formulas for calculation of this value; various forces due to electric current passing through conductor have their abutments, or reaction, in material of conductor, hence react on it.

INDUSTRIAL, DESIGN. Essentials of Design of Electric Industrial Furnaces and Their Application to Leveling Up Load Curves, Gel. P. Mills. Iron & Steel Engr., vol. 2, no. 3, Mar. 1925, pp. 136-141 and (discussion) 141-146, 10 figs. Summary of advantages of electrically heated industrial furnaces; discusses subject under head of overall cost of production.

IRON FOUNDRIES. Electric Furnaces in Iron Foundries (Der Elektroofen in der Eisengiesserei), K. Kerpely. Giesserei-Zeitung, vol. 22, no. 3, Feb. 1, 1925, pp. 61-65 and (discussion) 65-67. Aspects underlying installation of electric furnaces; size of furnace, current consumption, economy and metallurgical phenomena; remelting process, duplex process and production of synthetic cast iron; practical experiences and results.

RADIANT-DOME TYPE. Remodeled Electric Furnace, T. F. Baily. Metal Industry (N. Y.), vol. 23, no. 3, Mar. 1925, p. 103, 1 fig. Comparison of old-type Baily furnace with reconstructed radiant-dome type.

ELECTRIC GENERATORS, A.C.

PARALLEL OPERATION. Parallel Operation of Alternators, G. Windred. World Power, vol. 3, no. 16, Apr. 1925, pp. 208-213, 6 figs. Effect of output on synchronizing torque.

The Parallel Running of Alternators, J. Frith. Electrician, vol. 96, no. 2441, Feb. 27, 1925, pp. 240-241 and 268-269, 1 fig. Discussion of problem from a new angle vibration an essential factor; nature of disturbing force.

ELECTRIC LOCOMOTIVES

APPARATUS STANDARDIZATION. Standardizing Apparatus in the Construction of Electric Locomotives for the Swiss Federal Railways (Normalisierung der Apparate beim Bau der elektrischen Lokomotiven der S.B.B.), F. Steiner. Schweizerische Bauzeitung, vol. 85, nos. 7 and 8, Feb. 14 and 21, 1925, pp. 83-86 and 103-107, 14 figs. Standards of symbols; diagrams for connections, and drawings, to reduce work of erection, overhauling and repairing to a minimum; advantages.

AUSTRIAN EXPRESS. Express Locomotives of the Austrian Federal Railway (Talschnellzugslokomotiven der Oesterreichischen Bundesbahnen), R. Lorenz. Elektrotechnische Zeit., vol. 46, no. 11, Mar. 12, 1925, pp. 374-377, 3 figs. Describes new electric locomotive with single-axle drive and calls special attention to vertical arrangement of motors.

CALCULATIONS. Graphic Determination of Distance Covered, Time of Run, Heating and Input of Steam and Electric Locomotive (Zeichnerische Ermittlung des Fahrtverlaufs, der Fahrzeit, der Erwärmung und des Verbrauchs für Dampf-und Elektrolokomotiven), F. Nussbaum. Organ für die Fortschritte des Eisenbahnwesens, vol. 80, no. 1, Jan. 15, 1925, pp. 1-6. Gives symbols, theory and formulas for the various computations; speed curves are drawn on profile of road as a basis; distance-time diagram, distance-fuel consumption diagram for steam locomotives, distance-temperature diagram for electric locomotives, distance-work diagram of electric locomotive are derived.

DIESEL-ELECTRIC. Diesel-electric Locomotive for Freight Service, J. Stumpf. Ry. Mech. Engr., vol. 99, no. 3, Mar., 1925, pp. 140-142, 3 figs. Excellent results are obtained in comparative test with modern steel locomotive; locomotive, built for Russian Government by Hohenzollern Locomotive Works, Düsseldorf, Germany, has 6-cylinder, 4-cycle Diesel-type engine.

PHASE-TRANSFORMING. Phase-Transforming Locomotives for 50-Period Alternating Current of the Royal Hungarian State Railway (Die Phasenumformerlokomotive für 50 periodigen Wechselstrom der Königl. ungarischen Staatsbahnen), L. von Veregbély. Elektrotechnik u. Maschinenbau, vol. 43, no. 7, Feb. 15, 1925, pp. 114-126, 15 figs. Detailed information on electrical features of new type of phase converter and driving motors.

REGENERATIVE BRAKING. Electric Locomotives for the South African Railways. Ry. Engr., vol. 546, no. 542, Mar., 1925, pp. 94-97, 8 figs. British-built locomotives, equipped for regenerative braking, supplied for main-line work on Maritzburg-Glencoe section, South African Railways.

ELECTRIC MOTORS

AUTOMATIC CONTROL SYSTEM. Automatically Controlled Asbestos Mill, A. A. St. Aubin. Elec. World, vol. 85, no. 13, Mar. 28, 1925, pp. 655-657, 7 figs. How this system has been applied in crushing, screening and grading asbestos; mill operated from one control room, where instruments and switches have been concentrated; details of installation.

CONTROL PANELS. Motor Starting Panels for Small Machine Tools. Machy. (Lond.), vol. 25, no. 649, Mar. 5, 1925, pp. 714-715, 5 figs. Describes Midget-type of starting panels designed by Brookhirst Switchgear.

WINDINGS. Some of the Details about Windings That Have One Bar Per Slot, A. C. Roe. Indus. Engr., vol. 83, no. 3, Mar. 1925, pp. 136-139, 11 figs. Show manner of making and connections and use of long and short bars together with typical layouts for this type of winding.

ELECTRIC MOTORS, A.C.

ASYNCHRONOUS UNITY-POWER-FACTOR. Asynchronous Unity-Power-Factor-Motor, V. A. Fynn. Elec. World, vol. 85, no. 16, Apr. 18, 1925, pp. 816-818, 4 figs. New apparatus which has induction-motor performance characteristics; brush failure does not render motor inoperative; discussion of power-factor correction.

GENERAL-PURPOSE. A New Alternating-Current General-Purpose Motor, H. Weichsel. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 4, Apr. 1925, pp. 356-363, 39 figs. Points out desirability of motors possessing good characteristics of induction motors and being capable of operating with leading power factor; describes new machine which operates as self-excited synchronous motor under normal operating conditions; during starting period and excess overloads, it has characteristics of induction motor with wound secondary; discusses electrical and mechanical phenomena during starting and synchronizing periods. (Abridged.)

INDUCTION. The Predetermination of the Performance of Induction Motors, D. B. Hoseason. Instn. Elec. Engrs.—Jl., vol. 63, no. 339, Mar. 1925, pp. 280-286, 7 figs. Describes quick, yet accurate means of predetermining performance of induction motors; group of accurate formulas is developed on basis outlined by Steinmetz and is given alongside corresponding approximate formulas which have heretofore been much used; it is possible to obtain results approaching accuracy of more involved systems of calculation, by using simplest formulas and applying appropriate correction.

SQUIRREL-CAGE. A New Type of Squirrel-Cage Induction Motor with High Starting Torque, T. F. Wall. Instn. Elec. Engrs.—Jl., vol. 63, no. 339, Mar. 1925, pp. 287-294 and (discussion) 295-298, 27 figs. Account of tests made on new type of squirrel-cage motor; each conductor of rotor winding is compound bar of which characteristic property is that resistance increases with frequency of alternating current flowing in it; describes new method of providing squirrel-cage motor with high starting torque without necessitating prohibitively large starting current in line.

SYNCHRONOUS. A Two-Speed Salient-Pole Synchronous Motor, Rob. W. Wieseman. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 4, Apr. 1925, pp. 339-346, 25 figs. Describes special pole which allows two-speed operation of synchronous motor to be obtained at high efficiency; same principle applied to generator enables two frequencies to be obtained at same speed or same frequency at two different speeds; at either speed two-speed synchronous motor functions exactly as ordinary synchronous motor.

SYNCHRONOUS INDUCTION. A New Separately Excited Synchronous Induction Motor, V. A. Fynn. Engineering, vol. 119, nos. 3086, 3087 and 3090, Feb. 20, Mar. 6 and 20, 1925, pp. 215-216, 281-283 and 343-345, 24 figs. Difficulties confronting designer of separately excited synchronous induction motors and various ways in which these have been handled are discussed and analyzed with special reference to their influence on stability, weight efficiency and conversion efficiency of such machines; describes new motors devised by writer and their mode of operation at starting, during synchronizing period, at synchronizing speed and under overload conditions.

ELECTRIC RAILWAYS

MOUNTAIN-CABLE. The Harissenbucht-Fürigen Electric Narrow-Cage Cable Line (Elektr. Kleinseilbahn Harissenbucht-Fürigen), H. H. Peter. Schweizerische Bauzeitung, vol. 85, no. 4, Jan. 24, 1925, pp. 45-49, 7 figs. Construction of line 382 m. in length rising 204 m. with gradient of 53 to 73 per cent; width of track 0.80 m.; car seats 16-20 persons; speed 1.60 m. sec.; three-phase motor of 20 hp. at 340 volts and 960 r.p.m.

ELECTRIC TRANSMISSION LINES

FLASHOVERS. The Possibilities of Flash-Overs. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 4, Apr. 1925, pp. 399-403. Discussion of paper by Austin, published in Dec. 1924 issue of Journal.

FLASHOVERS, AVOIDANCE OF. Avoiding Flashovers on 220-Kv. Transmission Lines, G. H. Stockbridge. Elec. World, vol. 85, no. 12, Mar. 21, 1925, pp. 611-612, 2 figs. Types of bird guards used on towers of Southern California Edison Co.'s line, after it had been found that birds were causing flashovers.

H-FRAME CONSTRUCTION. H-Frame Construction, E. G. Nichols. Elec. Light & Power, vol. 2, no. 3, Mar. 1925, pp. 20-21 and 70, 2 figs. Record of difficulties overcome in setting H-frame line across a lake.

OPERATION. Operation of Transmission Systems, J. L. Hecht. Power Plant Eng., vol. 29, no. 8, Apr. 15, 1925, pp. 435-437, 1 fig. Review of developments; training of system operators; inspection of lines. (Abstract.) Paper delivered at Ill. Gas, Elec. & Elec. Rys. Assn.

ELECTRIC WELDING

CAR WHEELS. Double-Heat Welder Cuts Wheel Maintenance in Detroit, A. C. Colby. Elec. Ry. Jl., vol. 65, no. 12, Mar. 21, 1925, pp. 463-464, 3 figs. Time of welding wheels reduced almost hald by addition of second head on automatic welder; special grinder increases mileage by reducing amount of metal removed.

ELECTRIC WELDING, ARC

LARGE STRUCTURE, VS. RIVETING OF. Welding vs. Riveting of Large Structures, W. Sparagen. Iron Age, vol. 115, no. 15, Apr. 9, 1925, pp. 1051 and 1095-1096, 1 fig. Lower cost and better product claimed for welding process; experience shows welding to be safe; more data needed.

STEAM PIPE LINE. Pipe Line Arc Welding, R. R. Applegate. Iron & Steel Engr., vol. 2, no. 3, Mar. 1925, pp. 125-126, 8 figs. Describes electric-arc welding of circular joints, saddles and angle flanges of exhaust steam line at Mingo Works of Carnegie Steel Co.

STEEL WORKS. Cutting Steel Mill Maintenance Costs with the Welding Arc, A. M. Candy. Iron & Steel Engr., vol. 2, no. 3, Mar., 1925, pp. 122-125, 14 figs. Gives list of work which can be arc welded.

Electric Arc Welding in the Steel Industry, W. L. Warner. Iron & Steel Engrs., vol. 2, no. 3, Mar., 1925, pp. 115-119, 8 figs. Also Am. Welding Soc.—Jl., vol. 4, no. 2, Feb., 1925, pp. 9-17, 4 figs. Discusses repairs done with electric-arc welding on spindles, in hot sheet mill, blooming mill, open-hearth furnaces and foundry, transportation system, and pipe lines.

ELECTRICAL EQUIPMENT

BREAKDOWN PREVENTION. Preventing Breakdowns of Electrical Equipment, C. R. Chace. Power, vol. 61, no. 14, Apr. 7, 1925, pp. 529-532, 4 figs. Points out that large percentage of failures in electrical equipment are preventable by proper inspection and maintenance methods, some of which are described.

ELECTRICAL MACHINERY

COOLING. Accomplishments in the Study of Cooling Electric Machines, C. J. Fechheimer. Power, vol. 61, no. 15, Apr. 14, 1925, pp. 574-575, 2 figs. Method of obtaining data on heat flow; other problems involved.

ELECTRICAL MEASUREMENTS

PHYSICAL VALUES, OF. Electrical Measurement of Physical Values, P. A. Borden. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 4, Apr. 1925, pp. 363-365. Determination by electrical and magnetic means of quantities not in themselves of electrical nature.

ELECTRICITY, APPLICATIONS OF

RURAL ELECTRIFICATION, PENNSYLVANIA. Rural Electrification in Pennsylvania, R. U. Blasingame. Elec. World, vol. 85, no. 14, Apr. 4, 1925, pp. 713-715, 5 figs. Records obtained from field surveys; influence of electricity on social and economical phases of agriculture; electrical equipment used on typical farms; field data and conclusions.

ELECTRICITY SUPPLY

RURAL ELECTRIFICATION. Cost of Rural Electrification, M. L. Cooke. Elec. World, vol. 85, no. 15, Apr. 11, 1925, pp. 765-766, 3 figs. Classification of rural conditions in Pennsylvania; development of curves; determination of cost from curves.

ELECTROMAGNETIC WAVES

PROPAGATION. Recent Investigations on the Propagation of Electromagnetic Waves, M. Baeumler. Inst. Radio Engrs.—Proc., vol. 13, no. 1, Feb. 1925, pp. 5-27, 18 figs. Since summer of 1922 quantitative measurements have been carried out on signal strengths of American high power stations using objective measuring method, for purpose of studying propagation of electromagnetic waves; it is concluded that night value is to be regarded as normal and day value as abnormal or disturbed one; gives explanation of diminution of field intensity. Bibliography.

ELEVATED RAILWAYS

CAR REPAIRING. Maintenance Methods on the Interborough. Elec. Ry. Jl., vol. 65, no. 12, Mar. 21, 1925, pp. 440-449, 29 figs. Describes nature and extent of repair problem, methods followed in carrying out repairs and organization by which this work is conducted in shops of Interborough Rapid Transit Co. of New York.

SUSPENDED. Proposed "Aerial" Railway for Paris. Ry. Gaz., vol. 42, no. 8, Feb. 20, 1925, pp. 232-233, 4 figs. Scheme, developed by F. Laur, involves overhead suspended railway about 2 miles in length; includes overheat track supported upon pillars; car is to be built of hard aluminum, weighing 7.5 tons complete with motor, and carrying 60 to 100 passengers.

ELEVATORS

EQUIPMENT. Solving Problems of Vertical Transportaton, E. M. Bourton. Can. Machy., vol. 33, nos. 14 and 15, Apr. 2 and 9, 1924, pp. 25-26 and 45-46 and 17-18, 4 figs. Reviews various types of elevator equipment and outlines progress made. Paper read before Ontario Sec., A.S.M.E.

MICRO-LEVELING EQUIPMENT. Elevator Micro-Leveling Equipment, F. A. Annett. Power, vol. 61, no. 13, Mar. 31, 1925, pp. 496-498, 7 figs. Construction and operation of equipment for automatically maintaining elevator-car floor level with landings.

EMPLOYEES' REPRESENTATION

PRINCIPLES. The Participation of Wage-Earners in Management. Safety Eng., vol. 49, no. 3, Mar., 1925, pp. 99-105. A study of principles of representation in industrial relations of employer and employee, in Colorado Fuel and Iron Co. made under auspices of Russel Sage Foundation.

EMPLOYEES, TRAINING OF

PLANNING STAFF. Training the Planning Staff, D. Ross-Ross. Mgt. & Admin., vol. 9, no. 4, Apr., 1925, pp. 375-378, 6 figs. Methods used by Canadian Consolidated Rubber Co.; types of planning department; planning school; method of instruction; final organization.

EMPLOYMENT MANAGEMENT

LABOR COST VARIATIONS. Classification of Causes for Variations from Standard Labor Costs, M. R. Lott. Mgt. & Admin., vol. 9, no. 4, Apr. 1925, pp. 347-348. Symbols and method of use on time cards.

EVAPORATORS

VACUUM, BURSTING OF TUBES IN. The Cause of Bursting of Tubes in Vacuum Evaporators (Die Ursache des Reissens der Rohre in Vakuumverdampfapparaten), B. Neumann and E. Zöllner. Zeit. für Elektrochemie, vol. 31, no. 1, Jan., 1925, pp. 24-31, 8 figs. Frequent bursting of tubes during evaporation of caustic soda or sodium aluminate solutions is due to stresses set up in rolling tubes or in setting them in evaporator; cxept for great care in rolling and attaching tubes, there is no known means of prevention unless entirely different method of attaching tubes is adopted.

EXECUTIVES

INDUSTRIAL, WORK OF. Work of the Industrial Executive, B. A. Franklin. Mgt. & Admin., vol. 9, no. 4, Apr., 1925, pp. 329-332. Discussion of profit; author declares that industry is a service and that profit is reward paid by public for service rendered; factors which make up any service and which must have attention of executive.

EXHAUST STEAM

UTILIZATION. Problems in the Utilization of Exhaust Steam, Chas. L. Hubbard. Power, vol. 61, no. 15, Apr. 14, 1925, pp. 568-570, 5 figs. Amount of heating influences type of engine to be used; condensing operation during summer not always advisable; bleeder turbine often most suitable prime mover.

EXPLOSIVES

COAL-MINING. Liquid Oxygen Explosive, E. W. Lewis. Colliery Eng., vol. 2, no. 13, Mar. 1925, pp. 103-104 and 138, 2 figs. Discusses its use in coal-mining industry.

MINE. The Choice of an Explosive, W. Cullen. Iron & Coal Trades Rev., vol. 90, no. 2972, Feb. 13, 1925, pp. 258-260. Notes on manufacture of explosives; discusses black powder; strength; annual consumption; British export trade; explosives for metalliferous mining. Paper read before Nat. Assn. Colliery Mgrs.

F

FEEDWATER HEATERS

LOCOMOTIVE. New Feedwater Heater for Locomotives (Nouveau réchauffeur d'eau d'alimentation pour locomotives, de l'auxiliaire des chemins de fer et de l'industrie), E. Sauvage. Société d'Encouragement pour l'Industrie Nationale—Bul., vol. 124, no. 2, Feb., 1925, pp. 135-140, 12 figs. partly on supp. plates. Details of modified design of heater constructed by Auxiliaire des Chemins de Fer et de l'Industrie and in use on Alsace-Lorraine locomotives, in which surface condensing has been replaced by mixed condensing.

FILTRATION PLANTS

CHIPPAWA, ONT., CANADA. Water Filtration Plant at Chippawa, G. G. Reid and D. H. Fleming. Can. Engr., vol. 48, no. 10, Mar. 10, 1925, pp. 285-287 and 294, 5 figs. Water flows by gravity from Chippawa Creek and is pumped through pressure filter to 75,000-gallon tank or direct to mains; two pumps have a capacity of 1,500 g.p.m. each; sewerage system also installed.

MONTREAL, CANADA. Montreal's Pumping and Filtration Plants, C. J. Desbaillets. units comprising water snpply system; cost of opeation and m9intenance Contract Rec., vol. 90, no. 99, Mas. 11, 9025, pp. 241-242. Description of and comparison between steam and electric power; new filtration plant is proposed.

FIRE PROTECTION

FACTORY. Factory Fire Protection, H. E. Barr. Am. Mach., vol. 62, no. 16, Apr. 16, 1925, pp. 627-628. Fire prevention and fire insurance; supplementing sprinkler system; various types of chemical fire extinguishers; importance of teaching their proper use and maintenance.

METHODS. Horizontal versus Vertical Fire Exits, H. E. J. Porter. Fire & Water Eng., vol. 77, no. 19, Mar. 11, 1925, pp. 455-456 and 482-485, 6 figs. Advantages of fire wall dividing a building into sections; use of party wall balcony; protecting hospital patients from fire.

FLOOD CONTROL

WINNIPEG DISTRICT, CANADA. Flood Protection of Winnipeg District, N. Barritt. Can. Engr., vol. 48, no. 14, Apr. 7, 1925, pp. 379-380, 1 fig. Report on drainage of Rosser, Lockwood and Woodland municipalities; flood protection of portions of St. James, Brooklands, Old and West Kildonan, West St. Paul municipalities, also north and west part of Winnipeg.

FLOORS

CONCRETE. Flat Slabs, M. Linenthal. Boston Soc. Civ. Engrs.—Jl., vol. 12, no. 2, Feb. 1925, pp. 79-83. Discussion of report of Joint Committee on Standard Specifications for Concrete and Reinforced Concrete.

FACTORY. Characteristics of Industrial Floors, H. K. Ferguson and B. R. Magee. Iron Age, vol. 115, no. 16, Apr. 16, 1925, pp. 1127 and 1169-1170. Factors to be considered in selecting floor; methods of preventing decay; adaptability to loads and machine weights.

FLOW OF STEAM

NOZZLES. Expansion and Compression Phenomena in Steam Jets, A. L. Mellanby. Chem. Age (Lond.), vol. 12, no. 300, Mar. 14, 1925, pp. 245-246. Account of simple experimental methods whereby losses attending flow of steam in elementary nozzles could be readily and accurately determined; shows relation between efficiency and pressure drop, or between efficiency and exit velocity. Paper read before Inst. Chem. Engrs.

FLOW OF WATER

CONDUITS. Measuring Water Flow in Conduits, D. W. Proebstel. Elec. World, vol. 85, no. 14, Apr. 4, 1925, pp. 711-712, 4 figs. Multiple pitot and piezometer tubes used; applies old principle combining simplicity, speed and accuracy; photographic readings.

SAND, THROUGH. Effect of Flowing Water on the Stability of Sand, C. M. Daily. Eng. News-Rec., vol. 94, no. 16, Apr. 16, 1925, p. 649. Experiments in filter bed and observations on dikes, cofferdams, and jetting piles for water intake at St. Louis, Mo.

SURFACE RESISTANCE OF LACQUERED PLANES. Law of Similitude for the Surface Resistance of Lacquered Planes Moving in a Straigth Line Through Water, F. Gebers. Nat. Advisory Committee for Aeronautics—Tech. Memorandums, no. 308, Apr., 1925. 75 pp., 13 figs. on supp. plates. Results of scientific research during last years of war, planned on considerably larger scale, as yet only partially carried out; experiments with tapered end sections and similar planes in cold water; magnitude of form resistance; experiments in warm water; resistance of longitudinal edges; pure surface resistance; comparison with values obtained from Froude's formula; McEntee's experiments.

FLUE GAS ANALYSIS

ORSAT APPARATUS. Modification of Orsat Apparatus, G. A. de Grafa. Power, vol. 61, no. 13, Mar. 31, 1925, p. 485, 2 figs. Apparatus is provided with fourth pipette containing water and connected by means of glass tubing of 2-mm. bore to each pipette.

FLUE GASES

LOSSES IN GAS FURNACES. Determination of Combustion-Air Volume and Chimney Losses in Gas Furnaces (Beiträge zur Ermittlung der Verbrennungsluftmenge und der Schornsteinverluste bei Gasfeuerungen), P. Hetzler. Wärme, vol. 48, no. 4, Jan. 23, 1925, pp. 39-42, 1 fig. Notes on Siegert formula and usual volumetric gas analyses; principles of new method of investigation and calculation; describes properly constructed apparatus and method for making test; evaluation of test results; formulas for excess air; calculation of heat loss through flue gases.

FLYING BOATS

ALL-METAL. An All-Metal Flying Boat. Engineer, vol. 139, no. 3613, Mar. 27, 1925, pp. 350 and 354, 6 figs. In Rohrbach-Beardmore system, duralumin is used throughout for construction of boat, no fabric being employed; structure is built up of riveted girders and plates which makes it possible to employ larger wing spans and higher powers than have hitherto been employed for flying boats of this class; boat is fitted with collapsible masts and sails.

OPERATION. The Operation of Flying Boats in the Mediterranean, C. R. Samson. Roy. Aeronautical Soc.—Jl., vol. 29, no. 171, Mar., 1925, pp. 114-126 and (discussion) 127-131. Description of flights made by author in 1921-22; analysis of results; refueling methods; pumping-out, lighting, cooking, and mooring-up arrangements; internal design of boat.

FOREMEN

EFFICIENCY REPORT FOR RATING. Efficiency Report for Rating Foremen, K. MacGrath. Mgt. & Admin., vol. 9, no. 4, Apr., 1925, pp. 371-372, 2 figs. Describes system used by Monroe Calculating Machine Corp.; reports are made up from following items which control efficiency of department; operator's efficiency; idle time, set up, repairs, scrap, house service or department labour.

FORGINGS

STEEL, MANUFACTURE OF. Processes in the Manufacture of Steel Forgings, L. H. Fry. Ry. Rev., vol. 76, no. 11, Mar. 14, 1925, pp. 515-518, 12 figs. Sidelights on manufacture of locomotive tires, locomotive forgings and rolled steel wheels. (Abstract.) Paper read before Southern & Southwest. Ry. Club.

FOUNDATIONS

STUDY OF. Some Notes on Foundations, Chas. R. Gow. Engrs.' Soc. West. Pa.—Proc., vol. 40, no. 10, Jan. 1925, pp. 339-366 and (discussion) 367-379, 7 figs. Discusses principles and theories and gives examples.

FOUNDRIES

NON-FERROUS, RESEARCH. The Scope and Progress of Non-Ferrous Foundry Research. Foundry Trade, Jl., vol. 31, no. 446, Mar. 5, 1925, pp. 195-196. Review of booklet issued by British Non-Ferrous Metals Research Assn. describing 25 investigations in progress or completed.

STANDARDIZATION IN. Standardization Work in Foundry Practice (Normungsarheiten im Giessereiwesen). Giesserei-Zeitung, vol. 22, no. 3, Feb. 1, 1925, pp. 72-75. Report of Committee on Steel Casting of German Industrial Standards Committee; determination of elongation limit; acceptance tests; strength; magnetic properties. Report of Committee on Non-Ferrous Metals.

STANDARDS, APPLICATION OF. Rules for Practical Introduction of Basic DIN Standards in Pattern Shop and Foundry (Richtlinien zur praktischen Einführung grundlegender "DI-Normen" in Modellwerkstatt und Giesserei), P. Hoffmeyer. Giesserei-Zeitung, vol. 22, no. 4, Feb. 15, 1925, pp. 89-93, 7 figs. Standardization as starting point of modern production methods; application of standards of German Industrial Standards Committee; practical examples showing economic advantages of such applications.

STEEL. Practical Experiences in the Steel Foundry (Betriebserfahrungen in der Stahlgiesserei), V. Zsak. Giesserei-Zeitung, vol. 22, no. 5, Mar. 1, 1925, pp. 113-117, 4 figs. Foundry processes; size of furnace and weight of castings; types of ladles; open-hearth-furnace and electric-steel founding.

FOUNDRY EQUIPMENT

FLASKS. A Note on Moulding Boxes, B. Shaw and Jas. Edgar. Mech. World, vol. 77, no. 1994, Mar. 20, 1925, pp. 185-186, 6 figs. Discusses important points to be taken into consideration when designing them, namely: (1) easy adaptability to most patterns; (2) rigidity and low weight in order that crane labour can be saved on all but heavy castings; (3) minimum of floor and store space required.

FUELS. *See Coal; Oil Fuel, Pulverized Coal.*

FREQUENCY CHANGERS

POWER-SYSTEM INTERCONNECTION, FOR. Use of Frequency Changers for Interconnection of Power Systems, H. R. Woodrow. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 4, Apr. 1925, pp. 354-356, 5 figs. Describes installation of frequency changers between 25- and 60-cycle systems by Brooklyn Edison Co.

FURNACES, HEATING

PULVERIZED-COAL-FIRED. Furnace Volume Comparisons, J. G. Coutant. Blast Furnace & Steel Plant, vol. 13, no. 4, Apr., 1925, pp. 156-158, 2 figs. Study of pulverized-coal-fired heating furnaces in relation to present boiler combustion chambers.

FURNACES, INDUSTRIAL

HEATING COSTS. Cost of Industrial Heating, D. J. Demorest. Chem. & Met. Eng., vol. 32, no. 9, Mar. 1925, pp. 381-382. Discusses cost of operating furnaces with various sources of heat and gives tabulation of cost figures.

RECUPERATORS. The Development of the Recuperator, E. R. Posnack. Forging—Stamping—Heat Treating, vol. 11, no. 3, Mar., 1925, pp. 81-83. Recent developments; recuperator in Europe and America; field for recuperation.

FURNACES, METALLURGICAL

COPPER-REFINERY, PULVERIZED-COAL-FIRED. Application of Pulverized Coal to Copper Refinery Furnaces, E. W. Steele. Am. Inst. Min. & Metallurgy—Trans., no. 1425-D, Mar. 1925, 10 pp., 1 fig. It is shown that pulverized coal can be used in copper-casting furnaces with same thermal efficiency as oil; saving of 15 to 20 per cent usually results when pulverized coal replaces hand firing, using same grade of coal; outlines conditions attending satisfactory use of pulverized coal.

G

GAGES

GAGING METHODS. Gaging at the Point of Manufacture, F. H. Mayoh. Machy. (N. Y.), vol. 31, no. 8, Apr. 1925, pp. 597-601, 11 figs. Gaging devices and methods; emphasizes importance of gaging work on machine during its manufacture.

LAPPING, PRECISION. Precision Lapping, Wm. E. Hoke. Machy. (N. Y.), vol. 31, no. 8, Apr., 1925, pp. 593-596, 1 fig. Lapping abrasives and methods and use of double type of lap for plane parallel surfaces.

WEAR TESTS. Gages, A Key Problem, G. K. Burgess. Soc. Automative Engrs.—Jl., vol. 16, no. 4, Apr., 1925, pp. 456-457. Laboratory wear tests and service wear tests for gages; work of Gage-Steel Committee.

GAS CLEANING

ELECTRICAL PRECIPITATION. The "Elga" Electrical Precipitation Gas-Cleaning Plant. Iron & Coal Trades Rev., vol. 110, no. 2978, Mar. 27, 1925, p. 506, 6 figs. partly on p. 507. Particulars of "Elga precipitation electric cleaning plant, manufactured by Elektr. Gasreinigungs-Gesellschaft, Kaiserslauten, Germany, which is of pipe type, i.e., precipitation electrode consists of a pipe of suitable diameter, in center of which radiation element is suspended. Operating results achieved.

GAS HOLDERS

REINFORCED CONCRETE, USE OF. Use of Reinforced Concrete in Gas Holder Tanks, J. F. Springer. Gas Age-Rec., vol. 55, nos. 7 and 13, Feb. 14 and Mar. 28, 1925, pp. 219-220 and 226; and 445-446 and 448, 3 figs. Notes on proper use of reinforced concrete.

GAS WORKS

INSTRUMENTS. The Application of Scientific Instruments to Gas Manufacture, H. A. Randall. Gas Jl., vol. 169, no. 3226, Mar. 11, 1925, pp. 607-610, 1 fig. Discusses expansion thermometers, electrical distance thermometers, optical and radiation pyrometers, automatic temperature control apparatus, dial gages, pressure and vacuum recorders, recording pressure gages for high pressures, CO_2 indicators and recorders, station meters, and recording calorimeter. Paper read before Lond. & South. District Jr. Gas Assn.

GASES

COMBUSTION, REGENERATION OF. Regeneration of Combustion Gases (Regenerierung von Verbrennungsgasen). Gas- u. Wasserfach, vol. 68, no. 6, Feb. 7, 1925, pp. 85-87. Discusses regeneration of combustion gases in producer furnaces by drawing them off by means of an air jet injector and passing them below grate of generator, making practical calculations.

COMPRESSION, INFLUENCE OF COOLING. Influence of Cooling a Gaseous Fluid Previous to Its Compression (Sur l'influence du refroidissement d'un fluide gazeux préalablement à sa compression), Geo. Patart. Académie des Sciences—Comptes rendus, vol. 180, no. 2, Jan. 12, 1925, pp. 120-122; and (abstracted translation) in Mech. Eng., vol. 47, no. 4, Apr. 1925, p. 298. Formulas for work required for compressing gas with and without precooling and compares quantities of energy consumed in each of these two cases.

GASOLINE

ETHYL. Ethyl Gasoline, Thos. Midgely, Jr. Am. Petroleum Inst.—Bul., vol. 5, no. 75, Dec. 31, 1924, pp. 136-138. Results of experiments to determine if health hazard exists in use of ethyl gasoline.

GEARS

TRANSMISSION. Hydraulic Transmission Gear, Schneider System (Das hydraulische Kolhengetriebe, System Schneider), P. Ostertag. Schweizerische Bauzeitung, vol. 85, nos. 10 and 12, Mar. 7 and 21, 1925, pp. 123-127 and 154-155, 19 figs. Design, construction and operation of Schneider piston gear, built by Swiss Locomotive & Machine Works in Winterthur, consisting of a combination of mechanic and hydraulic transmission, enabling introduction of Diesel engines on main line operation. Results of tests giving entire satisfaction.

The Problem of Speed Changes (Le problème des changements de vitesses), F. Collin. Génie Civil, vol. 86, no. 9, Feb. 28, 1925, pp. 201-207, 15 figs. Principle and operation of Constantinesco "transformer" shown at Wembley, and other types of transmissions.

GOLD

CANADA. Gold Situation in Canada. Can. Min. Jl., vol. 46, no. 13, Mar. 27, 1925, pp. 329-331. Synopsis of information available up to end of 1924.

GOLD METALLURGY

CYANIDATION. Operations at the United Eastern Mill, E. M. Bagley. Eng. & Min. Jl.-Press, vol. 119, no. 11, Mar. 14, 1925, pp. 436-439, 3 figs. Complete data, including costs, on cyaniding gold ores at plant of United Eastern Min. Co. in Oatman, Ariz.

GOLD MINING

CALIFORNIA. Gold Mining in California, E. Higgins. Min. & Metallurgy, vol. 6, no. 220, Apr. 1925, pp. 192-193. Mining costs; price of gold; new capital for development; gold-dredging operations; it is concluded that there appears little reason to expect boom of any proportion.

GRAIN ELEVATORS

FLOATING PNEUMATIC. Floating Pneumatic Grain Elevators for the Port of London. Engineer, vol. 139, no. 3611, Mar. 13, 1925, pp. 297-298 and 300, 7 figs. Describes two new grain elevators of floating pneumatic type, built by order of Port of London Authority.

GRINDING

AUTOMOBILE ENGINE PARTS. Modern Grinding Methods. Abrasive Industry, vol. 6, nos. 3 and 4, Mar. and Apr. 1925, pp. 73-77 and 110-114, 21 figs. Grinding operations involved in manufacture of Willys-Knight motors.

GRINDING MACHINES

TOOL. Universal Tool-Grinding Machine (Universal-Werkzeug- und Rundschleifmaschine), M. Coenen. Zeit. des Vereines deutscher Ingenieure, vol. 69, no. 14, Apr. 4, 1925, pp. 439-440, 16 figs. partly on supp. plate. Describe circular grinding which can be used for tools of cylindrical and conical shape, and for circular, internal and surface grinding.

GUNS

CAST-IRON, METALLURGICAL PRACTICE. Brief History of Metallurgical Practice in Cannon-making with Particular Reference to the Cast-iron Gun, J. Goostray, R. F. Harrington and M. A. Hosmer. Am. Inst. Min. & Metallurgy—Trans., no. 1420-C, Mar. 1925, 22 pp., 8 figs. Early American foundries; foundries and processes, 1840-50; Rodman's process; the Dahlgren gun; earliest 15-inch gun; Greenwood furnace and Parrott gun; improvements in bronze cannon; post-Civil War work at South Boston Iron Works: large guns at Fort Pitt foundry; defense program of United States, 1885; adoption of steel alloy for guns; modern high-power guns.

GYPSUM

MANITOBA. The Gypsum Industry in Manitoba, W. E. Armstrong. Can. Inst. Min. & Metallurgy—Bul., no. 155, Mar., 1925, pp. 298-302. Commercial uses of gypsum; process of manufacture.

H

HARDNESS

BRINELL TEST. Observations with the Brinell Ball Hardness Test (Beobachtungen bei der Kugeldruckprobe nach Brinell), M. Moser. Stahl u. Eisen, vol. 45, no. 10, Mar. 5, 1925, pp. 343-344, 8 figs. partly on supp. plate. Points out that crystallites offer different resistances to indentation of Brinell ball according to the different axes, so that an angular form of indentation can result from position of axis.

TESTERS. Hardness Testers. Mech. Eng., vol. 47, no. 4, Apr. 1925, pp. 282-284, 3 figs. Description of new hardness-testing machine operating on Brinell principle; discussion of J. O. Keller's paper on Herbert pendulum and other hardness testers, published in Mid-November issue of Journal; Coker's research work on cutting metals.

HEAT

RADIATION. Thermodynamic Bases of the Theory of Heat Radiation (Interno ai fondamenti termodinamici della teoria dell'irraggiamento termico), P. Stranco. Nuovo Cimento, vol. 1, no. 4, Oct.-Dec. 1924, pp. 345-357, 1 fig. Discusses work of Bartoli; optical basis of theory of radiation; pressure of light.

HEAT TRANSMISSION

CALCULATION. Calculation and Evaluation of Indirect Heating Surfaces (Ribbed Heating Surfaces) [Berechnung und Bewertung von indirekten Heizflächen (Rippenheizflächen)], G. Wolf. Gesundheits-Ingenieur, vol. 48, no. 8, Feb. 21, 1925, pp. 85-88, 5 figs. Most economic height of ribs, their surface temperature and efficiency; circular ribs; makes calculations.

JACKETED KETTLES. Heat Transmission in Jacketed Kettles, H. L. Olin, B. S. Southwick and H. M. Prince. Chem. & Met. Eng., vol. 32, no. 9, Mar., 1925, pp. 370-372, 2 figs. Comparative study of overall coefficients of heat transmission in cast-iron, lead-lined and copper steam-jacketed kettles.

HEATING

Gymnasiums. Institutional Gymnasium Heating, A. J. Offner. Heat. & Vent. Mag., vol. 22, no. 4, Apr. 1925, pp. 51-54, 5 figs. Describes novel methods used in design for Men's Gymnasium, Bloomingdale Hospital, White Plains, N.Y.; building is heated by a vacuum steam heating system.

Heat Losses in. Methods of Figuring out Heat Losses and Replacing by Radiation, F. E. Dixon. Domestic Eng. (Lond.), vol. 45, no. 3, Mar., 1925, pp. 63-66. Discusses method of working out heat losses and methods of replacing heat losses by radiation.

Systems and Apparatus. Heating Systems and Apparatus. Abridgments of Specifications, Period 1916-20, Class 64 (ii), 1924, 100 pp. Patents for inventions such as radiators and systems for heating buildings, ships, and vehicles; temperature regulating apparatus; etc.

HEATING AND VENTILATING

Buildings, Industrial. Improvements in Heating and Ventilating Industrial Buildings (Perfectionnements apportés au chauffage et à la ventilation des bâtiments industriels), E. Casedamont. Technique Moderne, vol. 17, no. 3, Feb. 1, 1925, pp. 83-85, 10 figs. Discusses various systems of atomizers for humidifying air and assuring rational heating and ventilating.

Codes. A State Code and Its Preparation, R. A. Small. Heat. & Vent. Mag., vol. 22, nos. 3 and 4, Mar. and Apr., 1925, pp. 63-65 and 71, and 56-57. Notes on questions and problems which arose in development of Wisconsin heating and ventilating code and working rules supplement and how they were handled.

Germany. Present State of German Heating and Ventilating Industry (Die Stellung der Heizungsund Lüftungs-Industrie), G. Dieterich. Gesundheits-Ingenieur, vol. 48, no. 11, Mar. 14, 1925, pp. 121-128. Discusses position of German industries, resources in capial and labour, production and consumption of fuels, and place taken by heating and ventilation.

HEATING, GAS

Central. Present Attitude of Central Heating Engineers Towards Gas Heating (Die heutige Stellung des Zentralbeizungsfachmannes zur Gasbeizung), W. Vocke. Gesundheits-Ingenieur, vol. 48, no. 7, Feb. 14, 1925, pp. 78-81, 3 figs. Gas-fired and coke-fired central heating plants; advantages of gas heating; comparison of gas and steam heating, with cost data.

HEATING, HOT-AIR

Furnace-Rating Formulas. Application of Furnace Rating Formula, V. S. Day. Sheet Metal Worker, vol. 16, no. 3, Mar. 13, 1925, pp. 86. Explains rating formula for warm-air heaters developed at Univ. of Ill., and shows application to a few actual heaters on which measurements have been made.

Textile Mills. Heating Systems for Textile Mills, C. L. Hubbard. Textile Wld., vol. 67, no. 10, Mar. 7, 1925, pp. 87, 89, 91 and 97-98, 13 figs. Methods of improving existing systems of hot-blast heating; suggestions for new installations; return ducts for air recirculation in cold weather; temperature regulation; possible savings in fuel; direct systems of heating; adaptability of unit heater.

HEATING, HOT-WATER

Water Circulation, Acceleration of. Hot-Water Heating With Accelerated Circulation (Warmwasserbeizung mit beschleunigtem Umlauf), M. Wierz. Gesundheits-Ingenieur, vol. 48, no. 1, Jan. 3, 1925, pp. 13-18, 8 figs. Describes apparatus by Rietschel & Henneberg for accelerating water circulation in gravity heating and experiments as to effect of bubble formation or emulsion in cast-iron boilers.

HEATING, HOUSE

Designing. Designing and Planning for Home Heating Economies, D. K. Boyd. Am. Soc. Heat. & Vent. Engrs.—Jl., vol. 31, no. 3, Mar., 1925, pp. 159-166. Need of conservation of fuel. Size and height of flues; location and construction of chimneys; location of coal bins; removal of ashes; making walls, roofs and openings tight.

Gas. Use of Gas for Heating Houses (Die Verwendung von Gas für Beheizung von Gebäuderäumen), H. Strache. Gesundheits-Ingenieur, vol. 48, no. 7, Feb. 14, 1925, pp. 73-78, 15 figs. Advantages of gas for heating; conditions for properly constructed gas heaters; types of gas heating and heaters.

Radiation-Requirements Calculation. Calculating Radiation Requirements of Residences. Heat. & Vent. Mag., vol. 22, no. 3, Mar., 1925, pp. 66-71, 8 figs. How Willard and Lichty heat-transmission formula may be applied to a variety of building constructions in common use.

HEATING, STEAM

Boiler-Setting. Practical Setting of Steam and Hot Water Heating Boilers, T. N. Thomson. Plumbers' Trade Jl., vol. 78, no. 6, Mar. 15, 1925, pp. 544 and 546, 5 figs. Proper methods to employ in Locating, setting and cementing boilers to avoid future trouble.

HELIUM

Airships, Value to. Helium and Its Value for Airships, P. W. Litchfield. Aviation, vol. 18, no. 10, Mar. 9, 1925, pp. 272-273. How helium is produced; the helium conservation bill; possibilities of rigid airships; America's advantageous position; international status of airships.

HOBS

Relieving Spiral-Fluted. Relieving Spiral-Fluted Hobs, G. D. Hutchings. Machy. (N.Y.), vol. 31, no. 8, Apr., 1925, p. 619, 1 fig. In relieving hobs of more than one thread, it is necessary either to advance or retard relieving attachment when indexing hob from one thread to another, in order to maintain same relation between relieving tool and all hob teeth; this correction may be made by disconnecting gearing between work and relieving attachment; advancing or turning back gears of attachment the required amount, and then reconnecting gears.

HOUSES

Concrete Slab Construction. House Building Methods in Holland. Concrete & Constr. Eng., vol. 20, no. 3, Mar. 1925, pp. 123-132, 15 figs. Concrete houses built of large slabs; the Occiden, Hunkemoller, and Korrelbeton systems.

HYDRAULIC TURBINES

High-Specific-Speed. High-Specific-Speed Hydraulic Turbines. Mech. Eng., vol. 47, no. 4, Apr., 1925, pp. 285-287. Review of symposium of six papers presented at session of Power Division of Am. Soc. Civ. Engrs.; deals particularly with their bearing on proportioning of number of units in low-head hydroelectric plants.

High-Speed. Comparison of Characteristics of Types of Modern High-Speed Turbines (Vergleich der mannigfachen Charakteristiken verschiedener Typen moderner Schnelläuferturbinen), W. Zuppinger. Schweizerische Bauzeitung, vol. 85, nos. 5 and 6, Jan. 31 and Feb. 7, 1925, pp. 55-59 and 75-79, 29 figs. Discusses also low-pressure turbines; compares profiles of runners and their dependence on head; number of blades; bucket wheels and propeller wheels; guide wheels and water supply; etc.

Standard Specifications. A Change in Hydraulic-Turbine Guarantees Needed, J. S. Carpenter. Power, vol. 61, no. 15, Apr. 14, 1925, pp. 575-576. Outstanding points which should be incorporated into standard specification, so that both customer and builder may be protected from unjust expectations and subsequent recriminations.

HYDROELECTRIC PLANTS

Austria. Inauguration of Lake Forst Power Plant in Carinthia (Zur Eröffnung des Forstsee-Praftwerkes in Kärnten). Elektrotechnik u. Maschinenbau, vol. 43, no. 9, Mar. 1, 1925, pp. 149-151, 3 figs. Particulars of equipment of Forst plant; 435-m. and 370-m. pressure pipe lines of 1200-mm. inside diameter; three units of 2700-hp., a. c. generators, 20,000-volt lines.

Island Falls, Canada. Hydro Plant on the Abitibi River. Contract Rec., vol. 39, no. 13, Apr. 1, 1925, pp. 306-312, 18 figs. Two 12,000-hp. generating units have been installed for Hollinger Gold Mines, Ltd., in station at Island Falls, with provision for four units; description of plant and its appurtenances.

La Gabelle, Quebec, Canada. Hydro-Electric Plant at La Gabelle, P.Q. Contract Rec., vol. 39, no. 12, Mar. 25, 1925, pp. 282-285, 10 figs. Particulars of 120,000-hp. power development recently completed on St. Maurice river for Shawinigan Water & Power Co.

New Zealand. The Mangahao Hydro-Electric Scheme. Engineer, vol. 139, no. 3610, Mar. 6, 1925, pp. 266-268, 7 figs. Details of hydro-electric station being constructed on Mangahao River, New Zealand; construction of dams; reservoir will hold 525,000,000 gal. of water and length of lake formed will be about 1¾ miles; station equipment consists of 5 main generators, each driven by waterwheel of Pelton type; details of switchgear, transmission line, etc.

Quinze River, Canada. Quinze River Hydro-Power Development. Can. Engr., vol. 48, no. 12, Mar. 24, 1925, pp. 333-337, 9 figs. Describes plant built by Northern Canada Power, Ltd., to supply Porcupine mining district with power; two 10,000-hp. units installed have initial capacity of 20,000 hp.; structures designed for ultimate capacity of 60,000 hp. at 900-ft. head.

Ringwood, England. The Ringwood Hydro-Electric Station. Elec. Rev., vol. 96, no. 2465, Feb. 20, 1925, pp. 284-285, 6 figs. Particulars of plant utilizing low-head waterfall on the Avon; working on only 4 ft. of water.

Stave Falls, B.C., Canada. Large Power Development, Stave Falls. Can. Engr., vol. 48, no. 13, Mar. 31, 1925, pp. 359-364, 7 figs. Further details of hydro-electric development being undertaken by British Columbia Elec. Ry. Co., Ltd.

Switzerland. The Projected Oberhasli Power Plant (Die projektierten Kraftwerke Oberhasli der "bernischen Kraftwerke" A.-G.). Schweizerische Bauzeitung, vol. 85, nos. 2 and 3, Jan. 10 and 17, 1925, pp. 13-14 and 28-33, 13 figs. Details of power plants in course of construction at Boden, Innertkirchen, Nessenthal and Handeck; barrage work, water storage and pressure conduits; cost data.

HYSTERESIS

Control Field in Magnetic. The Control Field in Magnetic Hysteresis, Rob. C. Gray. Roy. Soc. Edinburgh—Proc., vol. 44, part 1, 1924, pp. 84-87. Shows that various control fields exerted by atom on its Weber element are not all equal; after demagnetization by reversals, element is under control of strongest atomic field; hence initial susceptibility is greater after heat treatment of specimen than after subsequent demagnetization by process of reversals.

I

ICE PLANTS

Diesel Engines in. Dependability Important for Diesel Power in Ice Plants, R. H. Bacon. Ice & Refrigeration, vol. 68, no. 3, Mar., 1925, pp. 224-225, 1 fig. Factors influencing Diesel engine dependability in a general way; development of two-cycle solid-injection type; arrangements provided for pumping fuel to injection nozzle.

Oil Engines in Ice Plants, G. H. Corlette. Refrig. Wld., vol. 59, no. 2, Mar. 1925, pp. 9-13 and 26, 2 figs. Comparison of costs of Diesel oil engines with other prime movers in ice-plant service.

Raw-Water. Air Treatment for Raw Water Ice, A. H. Baer. Refrig. Eng., vol. 11, no. 9, Mar. 1925, pp. 330-338, 17 figs. Author believes that use of low-pressure air treated by recirculation, location of air tube near center of ice block and its removal at dump during thawing is marked improvement over any of other methods indicated.

ICE MANUFACTURE

Raw-Water Ice. Discussion of Raw Water Ice Making Methods, W. H. Aubrey. Ice & Refrigeration, vol. 68, no. 4, Apr. 1925, pp. 344-349, 8 figs. Makes comparison of systems with which author has come in contact; methods change almost yearly. Paper read before Va. Ice Mfrs. Assn.

IMPACT TESTING

Notched-Bar Tests. A New Method of Interpreting Notched Bar Impact Test Results, M. Moser. Am. Soc. Steel Treating—Trans., vol. 7, no. 3, Mar. 1925, pp. 297-320, 21 figs. Not only area of cross section at notch is used in computing results of impact of pendulum, but also considerable volume of metal surrounding notch; this affected volume absorbs certain portion of impact energy; presents illustrations showing effect of impact on area surrounding notch; also tables and curves discussing problem.

INDICATORS

Optical. An Improved Model of Optical Indicator, W. J. Stern and H. Moss. Aeronautical Research Committee (Great Britain), Reports & Memoranda, no. 925, Oct. 1924, 15 pp., 12 figs. on supp. plates. Possesses the great advantage over other forms of indicator in that diagram can be viewed as a whole and action within cylinder examined at any moment or continuously without necessarily taking records. Describes improved instrument as used at Air Ministry Laboratory on a 40-hp. single-cylinder Benz engine.

INDUSTRIAL MANAGEMENT

Market Analysis. How Many People Will Buy the Product You Have to Sell? R. G. E. Ullman. Mgt. & Admin., vol. 9, no. 4, Apr. 1925, pp. 361-362. Possibilities in study of market; points out that market analysis provides sound foundation of facts which removes many usual business risks.

Motion Study. *See Motion Study.*

Planning System. A Planning Department System, A. B. Graham. Machy. (Lond.), vol. 26, no. 653, Apr. 2, 1925, pp. 12-16, 11 figs. Describes system employed in circumstances where components to be dealt with are very varied and output of various parts is comparatively small; it will probably be of interest to people who are engaged on intensely specialized manufactures, but whose products are of more general nature.

Production Control. Controlled Production of Knit Goods, H. C. Gates. Mgt. & Admin., vol. 9, no. 4, Apr. 1925, pp. 343-346, 7 figs. Methods used by company producing 5000 manufacturing units; functions of planning department.

Production Control, Geo. D. Babcock. Mech. Eng., vol. 47, no. 4, Apr. 1925, pp. 243-248, 3 figs. Outline of subject of production control in manufacturing, taking up for consideration, respectively, actual output with given equipment, preplanning, establishment of manufacturing programs, determination of lot sizes, establishment of production schedule, operation analysis, stores systems, dispatching of work, inspection, maintenance and forms. (Abridged.)

INDUSTRIAL RELATIONS

RAILWAYS. Personnel Administration. New York R. R. Club—Official Proc., vol. 35, no. 4, Feb. 20, 1925, pp. 7572-7593. Contains following contributions: Points of Real Significance to Executives in Their Attitude Toward Labor Relations Problems, H. C. Metcalf; Personnel Relations and Employee Representation on the Pennsylvania System, C. W. Garrett; Univ. of Action, H. Robbins; Citizenship of Industry—Standard Organized Labor Movement One of the Best Agencies for Improving Morale, O. S. Beyer, Jr.; etc.

INJECTORS

TOOLING METHODS. Special Tooling on Railroad Injector Work, S. L. Kneass. Am. Mach., vol. 62, no. 13, Mar. 26, 1925, pp. 499-501, 9 figs. Methods devised for manufacturing injectors and injector parts on economical basis; utilizing standard machine tools by means of special tools and fixtures.

INSPECTION

FACTORY. How They Took the Five Steps to Successful Inspection, W. E. Irish. Factory, vol. 34, no. 3, Mar. 1925, pp. 417-419, 494, 496 and 498. Eastern factory's experience in reconciling quality with quantity production.

INSULATORS, ELECTRIC

SUSPENSION. The Development of a Suspension-Type Insulator. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 4, Apr. 1925, pp. 412-418, 8 figs. Discussion of paper by H. B. Smith.

INTERNAL-COMBUSTION ENGINES

LIQUID FUELS, USE OF. Using Liquid Fuel in Internal-Combustion Engines (L'utilisation des combustibles liquides dans les moteurs à combustion interne), S. Golczewski. Génie Civil, vol. 86, no. 7, Feb. 14, 1925, pp. 163-165, 2 figs. Discusses distillation products of oil, coal and lignite; process and conditions of proper combustion in Diesel engines.

MECHANICAL EFFICIENCY. The Mechanical Efficiency of an Internal Combustion Engine, H. Moss and W. J. Stern. Automobile Engr., vol. 15, no. 200, Mar. 1925, pp. 78-82, 10 figs. Account of research work conducted at (British) Air Ministry laboratory; tests carried out on Benz single-cylinder engine to determine (1) whether there was any appreciable difference in sliding friction when engine was motored and when under power, (2) whether this was balanced by difference in pumping losses, (3) resultant error, if any, in assumption that addition of brake and motoring powers gave indicated power.

See also Airplane Engines; Automobile Engines; Diesel Engines; Oil Engines.

IRON

CORROSION. Causes and Controlling Factors in the Corrosion of Iron and Steels, W. P. Wood. Am. Soc. Steel Treating—Trans., vol. 7, no. 3, Mar. 1925, pp. 321-336, 2 figs. Discusses importance of corrosion and early interest in its phenomena; compares acid and electrolytic theories and reviews work leading up to substantiation of latter; points out that fundamental reactions in corrosion are fairly simple, variations observed being largely due to variations in attendant conditions; emphasizes inaccuracy of acid tests; controlling factors of corrosion, their effects and importance.

IRON ALLOYS

IRON-CARBON. Secondary Crystallization in Iron-Carbon Alloys, V. N. Krivobok. Am. Soc. Steel Treating—Trans., vol. 7, no. 4, Apr. 1925, pp. 457-485, 29 figs. Deals with question of cast-steel structures and describes two extreme types of such structures; traces genesis of formation of these types back to zone of its origin and formation and discusses them in terms of iron-carbon diagram.

IRON AND STEEL

CHEMISTRY OF. The Chemistry of Iron and Steel, F. T. Sisco. Am. Soc. Steel Treating—Trans., vol. 7, no. 3, Mar. 1925, pp. 363-378. Chemistry of blast furnace and manufacture of iron; reduction of manganese oxide to manganese, phosphates to phosphorus, silica to silicon, and sulphides to sulphur; factors influencing condition of carbon; chemistry of Bessemer process; oxidation of silica and manganese, and of carbon; reactions in deoxidation and recarburization.

The Chemistry of Iron and Steel, F. T. Sisco. Am. Soc. Steel Treating—Trans., vol. 7, no. 4, Apr. 1925, pp. 494-517. Chemistry of basic open hearth; elimination of silicon and manganese; oxidation and removal of phosphorus; oxidation of carbon; removal of sulphur; reactions in recarburizing and deoxidizing; basic open-hearth slags. Chemistry of acid open-hearth and acid electric process; reactions in melting and oxidizing, and in deoxidizing. Comparison of chemistry of basic and acid open-hearth processes. Chemistry of basic electric process.

COLD DRAWING, EFFECT OF. Effects of Cold Drawing on Some Properties of Steel and Iron, R. M. Brown. Iron & Coal Trades Rev., vol. 90, no. 2973, Feb. 20, 1925, pp. 302-303. Describes experiments on single-stage reduction; effects on modulus of elasticity in tension, limit of proportionality, hysteresis, ultimate strength, ductility, etc. Paper read before Instn. Engrs. & Shipbldrs. in Scotland.

IRON CASTINGS

DEFECTIVE, ANALYSIS OF. An Analysis of Defective Castings, E. Longden. Foundry Trade Jl., vol. 31, nos. 446 and 447, Mar. 5 and 12, 1925, pp. 208-210 and 229-232, 26 figs. Notes on cavities and porosity due to gases, and due to loose sand, slag or sullage; scabbing of molds and cores; contusion of mold and core joints; escape of metal from mold; displacement and misplacement of cores; lap or crossed joints; faulty repair of cores and molds; failure in construction of mold; unsuitable metal; examples of defects. Remarks are confined to gray cast iron.

GRAY, LIQUID SHRINKAGE. Some Consideration on Liquid Shrinkage in Grey Iron, J. Longden. Foundry Trade Jl., vol. 31, no. 447, Mar. 12, 1925, pp. 219-225, 27 figs. Describes experiments from which it is concluded that gray iron shrinks round about 4.5 per cent of its liquid volume on crystallizing; quick cooling does not reduce rate of liquid shrinkage; slow pouring does not reduce rate of liquid shrinkage, but may alter its distribution throughout casting; etc. Bibliography.

IRON DEPOSITS

CANADA. Some Geological Conditions Controlling the Formation of Iron Deposits in Canada, E. S. Moore. Can. Inst. Min. & Metallurgy—Bul., no. 155, Mar. 1925, pp. 209-219. Study of such deposits reveals fact that number of distinct types are producing large tonnages of ore; these types may be classified according to origin and occurrence as follows: bedded sedimentary deposits, contact metamorphic deposits, residual ores, lenses in metamorphic rocks and in some cases of uncertain origin; influence of glaciation; possibilities of finding large iron-ore deposits in Canada.

L

LABORATORIES

HYDRAULIC. Scientific and Economic Importance of Hydraulic Experiments (Wissenschaftliche und wirtschaftliche Bedeutung des wasserbaulichen Versuchs), E. Meyer-Peter. Schweizerische Bauzeitung, vol. 86, no. 1, Jan. 3, 1925, pp. 1-4. Discusses necessity for hydraulic experimenting, and work to be done by hydraulic laboratories.

LATHES

CENTER. New 12½-inch Center Lathe with All-geared Head. Machy. (Lond.), vol. 26, no. 653, Apr. 2, 1925, pp. 24-25, 3 figs. Latest lathe produced by Geo. Swift & Sons, Halifax has bed 16 ft. long which enables 10 ft. 3 in. to be turned between centers.

LIGHTING

STANDARDS. Some Problems in the Definition and Measurement of Illumination, J. Frith. Illuminating Engr., vol. 17, nos. 10-12, Oct.-Dec. 1924, pp. 156-159, 3 figs. Discusses physical and physiological aspects of illumination; difficulties in setting up standards; care required in definition of units like lumen.

STREET. Columbus (O.) Street-Lighting Survey. Elec. World, vol. 85, no. 12, Mar. 21, 1925, pp. 607-611, 3 figs. Scope of investigating committee's report based on watts per linear foot, determining illumination requirements of city after 2 years' study of specimen lighting standards.

Essentials of Good Street Lighting, L. B. W. Jolley. World Power, vol. 3, no. 15, Mar. 1925, pp. 143-152, 16 figs. Deals with electric and ga lighting.

LOCOMOTIVES

COALING STATIONS. Norfolk & Western Coaling Stations is of Unusual Design. Ry. Age, vol. 78, no. 20, Apr. 18, 1925, pp. 995-996, 3 figs. Built entirely of cast-in-place reinforced concrete from foundation to peak of roof which is 135 ft. above base of rail of coaling tracks; main feature is elevated circular reinforced-concrete storage bin with capacity of 2000 tons of bituminous coal arranged to deliver coal simultaneously to locomotives on six tracks.

ELECTRIC. *See Electric Locomotives.*

DIESEL, HYDRAULIC TRANSMISSION FOR. Hydraulic Transmission for Diesel Locomotives. Ry. Mech. Engr., vol. 99, no. 3, Mar. 1925, pp. 151-152, 3 figs. Lentz-type transmission on switching unit provides three speeds forward and reverse.

FAIRLIE. "Modified Fairlie" Locomotive, South African Government Railways. Ry. Gaz., vol. 42, no. 9, Feb. 27, 1925, pp. 260-261, 2 figs. Articulated locomotive of improved Fairlie type, having much larger boiler with wider grate, and accessibility of boiler for removal or repair.

FIREBOXES. Water Tube Firebox, W. L. Bran. New York R. R. Club—Official Proc., vol. 35, no. 3, Jan. 16, 1925, pp. 7550-7555, 5 figs. Describes firebox of McClellon type.

FIRELESS. The Loading of Fireless Locomotives (Die Füllung feuerloser Lokomotiven), Wichtendahl. Hanomag Nachrichten, vol. 12, no. 136, Feb. 1925, pp. 17-30, 19 figs. Theory, design, technical data and formulas for calculation of fireless locomotives, as built by "Hanomag" works in Hannover, Germany.

FUEL-OIL FACILITIES. Facilities for Fuel Oil for Locomotives. Ry. & Locomotive Eng., vol. 38, no. 4, Apr. 1925, pp. 114-117. Report of Subcommittee on Shops and Locomotive Terminals presented to Am. Ry. Eng. Assn.

HIGH-PRESSURE COMPOUND. High-Pressure Compound 2-8-0 Type Locomotive. Engineering, vol. 119, no. 3091, Mar. 27, 1925, pp. 381-382, 8 figs. on supp. plates. Details of Horatio Allen, No. 1400, of Delaware & Hudson Co.

INCREASED HORSEPOWER OUTPUT. Increased Horsepower Output, W. E. Woodward. New York R. R. Club—Official Proc., vol. 35, no. 3, Jan. 16, 1925, pp. 7544-7547. In author's vision, locomotive of near future is one which high boiler pressure, cylinders capable of developing 3000 to 3500 hp., with boiler and firebox capable of producing adequate amount of steam for cylinders in economical manner.

INTERCHANGEABLE PARTS. New Locomotives for Bombay Baroda & Central India Railways. Ry. Rev., vol. 76, no. 15, Apr. 11, 1925, pp. 689-692, 5 figs. Pacific-type passenger and Mikado freight engines, built by Kitson & Co., Leeds, Eng., so designed as to provide for interchangeability of like or similar parts in so far as is possible.

MOUNTAIN TYPE. New "Mountain" (4-8-2) Type Locomotive for the Paris, Lyons & Mediterranean Railway. Ry. Gaz., vol. 42, no. 14, Apr. 3, 1925, pp. 466-467, 2 figs. Locomotives of exceptional size and power are being built for service on heavily graded sections of main line.

PACIFIC TYPE. C. I. & W. R. R. Pacific Type Passenger Locomotives. Ry. Rev., vol. 76, no. 13, Mar. 28, 1925, pp. 599-603, 4 figs. New locomotives placed in operation by Cincinnati Indianapolis & West. R. R., constructed in Brooks works of Am. Locomotive Co.

RACK. Rack Locomotives on the Chilian Transandine Railway, W. T. Lucy. Ry. Gaz., vol. 42, no. 15, Apr. 10, 1925, p. 498. Abstract of communication to Instn. Civ. Engrs. constituting addenda to paper written in 1914, dealing with operation on railway and locomotives employed thereon; tells how alterations mentioned have stood test of time under conditions of increased severity, and notes on recent developments.

STEAM-TURBINE. Ramsay Condensing Turbo-Electric Locomotive, Geo. F. Jones and T. L. Hale. Mech. Eng., vol. 47, no. 4, Apr. 1925, pp. 235-239, 11 figs. Description of locomotive; design of condensing plant; control of power and speed regulation; shop and main-line testing. See Discussion of Papers on Turbo-Locomotives, pp. 240-242, 1 fig.

SWITCHING. Unique Front End Arrangement on Powerful M.-K.-T. Switcher. Ry. Age, vol. 78, no. 20, Apr. 18, 1925, pp. 981-983, 5 figs. Dry pipe and branch pipes on outside of boiler; smokebox air-tight; tractive force, 60,000 lbs.

TANK. 2-6-4 Tank Locomotives for the Metropolitan Railway. Ry. Gaz., vol. 42, no. 11, Mar. 13, 1925, pp. 355-357, 4 figs. Particulars of locomotives supplied by G. C. Armstrong Disposal Corp. for hauling freight traffic.

THREE-CYLINDER. First Three-Cylinder 2-6-0 Locomotives Built at Darlington. Ry. Gaz., vol. 42, no. 13, Mar. 27, 1925, pp. 436-437, 3 figs. Example of how railway grouping allows of wider work distribution.

Return of Three Cylinders, Jas. Partington. New York R. R. Club—Official Proc., vol. 35, no. 3, Jan. 16, 1925, pp. 7548-7549. Dynamic augment reduced with economy and efficiency in train haul.

Southern Pacific's New 4-10-2 Type Three Cylinder Locomotive. Ry. & Locomotive Eng., vol. 38, no. 3, Mar. 192, 5pp.70-71, 2 figs. Details of locomotives to be used in passenger and freight service over Sierra Nevada mountains.

TWO-CYLINDER. Broad Gage Locomotives for India, E. C. Poultney. Ry. Mech. Engr., vol. 99, no. 3, Mar. 1925, pp. 142-144, 3 figs. Examples of new types recently supplied to Bombay, Baroda and Central India for heavy traffic on broad-gage section of that system; largest and most powerful 2-cylinder types ever built for service in India.

VALVE SETTING. British Methods of Setting Locomotive Valves, F. Norman. Ry. Mech. Engr., vol. 99, no. 3, Mar. 1925, pp. 99, no. 3, Mar. 1925, pp. 163-164, 4 figs. Describes practice of setting valves, adopted by large locomotive works in England; method of setting piston valves with internal admission; setting D-type valve.

LUBRICANTS

GREASE AND GRAPHITE. Solid and Semi-Solid Lubricants (Les lubrifiants solides et demi-solides), J. Lévy. Technique Moderne, vol. 17, no. 2, Jan. 15, 1925, pp. 40-46, 9 figs. Discusses application and uses of greases and graphite.

LUMBER

MILLS, ELECTRICITY IN. Electricity in a Modern Lumber Project, F. R. Innes. Elec. World, vol. 85, nos. 3, 4 and 6, Jan. 17, 24 and Feb. 7, 1925, pp. 137-140, 198-202 and 297-301, 26 figs. Completely electrified plant and logging operations require 18,000-kw. poweri nstallation; first mill unit cut shalf million board-feet per shift; general plan of Long-Bell Lumber Co.'s mill at Longview, Wash. Jan. 24: Primary distribution and substations. Feb. 7: Interior illumination.

M

MACHINE SHOPS

COST ESTIMATING IN. How to Estimate Machine Shop Costs, A. A. Dowd. Am. Mach., vol. 62, nos. 2, 5, 7, 10, 14 and 16, Jan. 8, 29, Feb. 12, Mar. 5, Apr. 2 and 16, 1925, pp. 59-62, 199-202, 273-276, 395-398, 543-545 and 617-620, 27 figs. Jan. 8: Estimating tool costs; examples of forms; methods of handling tool work. Jan. 29: Time estimates for turret-lathe tools and fixtures; estimating costs of making cutting tools; records and forms for estimating. Feb. 12: Importance of shop equipment; maintenance a factor in overhead figures. Mar. 5: Estimating special machinery; sample estimate sheets; setting-up time, assembly, test and their bearing on final figure. Apr. 2: Problem of job-work estimating; equipment, tools, shop facilities and methods as controlling factors; illustrated methods approach to set cost figures. Apr. 16: Estimation of drafting costs; examples of flat-rate estimates; contingency per-cent allowance.

MACHINE-TOOL INDUSTRY

AMERICAN PRODUCTION METHODS. New Methods for Successful Production (Neue Wege zum Fabrikationserfolg), Geo. Schlesinger. Zeit. des Vereines deutscher Ingenieure, vol. 69, nos. 8 and 11, Feb. 21 and Mar. 14, 1925, pp. 197-206 and 346-348, 39 figs. Design and production of standard machine tools; special machines; workshops for production of machine tools; standardization; use of machine tools; fundamentals governing efficiency; handling equipment; labor problems; problems of training. Results of author's impression in America.

MACHINE TOOLS

CUTTING-SPEED CONTROL. Direct Control of Cutting Speeds. Am. Mach., vol. 62, no. 13, Mar. 26, 1925, p. 501, 9 figs. Recent machines built by Siemens-Schuckert Works, Germany, have motor fitted in pedestal of machine, to get motor of way and to protect it from damage; special feature is use of cutting-speed indicator that controls speed of motor.

DESIGN. The Chicago Machine-Tool Meeting. Mech. Eng., vol. 47, no. 4, Apr. 1925, pp. 306-308. Review of discussion at session of Chicago Section of A. S. M. E., dealing with following subjects: Trend of machine-tool design from user's standpoint; characteristics required in machine tools for intensive production; interchangeability of repair parts; die-cast vs. machine parts; heavy general-purpose milling machines; planers; flat-surface grinding machines; etc.

LAYOUT, MAINTENANCE AND OPERATION. What Users Want in Machine Tools, Rob. R. Keith. Iron Trade Rev., vol. 76, no. 14, Apr. 2, 1925, pp. 878-879, 2 figs. Experience in manufacture of tractors brings to light difficulties in layout, maintenance and operation of machines; faulty lubrication, repair parts that do not fit, inadequate bearings, etc., cause trouble. (Abstract.) Paper read before Chicago Section A. S. M. E.

SPECIAL, FOR CASH REGISTERS. Drilling Parts for Cash Registers, L. S. Love. Iron Age, vol. 115, no. 16, Apr. 16, 1925, pp. 1113-1117, 10 figs. National Cash Register Co. plant has developed combinations of operations and special machines to save labor; universal engraving machine, its uses and operation.

T-SLOT STANDARDIZATION. Standard T-Slots—Discussion, C. B. Hughes. Am. Mach., vol. 62, no. 13, Mar. 26, 1925, p. 490. Based on announcement of committee appointed to look into matter of standardization, author offers suggestions.

MACHINING METHODS

ELECTRIC WASHERS. Electric Washer Production Methods. Iron Age, vol. 115, no. 12, Mar. 19, 1925, pp. 819-822, 6 figs. Methods and equipment used in manufacture of electric washing machines; machining operations are progressive; progressive method applied also to assembly; conveyors take washers to painting booths.

MAGNETOS

AIRCRAFT ENGINES. The Scintilla Magneto for Aircraft Engines. Aviation, vol. 18, no. 11, Mar. 16, 1925, pp. 294-295, 3 figs. Magneto adopted by U. S. Navy has unusual design features making it particularly rugged and adaptable to aircraft use.

MATERIALS HANDLING

INSTALLATIONS. 21 Material-Handling Installations Which Have Saved Money, Geo. E. Hagemann. Mgt. & Admin., vol. 9, no. 4, Apr. 1925, pp. 357-359. Data on trucks, tractors and cupola chargers.

RUBBER-TIRE PLANT. Selecting Material Handling Methods for Economical Production, G. L. Montgomery. Chem. & Met. Eng., vol. 32, no. 10, Apr. 1925, pp. 427-431, 9 figs. How Dunlop Tire & Rubber Corp. devised handling system that gives highly satisfactory results.

MEASUREMENTS

LENGTH. Measurement of Dimensions and Checking of Forms (La mesure industrielle des dimensions et la vérification des formes), H. Stroh. Génie Civil, vol. 86, no. 10, Mar. 7, 1925, pp. 230-234, 12 figs. Application of length measure for precision measuring of cones, conic plugs, etc.; screw threads; checking by optical projection.

METAL WORKING

STAMPING. Metal Stamping and Some of Its Form, H. Jay. Forging—Stamping—Heat Treating, vol. 11, nos. 2 and 3, Feb. and Mar. 1925, pp. 46-48 and 90-94, 22 figs. Uniformity in shape and design, rapid rate of production, comparatively low cost and elimination of machine work are among advantages of metal stampings.

METALLOGRAPHY

POLISHING SPECIMENS FOR EXAMINATION. Polishing of Iron and Steel Specimens for Metallographic Examination, C. O. Burgess and J. R. Vilella. Am. Soc. Steel Treating—Trans., vol. 7, no. 4, Apr. 1925, pp. 486-493, 5 figs. Study of polishing of metallographic iron and steel specimens; presents definite methods of procedure in preparation of specimens so as to eliminate possibility of error arising in examination of poorly prepared specimens; discusses technique and proper preparation of metallographic specimens; photomicrographs showing results of each polishing operation.

METALLURGY

RESEARCH. Metallurgical Research in England, W. Rosenhain. Iron Age, vol. 115, nos. 14 and 15, Apr. 2 and 16, 1925, pp. 975-978 and 1914; and 1129-1131, 11 figs. Buildings and equipment of National Physical Laboratory; some of the work done in metallurgy; recent researches. Experimental foundry and small rolling mill aid research; investigations in progress.

METALS

ABRASION. Some Experiments on the Abrasion of Metals, Kôtarô Honda and Ryônosuke Yamada. Inst. Metals—advance paper, no. 10, for mtg. Mar. 11-12, 1925, 20 pp., 12 figs. Amount of wear under different frictional horsepower and under different coefficients of friction was measured with respect to soft metals and carbon steels; amount of wear is proportional to frictional horsepower, provided that coefficient of friction is constant; amount of wear under constant frictional horsepower increases with coefficient of friction.

CORROSION. Surface Abrasion as a Potential Cause of Localized Corrosion, U. R. Evans. Inst. Metals—advance paper, no. 7, for mtg., Mar. 11-12 1925, 17 pp., 1 fig. Experiments carried out to ascertain whether electric currents set up by local abrasion of surface layers on metals is capable of causing serious localized corrosion; conclusion reached represents compromise between "corrosionist" and "erosionist" views; effect of localized removal of high-temperature oxide films has been studied, and currents produced between two electrodes of same metal (one greasy, one ungreasy) have been measured.

ELASTIC LIMIT AND ELONGATION. The Significance of the Elastic Limit, Elongation and Impact Strength in Construction, P. Ludwik. Metallurgist (supp. to Engineer, vol. 139, no. 3613), Mar. 27, 1925, pp. 45-47. Author expresses opinion that cause of ill-defined and easily varied magnitude of elastic limit of many pure metals and alloys can be traced to structure of material; he considers that of all usual mechanical tests, notched-bar impact test is most important. (Abstract.) Translated from Zeit für Metallkunde, vol. 16, 1924, p. 207.

FATIGUE. Studying the Fatigue of Metals, H. F. Moore. Am. Mach., vol. 62, no. 15, Apr. 9, 1925, pp. 563-565, 9 figs. Inception of investigation into fatigue of metals and means for conducting it; testing machines and test specimens; some of more important conclusions already reached.

JOINTING WITH NON-FERROUS ALLOYS. Brazing or the Jointing of Metals by Means of Non-ferrous Alloys. A. R. Page. Foundry Trade Jl., vol. 31, no. 446, Mar. 5, 1925, pp. 205-207. Hyde welding. General consideration of processes; effect of temperature; type of joint; composition of jointing material; shearing strength of joints; comparison between brazing and Hyde welding; tensile strength of brazed joints; fluxes. Discussion and author's reply. Paper read before North-East Coast Section of Inst. Metals.

MICROSTRUCTURE AND MECHANICAL PROPERTIES. Relation Between Microstructure and Mechanical Properties, H. North. Metal Industry (Lond.), vol. 26, no. 13, Mar. 27, 1925, pp. 311-312 and 320, 4 figs. Gives typical and varied examples of such relationships in metals and alloys.

PHOTOELECTRIC ACTIVITY. The Variation in Photo-Electric Activity with Wave-Length for certain Metals in Air, Thos. H. Osgood. Roy, Soc. Edinburgh—Proc., vol. 44, part 1, 1924, pp. 8-13, 3 figs. Results of experiments undertaken with view to investigation variation in photoelectric activity of number of metals in air with wavelength of exciting light.

PICKLING. Designing the Pickling Department for Economy in Maintenance, C. A. Crawford. Iron Trade Rev., vol. 76, nos. 14, 15 and 16, Apr. 2, 9 and 16, 1925, pp. 875-877, 935-937 and 1003-1006, 11 figs. Pickling practice and equipment. Apr. 2: Temperature changes after service; use of lead lining and wood; false economy of cheap rods. Apr. 9: Rods in tank construction should be acid-resistant; importance of size of thread; improved method of bolting plungers and partitions. Apr. 16: Wearing plates protect lining; agitation shortens pickling time; temperature and strength of acid bath and time of immersion important factors.

SURFACE TREATMENT WITH ALUMINUM. Surface Treatment of Metals with Aluminum, J. F. Kayser. Metallurgist (supp. to Engineer, vol. 139, no. 3613), Mar. 27, 1925, pp. 34-37, 3 figs. Methods of applying aluminum; properties of "aluminumized" surfaces; theory of aluminization.

TESTING. Comparative Tensile, Compression, Torsional and Rolling Tests (Vergleichende Zug-, Druck, Dreh-und Walzversuche), P. Ludwik and R. Scheu. Stahl u. Eisen, vol. 45, no. 10, Mar. 5, 1925, pp. 373-381, 8 figs. Relations between tension and pressure diagram; determination of flow curve from torsion diagram; comparative tensile and ctmpression tests with copper; influence of pressure-surface friction; torsion tests with copper; relations between torsion diagram and tension and pressure diagram.

Modern Machines for Testing Metals (Les machines modernes pour l'essai des métaux), H. Drouot. Technique Moderne, vol. 17, no. 3, Feb. 1, 1925, pp. 65-77, 45 figs. Discusses most recent machines and methods for impact, resilience, bending, hardness, torsion, fatigue and wear testing, and gives details of operations. Bibliography.

VOLUME CHANGES ON MELTING AND FREEZING. Volume Changes on Melting and Freezing. Metallurgist (supp. to Engineer, vol. 139, no. 3613), Mar. 27, 1925, pp. 42-44, 1 fig. Methods of determining volume changes, with special reference to method used by Endo of weighing metal in small silica cup which is suspended from one arm of special thermo-balance; data obtained by Endo for number of alloys; results correspond broadly with what has been previously known from foundry experience and rougher measurements.

MILLING MACHINES

DESIGN. A New Design of Milling Machine. Machy. (Lond.), vol. 25, no. 649, Mar. 5, 1925, pp. 731-733, 6 figs. Describes machine of Swiss manufacture; principal departure from orthodox design is in pillar support that knits outboard bearing and knee firmly to machine frame, and in such a way as to present most effective resistance in directions along which severe thrusts are set up in heavy-duty milling.

HEAVY-DUTY. Heavy-Duty Worm-Drive Milling Machines. Engineering, vol. 119, no. 3091, Mar. 27, 1925, pp. 383-385, 6 figs. Machines introduced by Jas. Archdale & Co., Birmingham, Eng., can be supplied either as plain machines, with full-automatic control for table feed, or with hand-operated quick power traverse alone.

HEAVY PORTAL. Heavy Portal Milling and Drilling Machine. Machy. (Lond.), vol. 25, no. 649, Mar. 5, 1925, pp. 717-721, 7 figs. Details of travelling machine of huge dimensions built by Schiess, Düsseldorf, Germany; whole structure rests on two massive 3-way bedplates; complete portal structure with two milling-tool boxes on its cross rail traverses whole length of bedplates; in addition, there is horizontal boring, milling, and drilling machine which is transferable and can be placed on either bedplate.

MINE LOCOMOTIVES

MOTOR APPLICATIONS. Applications of Motors to Mine Locomotives, W. A. Clark. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 4, Apr. 1925, pp. 347-349. Discusses rule-of-thum method of applying motors to mine locomotives; shows why speed of locomotive should be considered in selecting motor horsepower; indicates rational method of selecting motors for locomotives for general application.

MINE SHAFTS

ARIZONA. Equipment and Operation of Inspiration's Porphyry Shaft, G. H. Booth. Eng. & Min. Jl.—Press, vol. 119, no. 12, Mar. 21, 1925, pp. 477-485, 14 figs. Describes equipment of shaft of Insoiration Consolidated Copper Co., Arizona, last word in modern large-scale hoisting practice, and its operation.

MINERALS

Non-Metallic, Canada.—Some Canadian Non-Metallic Minerals—A Review of Fifteen Years' Progress. Can. Inst. Min. & Metallurgy—Bul., no. 155, Mar. 1925, pp. 232-281, 3 figs. Review of changes that have taken place in certain Canadian non-metallic mineral industries since 1909; deals with natural abrasives, sodium and magnesium salts, silica, and feldspar, mica, graphite, barytes, talc and soapstone, asbestos.

MINERS

Fatigue, Treatment for. Salt Treatment for Miners' Fatigue, J. Court. Instn. Min. Engrs.—Trans., vol. 68, No. 5, Feb. 1925, pp. 364-369. Results obtained with treatment for miners' fatigue which consists of supplying salt in proportion of about ¼ per cent in drinking water.

MINES

Electrical Equipment. Electricity in Mines. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 4, Apr. 1925, pp. 409-411. Discussion of paper by F. L. Stone, published in Dec. 1924, issue of Journal.

Roof Control and Support. Roof Control and Support in Mines in Relation to accidents, T. Webster. Colliery Guardian, vol. 129, no. 3349, Mar. 6, 1925, pp. 573-574. Discusses effect of packing, methods of timbering, timbering of roadways, roof support at junctions, discipline and supervision, etc.

MINING

Detachable Bits, Use of. Experimenting with Detachable Bits at Anyox, B. C., W. J. Coulter. Eng. & Min. Jl.-Press, vol. 119, no. 13, Mar. 28, 1925, pp. 530-532, 5 figs. Encouraging results obtained from use of a socket-type bit in copper mining.

MOLDING MACHINES

Heavy Electrical-Casting Molds. Speeds Production of Heavy Molds for Electrical Castings, P. Dwyer. Foundry, vol. 53, no. 8, Apr. 15, 1925, pp. 307-310, 5 figs. Methods and equipment of gray-iron foundry, operated by General Electric Co., at Erie, for making of castings for electrical machinery ranging from few hundred pounds up to 60 tons; details of molding machine which combines in itself ability to take care of all items involved in making mold; it travels under its own power, cuts sand and piles it in long heap fit for use, riddles sand, and rams it in flask.

Peacolt. The Improved Peacolt Moulding Machine. Foundry Trade Jl., vol. 31, no. 446, Mar. 5, 1925, pp. 197-198, 3 figs. Machine is of turnover type, but by removal of turnover table and substitution of lifting brackets, is convertible to direct-draw or stripping-plate operation.

MOTION STUDY

Variables Affecting Motion. Motions and the Variable Factors that Affect Them, K. H. Condit. Am. Mach., vol. 62, no. 16, Apr. 16, 1925, pp. 609-611, 3 figs. How motion study was discovered; three types of variables that affect motions and workers. Article is based on material obtained from F. B. Gilbreth before his death.

MOTOR BUSES

Braking. Improved Braking for Motor Coaches. Motor Transport (Lond.), vol. 40, no. 1045 and 1046, Mar. 9 and 16, 1925, pp. 307-309 and 319-320, 10 figs. Limitations of rear wheel brakes and avenues for designers of four-wheel braking equipments; variations in fundamental principles and detail.

Gas-Electric Drive. A Technical History of Gas-Electric Drives, P. M. Heldt. Automotive Industries, vol. 52, no. 12, Mar. 19, 1925, pp. 529-532, 5 figs. Describes various systems; chief advantage is smooth, steady accelaration.

Oil Transmission Gear. A Motor Coach with Oil Transmission Gear. Engineer, vol. 139, no. 3611, Mar. 13, 1925, pp. 308, 1 fig. Describes new type of transmission gear designed and built by Swiss Locomotive Works at Winterthur, and installed in gasoline motor coach, which enables speed changes to be made by simple movement of starting handle fixed in driving cab similar to hand lever of electric controller.

Saurer. Introduction of Autobuses for Suburban Traffic of Bern. Municipal Street Cars (Die Einführung des Autobetriebs im Vorortverkehr der städtischen Strassenbahnen in Bern). Schweizerische Bauzeitung, vol. 85, no. 6, Feb. 7, 1925, pp. 75-77 5 figs. Details of Saurer motor buses; four cylinders, aluminum pistous, 1300 r.p.m., four speeds, 55-58 b.hp., capacity 25 seated and 15 standing.

MOTOR TRUCKS

Crossley. British Truck Designed for High Speeds with Solid Tires, M. W. Bourdon. Automotive Industries, vol. 52, no. 13, Mar. 26, 1925, pp. 584-585, 5 figs. New Crossley unit has 4-speed gearset providing ratios ranging from 7 to 1 on high to 38 to 1 on low; engine is 4-cylinder type; total weight of chassis, 4060 lb.

Electric. Advantages of the Electric Vehicle, E. M. Watts. Elec. World, vol. 85, no. 13, Mar. 28, 1925, pp. 665-668, 4 figs. Careful study should be made to see that electric vehicles are applied in proper field; analysis of their fundamental superiority under certain conditions.

1925 Electric Truck Show Reveals Advanees in Design, P. M. Heldt. Automotive Industries, vol. 52, no. 13, Mar. 26, 1925, pp. 574-575, 5 figs. Resistance control discarded by one maker in favor of change in voltage control; new make of truck has built-in hoist for lowering and raising battery; other features of show held in New York City.

Military, British. Vulcan Two Ton Lorry Chassis. Engineering, vol. 119, no. 3092, Apr. 3, 1925, pp. 432-434, 4 figs. One of first vehicles designed to (British) War Office No. 11 specification to pass necessary tests to render it eligible for subsidy; engine is of 4-cylinder monobloc type; clutch is of direct cone type and is fitted with adjustable springs.

Six-Wheel. Six-Wheel Truck Construction aud Operation, E. Favary. Soc. Automotive Engrs.—Jl., vol. 16, no. 4, Apr. 1925, pp. 427-432, 5 figs. Causes of road failures; effect of unsprung weight; traction of driving wheels; six-wheel-construction advantages; economy of operation; cost of freight transportation; mathematical analysis of impact; steering considerations; other types of construction.

N

NATURAL GAS

Canada. Natural Gas in Canada and Its Uses, R. T. Elworthy. Can. Inst. Min. & Metallurgy—Bul., no. 155, Mar. 1925, pp. 282-289, 1 fig. Natural gas is found in commercial quantities in New Brunswick, Ontario and Alberta; composition of gas; industrial chemicals from natural gas.

NON-FERROUS METALS

Research. Progress in Co-operative Research. Metal Industry (Lond.), vol. 26, no. 10, Mar. 6, 1925, pp. 237-238, 1 fig. Review of progress of work being carried out by British Non-Ferrous Metals Research Assn., investigation of copper and brass, aluminum, lead and zinc, die casting and gas problems in general casting, lead and zinc, high-temperature alloys, etc.

NUTS

Pressing Process. Modern Hot Nut Pressing Process, R. Niemeyer. Eng. Progress, vol. 6, no. 2, Feb. 1925, pp. 35-37, 11 figs. Describes modern working methods and presses.

O

OFFICE MANAGEMENT

Supplies, Purchase Specifications for. Specifications for the Purchase of Office Supplies, Rob. Sherran. Mgt. & Admin., vol. 9, no. 4, Apr. 1925, pp. 333-336. Definite information concerning uses, advantages, and disadvantages of various supply items to enable person who buys such material to make best use of money at his disposal.

OIL

Origin. A Phase of the Origin of Petroleum, E. M. de Villa. Indus. Australian & Min. Standard, vol. 23, no. 1886, Feb. 5, 1925, pp. 179-180. Discusses inorganic, vegetable, and animal origin theories of petroleum; summary of theories of origin applied to Australia; tangential pressure and genesis of petroleum.

Production from Coal. The Conversion of Coal to Oil (Die Umwandlung der Kohle in Oele), F. Fischer. Zeit. des Vereines deutscher Ingenieure, vol. 69, no. 1, Jan. 3, 1925, pp. 15-17, 4 figs. Discusses possibility of oil rceovery by low-temperature coking of coal, hydration of coal and synthesis of gases.

OIL ENGINES

AEG-Burmeister & Wain. The Oil-Engine Plant of the 20,600-Ton Motorship Svealand and Americaland (Die Oelmaschinenanlage der 20,600 t-Motorschiffe "Svealand" und "Americaland", H. Thorwarth. Zeit. des Vereines deutscher Ingenieure, vol. 69, no. 10, Mar. 7, 1925, pp. 305-310, 16 figs. Details of oil-engine plant built by German Gen. Elec. Co. (AEG) Turbine Factory for two ore-carrying ships being built at the Deutscher Werft; each ship is equipped with two 8-cylinder 4-stroke-cycle AEG-Burmeister & Wain engines.

Industrial Use. Industrial Use of the Oil Engine, L. H. Morrison. Mech. Eng., vol. 47, no. 4, Apr. 1925, pp. 255-256 and (discussion), 257. How one of factors in decentralization of industry is affected by economical source of power in small units; adaptability of oil engines.

Scott-Still. Marine Oil Engine Trials. Engineering, vol. 119, nos. 3091 and 3092, Mar. 27 and Apr. 3, 1925, pp. 397-402 and 434-436, 33 figs. Abstract of second report of Marine Oil Engine Trials Committee on tests carried out under their direction on M. S. Dolius and her Scott-Still oil engines. See also Engineer, vol. 139, no. 3613, Mar. 27, 1925, pp. 346-349, 3 figs., containing brief abstract of report and discussion.

Solid-Injection. Solid-Injection Oil Engines, R. Hildebrand. Mech. Eng., vol. 47, no. 4, Apr. 1925, pp. 261-265, 21 figs. Deals with developments during last two years in connection with 4-stroke-cycle, 3-cylinder, heavy-oil engine of solid-injection type; discusses combustion chambers and effect of turbulence and describes design of combustion chamber finally adopted by author; impact fuel pump and spray valve developed for engine; operation and future of solid-injection engine.

Storage and Handling in Plant. The Storage and Handling of Fuel Oil in Industrial Plants. Mech. Eng., vol. 47, no. 4, Apr. 1925, pp. 272-274. Review of discussion at meeting of A.S.M.E. in December 1924.

OIL FIELDS

California. Graphic Review of California Oil Fields, M. van Couvering. Oil Bur., vol. 11, no. 2, Feb. 1925, pp. 136-141 and 213, 8 figs. All graphs cover period extending through years 1921, 1922, 1923 and 1924.

OIL SHALES

Canada. Oil-Shales of Canada, S. C. Ells. Can. Inst. Min. & Metallurgy—Bul., no. 155, Mar. 1925, pp. 294-297. Deposits in Nova Scotia, New Brunswick, Quebec, Ontario, etc.

OIL TANKS

Failure. Oil Tank Fails After Sudden Drop in Temperature. Eng. News Rec., vol. 94, no. 16, Apr. 16, 1925, pp. 638-639, 2 figs. Two tanks destroyed in fire apparently eaused by rupture of one tank; sudden eold snap may be responsible.

OIL WELLS

Plunger Rotators. Plunger Rotators, L. Suverkrop. Cal. Oil Fields, vol. 10, no. 4, Oct. 1924, pp. 5-9, 2 figs. Deals with device, used to slowly rotate rods and plunger during pumping operation, which has proved useful in economic production of petroleum and has been adopted for many wells in California oil fields; principal advantage is that it reduces lifting cost in production of heavy oil or production of oil carrying troublesome quantities of sand or finely divided shale.

OILS

Hydrogenation. The Hydrogenation of Vegetable and Marine Oils by a Continuous Process, R. A. Bellwood. Chem. Age (Lond.), vol. 12, no. 299, Mar. 7, 1925, pp. 222-224. Describes a continuous process for hydrogenation of vegetable and marine oils and summarizes advantages of system. Paper read before Hall Chem. & Eng., Soc. See also Chem. Trade, Jl., vol. 76, No. 1972, Mar. 6, 1925, pp. 291-294, 6 figs.

Vegetable, Refining. Refining Vegetable Oils and Fats, E. Herrndorf. Eng. Progress, vol. 6, no. 2, Feb. 1925, pp. 27-31, 7 figs. Process of refining; usual process; standard and universal refining processes.

OPEN-HEARTH FURNACES

Regenerative, Draft Conditions. Draft Conditions in Regenerative Furnaces (Die Zugverhältnisse bei Regenerativöfen), H. K. von Scheele. Wärme, vol. 48, no. 8, Feb. 20, 1925, pp. 85-88, 6 figs. Discusses draft conditions, introducing factor of furnace width; it is shown that usual theories concerning furnace draft cannot always be applied to draft conditions in regenerative furnaces; deals with problems of waste-heat utilization and of artificial draft.

ORDNANCE

Modern. Modern Ordnance, C. C. Williams. Franklin Inst.—Jl., vol. 199, no. 3, Mar. 1925, pp. 353-380, 21 figs. Calls attention to a few of more important phases of problems; deals with small arms, tanks, mobile artillery, tractors, anti-aircraft artillery, ammunition problem, super-guns; German long-range guns; bombing.

ORE CONCENTRATION

Dorr Thickeners. The Determination of Capacities of Dorr Thickeners, P. Middleton Chem. Eng. & Min. Rev., vol. 17, no. 196, Jan. 5, 1925, pp. 131-133, 2 figs. Notes on method of determining size and capacity of thickener installations, based on writer's experience.

ORE DRESSING

Research in. The Status of Research in Ore Dressing, E. A. Hersam. U. S. Bur. Mines, Reports of Investigations, Serial No. 2669, Feb. 1925, 48 pp. Study of status of ore dressing in United States extended over entire field and included mechanical treatment of ores and mineral substanees, particularly metal-bearing ores, coal, and clay; investigations also covered British Columbia and Ontario.

ORE TREATMENT

Hardinge Mills. The Origin of the Hardinge Mill, J. C. Farrant. Chem. Age (Lond.), vol. 12, no. 294, Jan. 31, 1925, pp. 98-101, 10 figs. Brief account of earliest stages of Hardinge mill, with operating data.

OSCILLOGRAPHS

Portable. A Six-Element Portable Oscillograph, J. W. Ecgg. Elec. Jl. vol. 22, no. 3, Mar. 1925, pp. 108-112, 8 figs. New instrument, was made possible by new form of permanent magnet; complete outfit weighs but 100 in., including daylight-loading film holder, rotating polygon of viewing mirrors, 6-colt shunt motor, three non-inductive shunts, and oscillograph proper.

OXY-ACETYLENE CUTTING

Blowpipe under Water, with. Some Notes on Metal Cutting under Water by Means of a Blowpipe and a Jet of Oxygen, J. B. Polland. Junior Instn. Engrs. — Jl., vol. 35, part 5, Feb. 1925, pp. 224-242. History of invention; principle of metal cutting under water; apparatus employed; execution of cuts below water; relighting blowpipe under water; use and application; costs.

Risers, Removal from Castings. Cutting Process Greatly Improves Foundry Practice. Blast Furnace & Steel Plant, vol. 13, no. 4, Apr. 1925, pp. 177-178, 2 figs. Discusses cutting of risers by oxy-acetylene blowpipe.

P

PACKING

Containers. Better Shipping Containers, Floyd T. Smith. Mgt. & Admin., vol. 9, no. 4, Apr. 1925, pp. 349-352, 9 figs. Features of excellence in design; faults in construction; packing; tests made to determine container design; aids in container designing.

Crate Making. Making Better Crates—and in Half the Time, B. E. Gaylord. Factory, vol. 34, no. 4, Apr. 1925, pp. 602-605, 3 figs. Describes use of nailing jigs and points out many advantages which they have.

PAINTS

Protective Coatings, Testing. Testing the Value of Paint Coatings on Metals (Verfahren und Apparat zur Prüfung der Dichtigkeit von Anstrichen), A. Junk. Zeit. für angewandte Chemie, vol. 38, no. 1, Jan. 1, 1925, pp. 8-9, 2 figs. Describes apparatus consisting of portable dry cell and telephone mounted together and connected with two terminals, one of which consists of brush of fine copper wire; other terminal is placed in metallic contact with material covered by paint, and brush terminal is then moved slowly over painted surface; flaws in protective-paint layer are detected by current through telephone.

PAPER MANUFACTURE

Pulp Grinders. Development of Equipment for Making Ground Wood Pulp, J. F. Clerc. Chem. & Met. Eng., vol. 32, no. 10, Apr. 1925, pp. 416-422, 14 figs. Progress in design of machines and control for production of mechanical pulp; modern American regulators; governing hydraulic-turbine drives; development of magazine grinders; continuous grinders; Warren grinder.

Wood Preparation. Machines for the Preparation of Wood for the Manufacture of Paper Pulp, A. Betzner. Eng. Progress, vol. 6, no. 2, Feb. 1925, pp. 48-50, 6 figs. Different methods of breaking up wood and removing bark; chief points of view as regards economical barking.

PAPER MILLS

Ventilation. Ventilation of the Mill, A. E. Montgomery. Paper Mill, 49, nos. 10 and 11, Mar. 7 and 14, 1925, pp. 4 and 48, and 10 and 44. How to get best drying results in connection with ventilation.

PATTERNS

Old Castings, Use of. Using Old Castings as Patterns, D. A. Hampson. Am. Mach., vol. 62, no. 15, Apr. 9, 1925, p. 588. Cases in which broken casting may be used advantageously for pattern.

PAVEMENTS, ASPHALT

Predetermined Form of Interlocking. New Asphalt Pavement Patent, C. A. Mullen, Can. Engr., vol. 48, no. 13, Mar. 31, 1925, pp. 355-356, 1 fig. Particulars of invention, Canadian Letters Patent No. 247, 652, covering predetermined form of interlocking between top and bottom courses.

PHOSPHATES

Rock. Basic Slags and Rock Phosphates, E. Vanstone, C. Chem. & Industry, vol. 44, no. 14, Apr. 3, 1925, pp. 155-157T, 2 figs. Investigation of ratio of citric-soluble phosphate to total phosphate for residual phosphate, after first extraction of 2 per cent citric acid; determination of phosphoric acid by volumetric method.

PHOTO-ELASTICITY

Applications. Photo-elasticity, E. G. Coker. Franklin Inst.—Jl., vol. 199, no. 3, Mar. 1925, pp. 289-331, 23 figs. Discusses applicability of results of optical measurements on transparent models to those of actual structures in steel and other engineering materials; deals with several cases of contact stress, including contact stress in piston rings, dove-tail joints, and stress due to pin or rivet in plate.

PHOTOMICROGRAPHY

Sample Preparation for High-Power. Sample Preparation for High Power Photomicrography, R. G. Guthrie. Am. Soc. Steel Treating—Trans., vol. 7, no. 3, Mar. 1925, pp. 337-362, 17 figs. Discusses method of preparing specimens for high-power photomicrography with which it has been possible to eliminate or reduce to minimum an amorphous film which usually covers surface of specimen before etching, and which usually causes uneven etching; method of polishing wherein paraffin polishing wheel is used; photomicrographs showing various structures obtained from specimens of steel under both low and high power magnification ranging from 2300 to 15,500.

PILES

Pine, Preservative Treatment. Specification for the Preservative Treatment of Yellow Pine Piles by Pressure Processes. Wood Preserving News, vol. 3, no. 2, Feb. 1925, pp. 21-23, 5 figs. General requirements; preservatives; amount of preservative to be used; treating operations.

PISTONS

Airplane-Engine. The Friction of Pistons and Piston Rings, T. E. Stanton. Aeronautical Research Committee (Great Britain), Reports & Memoranda, No. 931, July 1924, 4 pp., 4 figs., on supp. plates. Frictional resistances of piston rings and their variation with piston load and with temperature of cylinder walls were determined. Measurement was made of intensity of pressure at back of piston rings pressing them against cylinder walls.

Aluminum-Alloy. Aluminum-Alloy Pistons—Properties and Advantages of These Heat Resisting Alloys, F. A. Livermore. Brass World, vol. 21, no. 2, Feb. 1925, pp. 55-56. Difficulties which must be faced in adoption of aluminum alloys for pistons; burning of aluminum pistons; piston design.

PLANERS

Cincinnati Hypro. Cincinnati "Hypro" Planer. Am. Mach., vol. 62, no. 13, Mar 26, 1925, pp. 513-514, 4 figs. New Machine features points involving strength of construction, adaptability for rapid manipulation with provisions for safeguarding all movements and design to produce continuous service ability.

Savings in Running Costs. Savings in Cost of Planer Work, T. Berna. Am. Mach., vol. 62, no. 14, Apr. 2, 1925, pp. 523-525, 4 figs. Planer has become a production machine; fallacy of double-cutting planer; multiple cutting tools; divided and auxiliary tables for repetitive work.

POWER

Conservation. Modern Methods of Power Conservation (Neuzeitliche Energie wirtschaft), H. v. Glinski. Zeit. des Vereines deutscher Ingenieure, vol. 69, nos. 6 and 7, Feb. 7 and 14, 1925, pp. 141-147 and 179-184, 11 figs. Discusses principles, status and trend of development; data on most important energy sources of the earth; water powers and coal deposits, their available supply, their ulitization and relation to cosmic energy; desiderata for design and operation of hydro-electric and steam plants; electrical installations for distribution of energy over extended territory.

POWER FACTOR

Correction. Economic Aspects of Power-Factor Correction, A. S. Knight. Elec. World, vol. 85, no. 13, Mar. 28, 1925, pp. 662-663. Penalties as optional rates; simplest rates no guarantee of greatest economy; problems of small consumers; defense of present metering methods and rate schedules.

Improvement. The Improvement of Power Factor, M. Walker. World Power, vol. 3, nos. 14 and 15, Feb. and Mar. 1925, pp. 86-90 and 153-156, 6 figs. Discusses chief kinds of machinery and apparatus that require lagging current; (1) overhead transmission lines; (2) induction motors; (3) transformers; (4) electric arc furnaces; (5) choking coils used to prevent excessive short-circuit.

POWER TRANSMISSION

Safeguarding Equipment. Safeguarding Power Transmission Equipment, D. C. Wright. Am. Mach., vol. 62, no. 14, Apr. 2, 1925, pp. 535-537. Careless inspection and lack of accepted safety standards for industrial hazards; work of Committee on Safeguarding of Mechanical Power Transmission Equipment.

PRECIPITATION

A. C. Precipitators. Determination of Suspensoids by Alternating-current Precipitators, P. Drinker and R. M. Thomson. Am. Inst. Min. & Met. Engrs.—Trans., no. 1445-A. Mar. 1925, 12 pp., 3 figs. Discusses constructional details and adaptation of portable a.c. precipitators to quantitative determination of suspensoids such as dusts, fumes, and smokes; brings out distinction between a.c. method, using glass-collecting electrodes, and rectified-current method, using metal-collecting electrodes (Cottrell process).

PRESSWORK

Pressed-Steel Automobile Parts. Sheet-Steel Automobile Parts, J. Younger. Am. Mach., vol. 62, no. 16, Apr. 16, 1925, pp. 605-607, 5 figs. Use of sheet steel to replace castings and even forgings at works of Hupp Motor Car Corp. in Detroit; spot-welding process insupplating riveting; built-up products becoming more popular; light weight ultimate goal.

PROFIT SHARING

Partnership Plan. Sharing Plant Management with the Workers, M. van Kleeck. Chem. & Met. Eng., vol. 32, no. 9, Mar. 1925, pp. 376-378. Partnership plan evolved in Dutchess Bleachery aimed to give workers voice in conduct of business, to give them current information on success of business, and to share profits with them, besides providing funds in advance to enable business to make payments to both stock holders and wage earners in periods of industrial depression.

PULVERIZED COAL

Boiler Firing. Powdered Anthracite as Boiler Fuel. Iron & Coal Trades Rev., vol. 110, no. 2976, Mar. 13, 1925, p. 433, 2 figs. Describes powdered-fuel installation of Pantyffynnon Colliery, of Blaina Colliery Co., Pantyffynnon, Carmarthenshire, Wales, put down to burn anthracite duff under a Stirling boiler. Results of tests.

Pulverized Fuel and Its Application to Boiler Firing, W. J. Cotterell. Combustion, vol. 12, no. 4, Apr. 1925, pp. 275-278. Advantages of pulverized-fuel firing include high efficiency, ability to use greater variety of fuels, accessibility, increased evaporation; general consideration before adoption.

Burning Equipment. Pulverized Coal Burning, Eng. & Boiler House Rev., vol. 38, nos. 9 and 10, Mar. and Apr., 1925, pp. 367-369, and 438 and 443-445, 11 figs. Details relating to equipment necessary for successfully burning pulverized coal, and description of Fuller system.

Drying before Pulverizing. Drying of Coal for Pulverizing, H. W. Brooks. Power Plant Eng., vol. 29, no. 8, Apr. 15, 1925, pp. 422-423, 2 figs. Points to be considered when deciding whether or not to use driers.

Operating Experiences. Operating Experiences in Pulverized Fuel. Mech. Eng., vol. 47, no. 4, Apr. 1925, pp. 271-272. Discussion by P. W. Thompson, on pulverized-coal burning at Detroit Edison Co.'s Trenton Channel plant; and by E. H. Tenney, on pulverized coal at Cahokia station, St. Louis.

Steel Works. Pulverized Coal at Trumbull Steel Mills. Iron Age, vol. 115, no. 13, Mar. 26, 1925, pp. 885-888, 5 figs. Costs cut through reducing number of men and using cheaper grade of coal; annealing furnaces and boilers served.

PUMPING PLANTS

Egypt. Pumping Plants in Egypt. Gas & Oil Power, vol. 20, no. 234, Mar. 5, 1925, pp. 117-118. Comparative running costs of steam and Diesel Drives.

PUMPS

Piston. Operating Control of Piston Pumps (Zur Betriebskontrolle der Kolbenpumpen), A. Staus. Gas- u. Wasserfach, vol. 68, nos. 2 and 3, Jan. 10 and 17, 1925, pp. 17-19 and 37-39, 23 figs. Discusses volumetric, hydraulic, indicated, mechanical, and total efficiency of pumps, especially for water works; effect of valve action on efficiency.

Viscous Liquids. A New Type of Pump for Viscid Liquids. Eng. Progress, vol. 6, no. 2, Feb. 1925, pp. 44-45, 2 figs. Kobra universal pump intended for handling of viscous liquids, dirty water and sludge of all kinds, which can by raised without trouble.

Water-Works. Modern Water Works Pumping Units, F. J. Taylor. Can. Engr., vol. 48, nos. 9 and 11, Mar. 3 and 17, 1925 pp. 265-269 and 311-315, 18 figs. Methods of pumping water as applied to water works, sewage and drainage service; principal features of various methods; pumps driven by steam, electric motors and internal-combustion engines; centrifugal and ram pumps; stereophagus pump.

PUMPS, CENTRIFUGAL

Steam-Turbine. Steam Turbine Driven Pumps for the Rand Water Board. Engineering, vol. 119, no. 3092, Apr. 3, 1925, pp. 412-413, 17 figs. partly on supp. plate and p. 420. Describes two duplicate sets of steam-driven centrifugals for pumping supply of water from filter and sedimentation station to distance of about 25 miles; pumps were each required to be capable of delivering at overload 6,000,000 gal. per 24 gr. against total head of 565 ft.

PYROMETRY

Developments and Methods. Pyrometry, H. A. Schwartz. Am. Soc. Steel Treating—Trans., vol. 7, no. 4, Apr. 1925, pp. 518-528. Deals with many phases of problem of measuring temperatures which are considerably above room temperature; outlines developments of art of pyrometry and discusses various methods of determining temperatures; describes radiation type, thermocouple type and optical type of pyrometers.

R

RADIOTELEGRAPHY

TRANSMITTERS. Recent Developments in Vacuum Tube Transmitters, B. R. Cummings Inst. Radio Engrs.—Proc., vol. 13, no. 1, Feb. 1925, pp. 49-109, 75 figs. Describes number of vacuum tube transmitters which have been developed and built during past year, both for commercial use and various governmental departments; includes discussion of circuits utilized, and reasons for adopting present circuits in place of former "antenna oscillators"; details of 20-kw. transmitters built for United Fruit Co. for installation in Central America, which represent most completely developments to date in medium power transmitters.

VALVE TRANSMITTERS. Wireless Telegraph Valve Transmitters Employing Rectified Alternating Current, G. Shearing. Instn. Elec. Engrs.—Jl., vol. 63, No. 339; Mar. 1925, pp. 309-327 and (discussion) 327-333, 41 figs. Describes development of valve transmitters employing rectified power for naval purposes; method of calculation of geometry of rectifying valve electrodes and of power loss; types of transmitter circuits employed; design of transmitting valve electrodes; question of valve rating.

WAVELENGTH MEASUREMENT. Discussion on "A Method of Measuring Very Short Radio Wave Lengths and Their Use in Frequency Standardization". Inst. Radio Engrs.—Proc., vol. 13, no. 1, Feb. 1925, pp. 125-127, 2 figs. Discussion by E. Takagishi and S. Kawazoe of paper by F. W. Dunmore and F. H. Engle, published in Proceedings, vol. 11, no. 5, Oct. 1923.

RADIOTELEPHONY

BROADCASTING STATIONS. The New London Broadcasting Station. Engineer, vol. 139, no. 3611, Mar. 13 1925, pp. 306-307, 2 figs. Apparatus for new station is twice as powerful as that usually employed and embodies some of very latest improvements introduced for first time in connection with broadcasting station at Chelmsford.

RAILS

HEAT TREATMENT, Heat Treatment of Rails (Traitement thermique des rails), Génie Civil, vol. 86, no. 6, Feb. 7, 1925, pp. 140-145, 7 figs. Describes process of Compagnie des Forges de Châtillon, by which pearlitic structure is converted into sorbitic, consisting mainly in an intermediate tempering.

JOINTS. A New Chapter in Permanent Way History, B. Leslie. Ry. Gaz., vol. 42, no. 8, Feb. 20, 1925, pp. 230-231, 1 fig. Details of author's non-deflecting rail joint and reversible rail carried on cast-iron pedestal sleepers; enumeration of chief improvements claimed for device; its adoption prolongs life of rails by at least 33 per cent; object is to do away with low points by provision of adequate bearing surface on ballast. (Abstract.) Paper read before Permanent Way Instn.

LAYING. Speed Records in Rail Laying, Chas. Weiss. Ry. Rev., vol. 76, no. 11, Mar. 14, 1925, pp. 497-499. Points to necessity of careful preparation, doing preliminary work before actual operation of changing rail is started, and careful supervision.

RAILWAY ELECTRIFICATION

AUSTRIA. Power Plants and Substations for Electric Operation of Arlberg and Salzkammergut Lines (Die Kraftwerke und Unterwerke für den elektrischen Betrieb der Arlberg- und der Salzkammergutbahn), A. Hruschka. Elektrotechnik u. Maschinenbau, vol. 43, nos. 1 and 2, Jan. 4 and 11, 1925, pp. 1-13 and 21-34, 43 figs. Layout and construction of enlarged Ruetz plant; reservoir; pressure conduits, power-house equipment, turbines, generators, transformers, switching plant and auxiliary equipment.

BERLIN. Berlin Suburban Electrification Put in Operation. Elec. Ry. Jl., vol. 65, no. 13, Mar. 28, 1925, pp. 503-504, 3 figs. First electrified section of Berlin suburban lines, between Stettin station and Hermsdorf was put in operation. Three-wire distribution is used for busiest section of 800-volt division; train units are made up of a motor car and two trail cars.

CHILE. Electrification of the Chilean State Railways, D. C. Hershberger. Ry. Rev., vol. 76, no. 16, Apr. 18, 1925, pp. 722-728, 11 figs. Water power supplies electric energy for transportation in country which desires to conserve coal resources.

INDIA. First Railway Electrification in India. Elec. Rev., vol. 96, no. 2464, Feb. 13, 1925, pp. 260-263, 7 figs. Particulars of electrification of section of Great Indian Peninsula Ry. forming Bombay suburban system.

MAIN-LINE. Main Line Railway Electrification, Phil Dawson and S. Parker Smith. Engineer, vol. 139, nos. 3604 and 3606, Jan. 23 and Feb. 6, 1925, pp. 98-100 and 156-159, 10 figs. Developments in Scandinavia; reasons for electrification; choice of system; extent of present electrification; Swedish state railways.

POSSIBILITIES, MISSOURI. Possibilities of Railway Electrification in Missouri, H. Rubey. St. Louis Ry. Club—Official Proc., vol. 29, no. 9, Jan. 9, 1925, pp. 163-172 and (discussion) 172-185. Enumerates and discusses factors which favor electrification.

POWER SYSTEMS. Railway Electrification and the Question of Power Systems (Bidrag till behandlingen av systemfragan för elektrisk järnvägsdrift), B. Wuolle. Teknisk Tidskrift, vol. 55, no. 6, Feb. 7, 1925, pp. 24-29 (Elektroteknik). Discusses new Kando system (high voltage, normal frequency, single-phase, on contact wire; frequency-changer set in locomotive cab) in comparison with present alternating-current systems.

PROBLEMS. Electrification—A Factor in the Development of the Railroad Industry, A. J. Manson. Can. Ry. Club—Official Proc., vol. 24, no. 1, Jan. 1925, pp. 21-31 and (discussion) 31-40. Growth of electric traction; operating characteristics of electric locomotive; possible solution of financial problem.

RAILWAY MOTOR CARS

DYNAMOMETER TESTING. A Scientific Test for Motor Cars. Ry. Rev., vol. 76, no. 10, Mar. 7, 1925, pp. 459-462, 6 figs. New dynamometer car gives accurate and scientific data on railway-motor-car performances.

GASOLINE. Gasoline Motor Cars of Swiss Federal Railways (Benzinmotor-Triebwagen der Schweizerischen Buudesbahnen), F. Christen. Schweizerische Bauzeitung, vol. 85, no. 9, Feb. 28, 1925, pp. 115-117, 7 figs. Design and construction of light gasoline-driven cars for branch-line service; 48 seats, 100 hp., maximum speed 50 km.p.h., length over buffers 13.73 m., weight 21 tons.

GASOLINE-ELECTRIC. A New Type Gas-Electric Car for the Reading Company, A. H. Candee. Ry. Rev., vol. 76, no. 16, Apr. 18, 1925, pp. 741-742, 2 figs. Car will be equipped with 250-hp. gasoline-engine generator set and 2 traction motors mounted on one of car trucks.

SEDDIN EXPOSITION, GERMANY. Railway Motor Cars at the Seddin Exposition (Die Triebwagen auf der Seddiner Ausstellung), W. Draeger. Organ für die Fortschritte des Eisenbahnwesens, vol. 80, no. 3, Feb. 15, 1925, pp. 39-49, 10 figs. Costs per passenger-kilometer are computed for a three-car steam train and for all commercial types of rail cars, calculations indicating that fuel-oil motor-driven rail car gives most economical operation under assumed conditions; describes different types; line drawings.

TWO-CAR. Two-car Gasoline Motor Train. Ry. Mech. Engr., vol. 99, no. 3, Mar. 1925, pp. 149-150, 6 figs. Big Four acquires combination baggage and mail motor car and 60-passenger trailer for local service on main line.

RAILWAY OPERATION

DESPATCHING. Directing Train Movements by Signal Indication. Ry. Age, vol. 78, Nos. 16 and 17. Mar. 21 and 28, 1925, pp. 785-790 and 839-843. Review of papers and discussion before Signal Section of Am. Ry. Assn.

The Dispatching or Control System, J. H. Follows. Int. Ry. Congress Assn. —Bul., vol. 7, no. 2, Feb. 1925, pp. 389-438, 11 figs. Methods of control administration; district control organization; control office accommodation and equipment; telephone circuits and apparatus; train boards and geographical maps; trainmen's relief; regulation of special traffics; distribution of rolling stock; track capacity and train diagramming; control staff; etc.

TRAIN CONTROL. Division Train Control Installation on C. & E. I. Approved by I. C. C. Ry. Signaling, vol. 18, no. 4, Apr. 1925, pp. 145-147, 3 figs. Interstate Commerce Commission tests all roadside and engine equipment of 106-mi. section of Miller apparatus.

The Richards Train Control System. Ry. Signaling, vol. 18, no. 4, Apr. 1925, pp. 142-144, 5 figs. New intermittent, non-contact, magnetic-induction type of train control installed and in operation on Maryland & Pennsylvauia R. R.

LONG RUNS. Long Engine Runs on the Burlington. Ry. Age, vol. 78, no. 20, Apr. 18, 1925, pp. 971-976, 4 figs. Monthly savings exceed $9,000; 30 engines released for other service; Hulson grates important aid. See also description in Ry. Rev., vol. 76, no. 16, Apr. 18, 1925, pp. 719-721, 1 fig.

RAILWAY REPAIR SHOPS

LOCOMOTIVE. Southern Builds Modern Equipped Locomotive Shops. Ry. Mech. Engr., vol. 99, no. 3, Mar. 1925, pp. 165-175, 18 figs. Claims that excellent results are being obtained through system of cost control and inspection.

RAILWAY SHOPS

ELECTRIC WIRING. Wiring and Fire Protection at Everett. Elec. Ry. Jl., vol. 65, no. 13, Mar. 28, 1925, pp. 499-502, 9 figs. Ring feeds from outside wood mill and paint shop provide flexible electric service at Everett shops of Boston Elevated Ry.; careful study of shop lighting preceded installation; well-developed sprinkler and hose service system used with alert and trained squads.

RAILWAY SIGNALING

COLORED-LIGHT SIGNALS. Signaling Two Tracks to Capacity, H. G. Morgan. Ry. Signaling, vol. 18, no. 4, Apr. 1925, pp. 139-141, 7 figs., also Ry. Age, vol. 78, no. 15, Mar. 14, 1925, pp. 733-735, 5 figs. Illinois Central installs colored light signals on 20 miles of double track with no normal direction.

CONTROLLED MANUAL BLOCK. Relieving Congestion by Signals on the Pennsylvania, W. M. Post. Ry. Age, vol. 78, no. 18, Apr. 4, 1925, pp. 881-884, 3 figs. Installation of controlled manual-block signaling postpones double tracking. Paper read before Signal Section, Am. Ry. Assn.

FIXED SIGNALS. Fixed Signals, Laigle. Int. Ry. Congress Assn.—Bul., vol. 7, no. 2, Feb. 1925, pp. 439-499, 6 figs. Principles of signaling for lines with dense traffic and for large stations; form of day and night signals; signal lights; automatic block signals.

INTERLOCKING. Electric Interlockers for Hump Yards, J. J. Corcoran. Ry. Signaling, vol. 18, no. 3, Mar. 1925, pp. 90-94, 11 figs. New York Central installs two plants at Castelton cutoff with high-speed switch machines having run-through features.

Inter-Control of Electric and Mechanical Functions at Interlocking Plants, T. Geo. Willson. Ry. Signaling, vol. 18, no. 4, Apr. 1925, pp. 150-151, 7 figs. S-8 electromechanical machine as manufactured by Union Switch & Signal Co. consists of standard Saxby and Farmer machine, above locking bed of which electric levers are supported and arranged.

Interlockings of New Chicago Station, Thos. Holt. Ry. Signaling, vol. 18, no. 3, Mar. 1925, pp. 95-101, 13 figs. Extensive layout, using electropneumatic system includes 5-indication position light signals, master release and progressive signaling.

METROPOLITAN RAILWAY CO., BRITAIN. Harrow to Rickmansworth Signalling, Metropolitan and Great Central Joint Line. Ry. Engr., vol. 46, no. 543, Apr. 1925, pp. 130-132 and 139, 7 figs. Second stage of biggest signaling installation done in England since before war was resignaling of Rickmansworth Station and provision of 3-aspect day color light signals thence to Harrow.

NORTHERN PACIFIC. A Fourteen-Year Signaling Program on 2,225 Miles or 76 Per Cent of N. P. Main Line, C. A. Christofferson. Ry. Signaling, vol. 18, no. 3, Mar. 1925, pp. 83-89, 8 figs. How program progresses; what automatic signals have accomplished; automatic block-signal system; satisfactory results from contracted construction.

RAILWAY TRACK

BALLAST, CRUSHED-STONE. Changes Made in Specifications for Crushed-Stone Railway Ballast. Rock Products, vol. 28, no. 6, Mar. 21, 1925, pp. 34-36. Revisions made by Am. Ry. Eng. Assn. at annual meeting in recommended standards.

BALLASTING. Canadian Pacific Ballasts Track at Rate of a Mile a Day. Ry. Eng. & Maintenance, vol. 21, no. 4, Apr. 1925, pp. 148-150, 8 figs. Work is performed uuder traffic, using separate gangs of men for each individual operation.

CROSSINGS. Level Crossings (Public Roads), H. P. Mass-Geesteranus. Int. Ry. Congress Assn.—Bul., vol. 7, no. 2, Feb. 1925, pp. 203-236, 17 figs. Dispensing with crossing keepers; visibility of trains from crossing; warning notices and signals; etc.

STRESSES. Fourth Progress Report of the Special Committee to Report on Stresses in Railroad Track. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 4, Apr. 1925, pp. 469-635, 103 figs. Report of tests on Chicago, Milwaukee and St. Paul Railway, and on Eastern railroads.

The Relation of Track to Stress, Geo. L. Fowler. Ry. & Locomotive Eng., vol. 38, no. 3, Mar. 1925, pp. 78-80, 5 figs. Indications that condition of track has important influence on intensity of lateral stresses imposed upon it.

RAILWAY YARDS

FREIGHT, DESIGN AND OPERATION. Freight Yard Design for Economies of Operation. Ry. Rev., vol. 76, no. 15, Apr. 11, 1925, pp. 685-689. Report of subcommittee of Committee on Yards and Terminals before Am. Ry. Eng. Assn., outlining general principles of yard design and operation which will make it possible, under proper supervision, to reduce to minimum period of time that train and engine crew of road freight train need be on duty before departing from their initial terminal and after arriving at their final terminal.

LIGHTING. Lighting the Pere Marquette Yards at Detroit. Ry. Elec. Engr., vol. 16, no. 3, Mar. 1925, pp. 87-89, 6 figs. Flood lighting lamps mounted on top of relatively low poles furnish good illumination.

SWITCHING YARDS. Shunting Yards, W. Simon-Thomas. Int. Ry. Congress Assn.—Bul., vol. 7, no. 2, Feb. 1925, pp. 237-311, 14 figs. partly on supp. plates. Shunting and marshalling yards for goods trains; layout and organization.

RAILWAYS

ROLLING STOCK, AXLEBOXES FOR. Reduction of the Cost of Traction: Lubrication of Axleboxes for all Rolling Stock, H. Fowler. Int. Ry. Congress Assn.—Bul. vol. 7, no. 2, Feb. 1925, pp. 313-388, 8 figs. Design and construction of axleboxes; arrangement of lubrication of axleboxes; coaching stock.

RAILWAYS

TEMISKAMING AND NORTHERN ONTARIO. Extension of Temiskaming & Northern Ontario Ry. Ry. Rev., vol. 76, no. 10, Mar. 7, 1925, pp. 411-422, 24 figs. Railway originally projected for agricultural development and colonization has opened large mineral and forest resources; construction of extension; bridges; brauch lines.

REFRIGERANTS

CONDENSATION OF. Condensation of Refrigerants W. H. Motz. Ice & Refrigeration, vol. 68, no. 3 Mar. 1925, pp. 238-240, 1 fig. Change of temperature heat-content, and volume of refrigerants during condensing process; a temperature-heat and volume-heat diagram; theoretical amount of heat removed; effect of actual conditions; formula for actual amount of heat; solution of typical problems.

REFRIGERATING PLANTS

NON-CONDENSABLE GASES. Non-Condensable Gases, B. E. Hill. Refrigeration, vol. 36, no. 3, Mar. 1925, pp. 44-49, 3 figs. Kinds and sources; various methods used for elimination; effects of non-condensable gases in a refrigerating system and economic importance of their removal. See also Ice & Refrigeration, vol. 68, no. 3, Mar. 1925, pp. 242-246, 3 figs.

PIPE CORROSION. Cause of Pipe Corrosion in Refrigerating Plants, D. L. Fagnan. South. Engr., vol. 43, no. 2, Apr. 1925, pp. 53-55, 1 fig. How to neutralize acidity in brine with an alkali, effect of strong electric currents in piping system and prevention of brine aerating.

REGULATORS

ARCA. Automatic Regulators. Engineer, vol. 139, no. 3613, Mar. 27, 1925, pp. 351-352, 6 figs. Describes regulators shown by British Arca Regulators, Ltd., at British Empire Exhibition.

RETAINING WALLS

REINFORCED-CONCRETE. Footings and Retaining Walls, B. A. Rich. Boston Soc. Civ. Engrs.—Jl., vol. 12, no. 2, Feb. 1925, pp. 84-88. Discussion of report on Joint Committee on Standard Specifications for Concrete and Reinforced Concrete.

RHEOSTATS

EXCITER-FIELD. Exciter Field Rheostats, J. F. Formanek. Gen. Elec. Rev., vol. 28, no. 2, Feb. 1925, pp. 125-128, 9 figs. Discusses accurate adjustment of excitation of alternators and proper control of exciter voltage.

RIVERS

MISSISSIPPI. How the Mississippi River Is Regulated, Chas. L. Potter. Eng. News-Rec., vol. 94, nos. 13, and 14, Mar. 26 and Apr. 2, 1925, pp. 508-514 and 556-559, 9 figs. History of control, with detailed description of various types of works in upper, middle and lower river. Suggested ways of controlling floods; why Mississippi River Commission sticks to "levees only" policy and does not advocate spillways, reforestation, reservoirs or contour plowing.

ROADS

SUPER-HIGHWAYS. The Detroit Super-Highway Project, D. L. Turner. Am. City Mag., vol. 32, no. 4, Apr. 1925, pp. 373-376, 2 figs. Super-highway not only provides for a cheaper form of rapid transit on rails and for ordinary highway motor traffic, but it will also furnish an express motor traffic highway upon which automobiles can travel continuously at a maximum speed with safety, because all grade-crossing interferences will be eliminated.

ROADS, CONCRETE

FORM SELECTION AND SETTING. Form Selection and Formsetting for Concrete Roads, C. N. Conner. Eng. News-Rec., vol. 94, no. 12, Mar. 19, 1925, pp. 477-478, 6 figs. Smooth roads closely related to good formwork; rigid forms and solid supports essential; setting methods important. (Abstract.) Paper presented before Am. Roads Bldrs.' Assn.

MAINTENANCE METHODS. Improved Methods Cut Upkeep Costs of Concrete Roads, H. J. Friedman. Eng. News-Rec., vol. 94, no. 13, Mar. 26, 1925, pp. 514-516, 3 figs. Special trailer heater coupled to service truck; mowing machine operated by motor truck saves 226 man-days on 38 miles.

ROADS, GRAVEL

DUST CONTROL. Dust Control on Gravel Roads in Michigan, B. C. Tiney. Eng. News-Rec., vol. 94, no. 14, Apr. 2, 1925, pp. 553-554, 1 fig. Asphaltic, oil, calcium chloride and bituminous surfacing used. Paper presented before Am. Road Bldrs. Assn.

ROLLING MILLS

CONTINUOUS. The Continuous Rolling Mill, L. D. Whitehead. Iron & Coal Trades Rev., vol. 110, nos. 2971 and 2972, Feb. 6 and 13, 1925, pp. 211-213 and 252-255, 10 figs. Brief history of origin of continuous rolling, its gradual development as illustrated by description of typical continuous and semi-continuous mills, author's own experience in operating mills of this type and, consideration of question as to how far conditions in England will permit application of system. Paper read before Staffordshire Iron & Steel Inst.

DRIVES. New Double Drive for a Reversing Two-High Rolling Mill. Iron & Coal Trades Rev., vol. 90, no. 2975, Mar. 6, 1925, pp. 385-386, 4 figs. Description of new form of drive for reversing mills in which pinions are dispensed with and each roll individually driven by a motor of half total power, and account of tests carried out by English Elec. Co., Lond., which satisfactorily demonstrated under most adverse conditions that claims made were realized in practice.

ELECTRIC DRIVE. Development of Electric Rolling Mill Drives (Die Entwicklung der elektrischen Walzwerkantriebe), F. Rohde. Elektrotechnische Zeit., vol. 46, nos. 7 and 8, Feb. 12 and 19, 1925, pp. 217-223 and 261-267, 52 figs. Development in Germany during last 10 years in design and general use of large motors for rolling-mill drive; Ilgner flywheel motor-generator system and Leonard method are standard; method of utilizing previously lost slip energy of induction motors by employing commutator machine which feeds this energy mechanically back into shaft of control motor; there are at present single-rotor motors in operation with maximum torque of 275 meter-tons and double-rotor motors with 330 metertons; illustrations of latest types of rolling-mill motors, accessories, connection diagrams and load curves, as examples of Siemens-Schuckert Works installations.

The Kraemer Group and Its Application in Control of Rolling Mill Train (Le groupe Kraemer dans son application à la commande d'un train de laminoirs), J. Marquin. Revue Générale de l'Electricité, vol. 17, no. 7, Feb. 14, 1925, pp. 261-264, 7 figs. Discusses Kraemer group, consisting of a three-phase motor and a. d. c. motor coupled to same shaft and a six-phase converter, and its application.

HOT ROLLING. Experimental Investigations of the Hot Rolling of Iron (Recherches expérimentales sur le laminage du fer à chaud), N. Metz. Revue de Métallurgie, vol. 22, nos. 1 and 2, Jan. and Feb. 1925, pp. 1-20 and 66-87, 67, figs. Continuation of experiments which were described in same journal (Mar. 1923); object of present research is to verify accuracy of author's method, and to study phenomenon of spreading of rolled pieces.

SOAKING PITS. Discussion: Electrically Heated Soaking Pits. Iron & Steel Engr., vol. 2, no. 3, Mar. 1925, pp. 129-136. Discussion of paper by T. F. Bailey published in Feb. issue of same journal.

ROPE DRIVE

PRACTICE. Modern Practice in Transmission of Power by Rope. Belting, vol. 26, nos. 1, 2 and 3, Jan., Feb. and Mar., 1925, pp. 31-34, 26-29 and 28-31, 29 figs. Jan.: Two systems used, their advantages and disadvantages; where and how to use them. Feb.: Wear of transmission rope; selecting brand; preventing shrinkage. Mar.: Advantages of splicing rope by hand over use of couplings, and how it is done.

RUBBER

VULCANIZATION. Note on the Theory of Vulcanization, D. F. Twiss. Chem. & Industry, vol. 44, no. 10, Mar. 6, 1925, pp. 106T-108T. Deals with certain features of vulcanization process, and embodies comments which appear sufficiently suggestive to deserve wider consideration.

S

SCRAP

DISPOSAL IN SMALL PLANT. The Scrap Problem in the Small Plant, R. C. Daniels. Factory, vol. 34, no. 3, Mar. 1925, pp. 414-416, 482, 484, 486, 488 and 490, 5 figs. Suggestions to small-plant executive for disposal of steel and iron scrap.

FERROUS, SPECIFICATIONS. Iron and Steel Scrap Specifications. Blast Furnace & Steel Plant, vol. 13, no. 3, Mar. 1925, pp. 115-119. Specifications for use by blast furnaces, steel plants and foundries.

SCREW MACHINES

TOOLING EQUIPMENT FOR PISTONS. Screw Machine Tooling for Two-piece Pistons, I. F. Yeoman. Machy. (N. Y.), vol. 31, no. 8, Apr. 1925, pp. 617-618, 4 figs. Aluminum-alloy pistons of 2-piece design in which closed end consists of separate cap screwed into body, are being finished at high production rate employing what is described as interesting set of tooling equipment in Foster No. 5 screw machine.

SCREW THREADS

WORM. The Worm with Threads Straight-sided on the Normal Section, E. A. Limming. Machy. (Lond)., vol. 25, no. 650, Mar. 12, 1925, pp. 757-760, 7 figs. Mathematical analysis.

SEAPLANES

SVENSKA AERO A. B. "S. II." A Swedish Reconnaissance Twin-Float Seaplane. Flight, vol. 17, no. 12, Mar. 19, 1925, pp. 158-160, 4 figs. Describes S. II, seaplane of Svenska Aero A.-B. of Stockholm; Rolls-Royce "Eagle" engine; top speed 115½ m. p.h.; span 59 ft. 6 in., length 41 ft. 6 in., wing area 567 sq. ft.

SEWAGE DISPOSAL

PLANTS. Sewage Disposal Plant for Milwaukee, T. C. Hatton. Can. Engr., vol. 48, no. 13, Mar. 31, 1925, pp. 365-366. Activated sludge process installed; plant cost eight million dollars; method employed for treating sludge described; cost of treating sewage.

SHEARS

PLATE. Progress in the Design of Plate Shears, H. Becker. Eng. Progress, vol. 6, no. 2, Feb. 1925, pp. 39-42, 4 figs. Appliances for guiding sheet-metal plates in plate shears; advantages of electric control.

SIGNALING

HIGHWAYS, RAILWAY METHODS FOR. Railway Signaling Methods for Public Roads, L. E. Moore. Eng. News-Rec., vol. 94, no. 4, Jan. 22, 1925, pp. 140-144, 7 figs. Universal adoption of light signals using railway system of indications, red for danger, yellow for proceed with caution, and green for proceed, is suggested, together with universal location of these lights not more than 7 or 8 ft. above roadway level.

SILVER WARE

MANUFACTURE. Modern Methods of Manufacturing Silver Ware. Can. Machy., vol. 33, no. 13, Mar. 26, 1925, pp. 15-17. Operations on presses and small rolling mills at Toronto plant of Wm. A. Rogers Co.

SLIDE RULES

LOGARITHMIC. Logarithmic Slide Rule for Sewers and Water Supply (Ein logarithmischer Rechenschieber für Kanalisation und Wasserversorgung), H. Bock. Schweizerische Bauzeitung, vol. 85, no. 10, Mar. 7, 1925, pp. 130-133, 6 figs. Details of methods for calculating canal profiles, quantity of water and velocity at any head and full profile, by means of slide rule, with examples.

SPRINGS

CUTTING AIRPLANE-STARTER. Cutting Airplane-Starter Spring from Solid Metal, P. T. Ash. Am. Mach., vol. 62, no. 14, Apr. 2, 1925, p. 538, 4 figs. Spring is made by boring and turning sleeve to proper thickness and then milling double thread clear through wall of cylinder.

DESIGN FOR MECHANICAL USE. Mechanical Springs, Jos. K. Wood Mech. Eng., vol. 47, no. 4, Apr. 1925, pp. 258-260. After defining mechanical spring and its material, author considers general cases of unit cube stretched by tensile force, of replacing cube by bar, and of applying load transversely; from these are established load-deflection-rate formulas for flexure and torsion; formulas for safe maximum load, deflection and work are derived in general terms containing constants which may be determined for stress method, material, form, etc.; adaptability of springs to requirements of mechanical design; states that general or collective method of treating mechanical springs should eliminate much of complexity and diversity of subject. (Abridged.)

STANDARDS

AUSTRIAN O. N. I. G. REPORTS. Report of Austrian Industrial Standards Committee (Normblattentwürfe). Elektrotechnik u. Maschinenbau, vol. 43, no. 12, Mar. 22, 1925, pp. 227-232, 4 figs. Proposed standards for slip-rings for electric machines, nipple threads, Edison threads, Edison lamp sockets, tube sockets, and single plugs for radio.

STEAM

HIGH-PRESSURE. Heating with High-Pressure Steam (Hochdruckdampfheizung), R. Tillmann. Chemiker-Zeitung, vol. 49, no. 4, Jan. 8, 1925, p. 35, 2 figs. To determine whether hot water or high-pressure steam heating is preferable, each case must be studied individually; in general, the lower the temperature required in apparatus to be heated, the greater the advantage for high-pressure steam; greatest economy is attained in those systems equipped with pump for returning condenser water to boiler.

STEAM ACCUMULATORS

RUTHS. Influence of Heat Accumulators in Steam Boilers (Der Einfluss der Wärmespeicher auf die Dampfkessel), H. E. Witz. Schweizerische Bauzeitung, vol. 85, no. 2, Jan. 10, 1925, pp. 18-21, 8 figs. Operation and advantages of hot-water accumulators, especially for plants with fluctuating steam consumption.

STEAM ENGINES

PROSSER RECIPROCATING. Test of a Prosser-Type Reciprocating Steam Engine, L. V. Ludy. Mech. Eng., vol. 47, no. 4, Apr. 1925, pp. 249-253 and (discussion) 253-255, 11 figs. Describes Prosser reciprocating steam engine and results of 53 trials made of it at Purdue University; distinctive feature of engine is steam jacketing; not only cylinder walls but heads, piston, piston rod, and valve case are steam-jacketed.

STEAM GENERATORS

BENSON SUPER-PRESSURE. Steam Generation under Critical Conditions, D. Brownlie. Chem. & Industry, vol. 44, no. 9, Feb. 27, 1925, pp. 213-219, 2 figs. Gives essential principles of Benson of steam generation, and its utilization at very high pressures and temperatures of superheat.

STEAM METERS

TYPES AND EFFICIENCY. The Measurement of Steam (Ueber Dampfmessung, etc.), H. Mittermayr. Wärme, vol. 48, nos. 5 and 6, Jan. 30 and Feb. 6, 1925, pp. 51-55 and 67-70, 9 figs. Measurement by means of flange, Gehre meter, mercury manometer and Rehnania meter; evaluation of formulas; accuracy of measurements; comparison of efficiency of apparatus.

STEAM PIPES

CALCULATION. Calculation of Power Lines for Saturated Steam and Superheated Steam (Die Berechnung der Kraftleitungen für Sattdampf und Heiss-dampf), O. Denecke. Wärme, vol. 48, nos. 3, 4 and 5, Jan. 16, 23 and 30, 1925, pp. 28-32, 43-45 and 56-58, 4 figs. Numerical examples for calculation of steam piping; influence of pipe friction; influence of valve design on economy of installation; results of too narrow pipe.

INSULATION. Economies Effected by Insulating Train Steam Pipes, Wm. N. Allman. Ry. Mech. Engr., vol. 99, no. 3, Mar. 1925, pp. 160-161. Discusses three types of insulation.

STEAM POWER PLANTS

BANK BUILDING. Power Plant of the Cleveland Federal Reserve Bank Building, E. Douglas. Nat. Engr., vol. 29, no. 4, Apr. 1925, pp. 155-159, 8 figs. First private power plant to be installed in Cleveland business section for past 10 years. Equipment details of new installation and operating records of plant.

ECONOMIC OPERATION. Economic Operation of the Power Plant, H. D. Morgan. Power Plant Eng., vol. 29, no. 5, Mar. 1, 1925, pp. 285-287, 8 figs. Outline of tests which are necessary to run in order to operate plant efficiently.

FUEL ECONOMY. Fuel Economy in Steam Power Plants, J. B. C. Kershaw. Combustion, vol. 12, no. 3, Mar. 1925, pp. 197-199, 1 fig. Examination of arguments in favor of erection of superpower stations.

GERMAN DEVELOPMENTS. Latest Development in Steam-Plant Installation in Germany. Power, vol. 61, no. 13, Mar. 31, 1925, p. 495. Most noticeable advance is probably to be found in fact that advantage. of using different kinds of coal for different purposes is assuming general industro-economic importance; pressures over 600 lb. not desirable; steam storage gaining favor.

HEAT AND STEAM CONSUMPTION. Heat and Steam Consumption and Modern Steam Power Plants (Wärmeverbrauch, Dampfverbrauch und Beurteilung neuzeitlicher Dampfkraftanlagen), H. Heinze. Wärme vol. 48, no. 3, Jan. 16, 1925, pp. 25-27, 6 figs. Points out that in evaluation of steam power plant heat consumption and not steam consumption is important; advantages of high-pressure steam in comparison with separate steam and heat generation.

RAILWAY. Stationary Power Plants for Railroads, P. R. Duffey. Ry. Mech. Engr., vol. 99, no. 3, Mar. 1925, pp. 146-148, 3 figs. Brings out necessity of properly classifying plants and bringing them up to certain points of standardization as compared to other units in layout of shops, yards, etc.

STEAM TRAPS

INSTALLATION AND OPERATION. Traps Must be Properly Installed, H. A. Jahnke. Power Plant Eng., vol. 29, no. 8, Apr. 15, 1925, pp. 443-445, 8 figs. Points out that most difficulties encountered in care and operation of traps are due to conditions outside trap: trap troubles and remedy.

STEAM TURBINES

BLADES. Deterioration of Turbine Blading in Service, C. H. S. Tupholme. Power Plant Eng., vol. 29, no. 7, Apr. 1, 1925, pp. 387-388. Discussion by British engineers of causes and prevention.

BLADES, WEAR OF. Wearing of Turbine Blades. Nautical Gaz., vol. 108, no. 4, Jan. 24, 1925, pp. 100-102, 2 figs. Discusses wearing away of tubine blades under action of steam. Particulars of tests undertaken to obtain estimate of resistance of various materials to erosion by wet steam.

BLEEDER. Calculation of Steam Consumption of Bleeder Turbines for Heating Plants (Berechnung des Dampfverbrauches von Entnahmeturbinen für Heiz-ungsanlagen), V. Hüttig. Gesundheits-Ingenieur, vol. 48, no. 3, Jan. 17, 1925, pp. 25-27, 1 fig. Steam consumption of normal and bleeder turbines and its calculation based on Forner's method.

DESIGN. Large Steam Turbines, F. Hodgkinson. Mech. Eng., vol. 47, no. 3, Mar. 1925, pp. 186-188, Discussion of their economy and reliability and of present trend in design. (Abridged.)

DEVELOPMENTS. Problems of the Steam Turbine, B. F. Wells. Universal Engr., vol. 41, no. 1, Jan. 1925, pp. 16-20, 7 figs. Review of progress in past few years as typefied by developments of Westinghouse Elec. & Mfg. Co.

DISKS, BALANCING OF. The Static Balancing of Turbine Disks, M. Delaporte. Mar. Engr., vol. 48, no. 570, Mar. 1925, p. 114, 3 figs. Description of a method used by a well-known French firm. Translation of paper read before Association Technique Maritime et Aéronautique, 1924.

ENGLISH TYPES. Modern English Steam Turbines (Neuere englische Dampfturbinen), E. A. Kraft. Zeit. des Vereines deutscher Ingenieure, vol. 69, nos. 4, 6 and —, Jan. 24, 31 and Feb. 14, 1925, pp. 85-90, 115-123 and 185-191, 60 figs. Describes design and important details of turbines of following firms; C. A. Parsons & Co., English Electric Co., General Electric Co., Metropolitan Vickers Electrical Co., W. H. Allen Sons & Co., Belliss & Morcom, Btirish Electric Plant Co., British Thomson-Houston Co., J. Carmichael & Co., H. Howden & Co., G. & Weir. Tendencies of design.

HIGH-SPEED. Steam Turbine Evolution. Colliery Eng., vol. 2, no. 12, Feb. 1925, pp. 66-69, 6 figs. Describes 10,000-kw., 3000-r.p.m. Zoelly set operating in South Wales, as example of increased capacity of high-speed turbine sets.

LEAVING LOSS. Method for Determining the Leaving Loss of a Steam Turbine, B. C. Sprague. Power, vol. 61, no. 11, Mar. 17, 1925, pp. 419-420, 4 figs. Points out that most economical vacuum depends largely on amount of leaving loss, representing unused energy due to speed of steam leaving last row of blades; steam economy at given load is improved by raising vacuum up to point called limiting vacuum; beyond this higher vacuum results in increased steam consumption.

MEDIUM-SIZE. Medium Size Steam Turbines. South. Engr., vol. 43, no. 1, Mar. 1925, pp. 40-44, 8 figs. Features of design in turbines of from 500- to 3000-kw. capacity.

MULTIPLE-EXHAUST BLADING. Multiple Exhaust Blading in Steam Turbines, P. C. Eppelsheimer. Power Plant Eng., vol. 29, no. 5, Mar. 1, 1925 pp. 282-283, 3 fig. Details of units installed in 35,000-kw. units at Springdale and Colfax Station.

NON-CONDENSING. Power as a Byproduct of Process Steam, W. G. Diman. Power, vol. 61, no. 8, Feb. 24, 1925, pp. 286-287, 4 figs. Points out that condensing operation of prime movers is not always best; demand for exhaust steam makes non-condensing or bleeder operation advisable; combined power and heating plant gives highest efficiency; example of non-condensing turbine.

ROTORS. Oscillating Bendings of Steam-Turbine Rotors (Ueber Biegungschwingungen von Dampftur-binenlaufrädern), E. Oehler. Kruppsche Monatshefte, vol. 6, Jan. 1925, pp. 1-10, 14 figs. Disks or runners of high-speed turbines are subject to oscillating bendings following one frequency, depending on design and speed of turbine and several harmonics of this frequency. Theoretical investigation is followed by its application to a practical case. Line drawings and diagrams.

The Bending Oscillations of Steam Turbine Rotors (Ueber Biegungsschwingungen von Dampfturbinen-laufrädern), E. Oehler. Zeit. des Vereines deutscher Ingenieure, vol. 69, no. 11, Mar. 14, 1925, pp. 335-340, 20 figs. Describes phenomena of flutter oscillations; calculating methods are developed based on works of Stodola for trapezoidal disk profiles with rim and boss; shows agreement between test results and calculation.

STEEL

ALLOY. *See Alloy Steels.*

BLUE BRITTLENESS. Blue Brittleness (Zur Frage der Blausprödigkeit), E. Maurer and R. Mailänder. Stahl u. Eisen, vol. 45, no. 12, Mar. 19, 1925, pp. 409-423, 20 figs. Static and dynamic notch-bending tests at high and low temperatures; classification of blue-brittleness phenomena into cold and hot brittleness; influence of shape of specimen, speed of test, cold working and heat treatment; general consideration of notched-bar test; theorics of blue brittleness; occurrence of similar phenomena in other metals.

COMPONENTS, EFFECTS OF. Effects of Sulphur, Phosphorus, Carbons, Manganese and Silicon in Steel. Automotive Industries, vol. 52, no. 7, Feb. 12, 1925, p. 367. Explanation of reasons for presence of these different components in steel and cast steel.

IRON-CARBON DIAGRAM. The Iron-Carbon Diagram and the Most Important Structure Components of Carbon Steels (Das Eisen-Kohlenstoff-Diagramm und die wichtigsten Gefügebestandteile der Kohlen-stoffstähle), K. Daeves. Stahl u. Eisen, vol. 45, no. 12, Mar. 19, 1925, pp. 427-434, 20 figs. partly on supp. plates. Significance of lines and points of diagram; changes due to very rapid cooling and hardening; standard letter symbols; standard definition of structure components; importance of diagram. Report of Committee on Materials of Verein deutscher Eisen-hüttenleute.

METALLOGRAPHY OF. Heat Treatment and Metallography of Steel, H. C. Knerr. Forging—Stamping—Heat Treating, vol. 11, no. 3, Mar. 1925, pp. 95-102, 15 figs. Microconstituents of steel; critical points of steel and their manifestations. From practical course in elements of physical metallurgy.

SPECIAL. Special Steels, J. H. Andres. Iron & Coal Trades Rev., vol. 110, no. 2976, Mar. 13, 1925, pp. 427-428. Properties of steels in relation to their microstructure; effect of nickel, effect of chromium, and combined effect of nickel and chromium; transformation point in a ferro-nickel alloy; atomic repulsion and attraction; tempering alloy steels. Paper read before Cleveland Instn. Engrs.

TENSILE TESTING. Recent Developments in Tensile Testing, J. V. Howard. Roy. Soc.—Proc., vol. 107, no. A741, Jan. 1, 1925, pp. 113-125, 9 figs. Experimental work deals only with removal and re-application of tensile stress, without introducing further question of reversal of stress.

STEEL CASTINGS

COMPOSITION, IMPROVING UNIFORMITY OF. Improvement in the Uniformity of Composition of Electric Steel. Research Group News, vol. 1, no. 4, Jan. 1925, pp. 4-5. Effects of phosphorus, sulphur, carbon, manganese and silicon, showing why these elements should be maintained within proper bounds.

DIESEL-ENGINE. A Note on Diesel-Engine Castings, J. Edgar. Mech. World, vol. 77, no. 1993, Mar. 13, 1925, p. 169. Discusses advantages of use of semi-steel for such castings.

MANGANESE-STEEL. Making Hard Manganese Steel, H. Hermanns and H. Meixner. Foundry, vol. 53, no. 8, Apr. 15, 1925, pp. 323-325, 1 fig. Hardness and dependability of steel is contingent upon manganese content; loss by oxidation is reduced by adding ferromanganese in molten state; discusses thick wall castings.

MERCHANDISING, SCIENTIFIC AND ECONOMIC. Enlightening Consumer Is Foundryman's Task, W. J. Corbett. Foundry, vol. 53, Mar. 1, 1925, pp. 181-185, 7 figs. Points out what foundryman should know in selling castings and touches on efforts that have been made toward eliminating poor practices in design of castings, ways in which patternmaker may contribute to successful manufacture, paramount need of cost-keeping systems and methods of figuring selling price of castings, which will yield a profit.

SHRINKAGE CAVITIES. Keeping Shrinkage Cavities out of Castings. Research Group News, vol. 1, no. 4, Jan. 1925, pp. 2-3, 2 figs. Points out that there should be complete absence of internal cavities if there is to be any faith in ability of castings to withstatnd severe service; consumers should be sure that foundries observe every precaution in shaping of heads used on castings.

STRENGTH AT HIGH TEMPERATURES. Strength Properties of Steel Castings at Higher Temperature (Festigkeitseigenschaften von Stahlguss bei erhöhter Temperatur), A. Pomp. Giesserei-Zeitung, vol. 22, no. 5, Mar. 1, 1925, pp. 124-126, 6 figs. Tensile and notched-bar tests at 20 to 400 and 500 deg. on Bessemer, openhearth and electric steel castings in cast and annealed state.

THERMAL REFINEMENT. Thermal Refining of Steel Casting (Ueber däs thermische Vergüten von Stahlformguss), W. Schürmann. Giesserei-Zeitung, vol. 22, no. 3, Feb. 1, 1925, pp. 68-69, 6 figs. Improvement of grain structure of steel-casting ingots by proper annealing.

STEEL, HEAT TREATMENT OF

EQUIPMENT, IMPROVEMENTS IN. Improvements in Heat Treating Equipment, A. L. Green. Forging—Stamping—Heat Treating, vol. 11, no. 3, Mar. 1925, pp. 84-86, 3 figs. Heat-treating facilities of Buffalo Bolt Co. designed to assure accuracy and uniformity of product; underground storage and cooling tanks used.

LOCOMOTIVE STEEL. The Effects of Forging and Heat Treatment on Locomotive Steels. Ry. Engr., vol. 546, no. 542, Mar. 1925, pp. 98-101, 7 figs. Instructive consideration of effects of working steel, influence of temperature, forging effects, and treatment of steel castings.

MECHANICAL PROPERTIES, INFLUENCE ON. Influence of Heat Treatment on Mechanical Properties of Steel (Influence de la trempe sur les propriétés mécaniques après revenu), L. Guillet and A. Portevin. Revue de Métallurgie, vol. 22, no. 1, Jan. 1925, pp. 52-56, 1 fig. Carbon, nickel, nickel-chromium, and stainless steels were quenched in water, oil, and boiling saturated solution of sodium chloride, and were reheated afterwards to 500, 575 and 650 deg.; variations in hardness of nickel-chromium and stainless steels after reheating were not so definite as to point to optimum quenching temperature; in general, structures were martensitic after quenching and sorbitic after reheating; carbon steels showed evidence of troostite and ferrite after quenching in oil, and greater proportion of ferrite when quenched in salt solution.

METHODS. Heat-treatment of Steel with Special Reference to Production, J. W. Urquhart. Machy. (Lond.), vol. 25, no. 650, Mar. 12, 1925, pp. 745-748. Treatment of tool steels; manganese in tool steels; critical temperatures; faulty use of pyrometers; treatment of harder tool steels; constituents of new high-speed steels; hardening of so-called diamond steels.

NON-CORROSIVE. Heat-Treatment of Non-Corrosive Steel, Jos. K. Wood. Am. Mach., vol. 62, no. 15, Apr. 9, 1925, pp. 567-570, 2 figs. Theory of corrosion; chromium in composition of stainless steels; physical properties of non-corrosive steels; future trend.

PRINCIPLES. Facts and Principles Concerning Steel and Heat Treatment, H. B. Knowlton. Am. Soc. Steel Treating—Trans., vol. 7, no. 3, Mar. 1925, pp. 379-405, 15 figs. Discusses in fundamental way facts concerning wrought iron, cast iron, steel, and their heat treatment; also methods of testing quality or physical properties of these materials; tensile-test, impact tests, and hardness tests: hardening of steels; changes taking place in steel during heating and quenching.

THERMAL CURVES. Some Fundamental Factors for Obtaining Sharp Thermal Curves, C. Benedicks, K. G. Lund and W. H. Dearden. Am. Soc. Steel Treating—Trans., vol. 7, no. 4, Apr. 1925, pp. 445-456, 6 figs. Authors give guiding principles for obtaining more sharply defined thermal curves; salient points to be observed are: specimen should possess, as far as possible, spherical form, preferably pear-shape; thermo-junction must be located at center of sphere: obtaining of contact between thermo-junction and specimen is most important; etc.

TOOL STEEL. Heat-treatment of Steel with Special Reference to Production, J. W. Urquhart. Machy. (Lond.), vol. 25, no. 647, Feb. 19, 1925, pp. 648-650. Tool steels and their treatment; acid hardening of tool steel; warning or deformation; relief of warping and cracking strains; high-production alloy-steel tools.

STEEL, HIGH-SPEED

TESTS. Experiments With High-Speed Steels With and Without Cobalt (Recherche sur les aciers à coupe rapide avec et sans cobalt), K. Sasagawa. Revue de Métallurgie, vol. 22, no. 2, Feb. 1925, pp. 91-106, 37 figs. Details of expansion and hardness tests; microstructure; concludes that cobalt high-speed steels have advantage of a lower tempering temperature. Bibliography.

TOOL STEEL. High-Speed Tool Steel Containing Cobalt (Les aciers à outils à coupe rapide renfermant du cobalt), L. Guillet. Revue de Métallurgie, vol. 22, no. 2, Feb. 1925, pp. 88-91, 5 figs. Discusses composition of high-speed cobalt steels, and effect of cobalt, showing that it enables tempering at lower temperature.

STEEL MANUFACTURE

CONVERTER BEDS, JARRING. New Method for Production of Converter Bottoms on Jarring Machines (Neues Verfahren zur Herstellung von Konverterböden auf Rüttelmaschinen), F. Diesfeld. Stahl u. Eisen, vol. 45, no. 8, Feb. 19, 1925, pp. 259-261, 4 figs. New method according to which bottoms for basic or acid converters can be made by jarring; with this method, production costs are reduced and strength of bottoms is increased.

ELECTRIC-FURNACE. Steel Manufacture in the Electric Furnace (Fabrication de l'acier au four électrique), A. Reynaud. Revue de Métallurgie, vol. 22, no. 2, Feb. 1925, pp. 57-65. Review of book published by F. T. Sisco giving an impartial view of acid and basic working and advantages of electric furnace.

SCRAP, USE. The Use of Scrap in Iron and Steel Manufacture, J. E. Fletcher. Iron & Coal Trades Rev., vol. 110, no. 2976, Mar. 13, 1925, pp. 441. An estimation of approximate amount of scrap annually thrown upon world's markets is very difficult, but author examines effects of an estimated percentage return of manufactured material. Influence of scrap on sulphur content. Pub. by permission Brit. Cast Iron Research Assn.

SULPHUR REMOVAL. Some Factors Affecting the Elimination of Sulfur in the Basic Open-hearth Process, C. H. Herty, Jr., A. R. Belyea, E. H. Burkart and C. C. Miller. Am. Inst. Min. & Met. Engrs.—Trans., no. 1436-C, Mar. 1925, 21 pp., 3 figs. Results of experiments covering following subjects: (1) distribution ratio of sulphur between gas and slag; (2) rates of absorption of sulphur by slags from gases high in sulphur, and rates of desulphurization of slags by gases free from sulphur.

STEEL WORKS

AUXILIARY MOTOR CONTROL. Auxiliary Motor Control, W. W. Garrett, Iron & Steel, Engr., vol. 2, no. 2, Feb. 1925, pp. 89-93, 20 figs. Consideration of proper adjustment most suitable to particular requirements of individual mill auxiliaries; this discussion of auxiliary control refers primarily to controls for manipulating or intermittent drives.

STOKERS

LOCOMOTIVE. The Standard Stoker. Ry. & Locomotive Eng., vol. 38, no. 3, Mar. 1925, pp. 65-70, 8 figs. Details in regard to simplification of its construction and efficiency of operation.

STONE

DECAY. Stone Decay and the Preservation of Buildings, A. P. Laurie. Chem. & Industry, vol. 44, no. 9, Feb. 27, 1925, pp. 86-92, 4 figs. Influence of calcium sulphate in promoting stone decay.

STRESSES

MATERIALS UNDER HIGH PRESSURE. Properties of Matter Under High Pressure, P. W. Bridgeman. Mech. Eng. vol. 47, no. 3, Mar. 1925, pp. 161-169, 23 figs. Phenomena observed when using hydrostatic pressures of order of several hundred thousand pounds per square inch; methods of packing and of measuring pressures; conditions under which materials rupture under high pressure, etc.

STREET RAILWAYS

TRACK. Precast Concrete Paving. Elec. Ry. Jl., vol. 65, no. 13, Mar. 28, 1925, pp. 505-506, 7 figs. Particulars of method of track construction using precast slabs of reinforced concrete for paving between and alongside rails, used by Willapa Elec. Co., Raymond, Wash.; paving maintenance costs are less; noise of operation reduced.

Track Reconstruction Cost Reduced by Use of Modern Equipment, A. Taurman. Elec. Ry. Jl., vol. 65, no. 14, Apr. 4, 1925, pp. 537-540, 11 figs. Rail pre-welded in lengths up to 3180 ft. was installed by Birmingham Elec. Co. without interruption to service; joints were thermit welded under pressure pzoduced by special clamps; concrete mixed at a central plant was transported and poured from an end-dumping rail car.

STRUCTURAL STEEL

COST COMPUTING. Knowing Better than Guessing when Bidding for Contract. Iron Trade Rev., vol. 76, no. 13, Mar. 26, 1925, pp. 813-819. Estimates not consciously below cost, but ignorance of cost methods brings losses to fabricators; estimating on pound basis is unsafe. Abstract of report presented by Am. Inst. Steel Constr. on fundamentals of uniform method of computing costs in structural steel industry.

STRESSES. Final Report of the Special Committee on Stresses in Structural Steel. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 3, Mar. 1925, pp. 392-405 Part. I; Feasibility of conducting stress measurements; Part II: Working stresses for structural steel in buildings and similar structures.

SUBSTATIONS

MERCURY-VAPOR-RECTIFIER. Automatic and Semi-Automatic Mercury-Vapour Rectifier Substations, G. Rogers. Instn. Elec. Engrs.—Jl., vol. 63, no. 338, Feb. 1925, pp. 157-172 and (discussion) 173-189, 18 figs. Discusses principal features of mercury-vapor rectifier, and describes number of novel and successful applications of use of automatic and semi-automatic mercury-vapor substations, designed for developing efficient d.c. supply to areas remote from existing sources of supply; arrangements for automatic and semi-automatic control; sites and buildings for different types of substations.

SULPHUR

INDUSTRIAL USES. Sulphur, An Industrial Necessity, H. C. Lint. Chem. & Met. Eng., vol. 32, no. 9, Mar. 1925, pp. 364-369, 15 figs. Manufacture and uses of sulphuric acid; uses of sulphur in papermaking and other industries.

SULPHURIC ACID

CHAMBER PROCESS. Absorption of Nitrogen Oxides in the Chamber Acid Process, Geo. E. Beavers. Chem. & Met. Eng., vol. 32, no. 7, Feb. 16, 1925, pp. 280-282, 4 figs. Relation of principal variables of temperature, purity and concentration of sulphuric acid to absorptive efficiency.

MANUFACTURE. Intensive Production of Sulphuric Acid, P. Parrish. Chem. Age (Lond.), vol. 12, no. 295, Feb. 7, 1925, pp. 128-129, 4 figs. Describes new patented process of E. A. Gaillard, of Barcelona, and discusses its working results and application to existing plants.

SURVEYING

INSTRUMENTS. Development and Manufacture of Surveying and Other Engineering Instruments, W. L. Egy. Am. Water Wks. Assn.—Jl., vol. 13, no. 2, Feb. 1925, pp. 193-200. Description of some of the problems encountered in developing a suitable design, in finding proper materials to use, and improving workmanship of a transit.

QUANTITY. The Benefits of Quantity Surveying H. N. Mason. Can. Engr., vol. 48, no. 7, Feb. 17, 1925, pp. 239-240. Method of taking off quantities which is now being introduced in Canada; advantages of method. Paper presented at Assn. Can. Bldg. & Construction Industries. See also Contract Rec. & Eng. Rev., vol. 39, no. 5, Feb. 4, 1925, pp. 102-104.

T

TELEPHONY

CARRIER. Carrier Telephony on High Voltage Power Lines, M. V. Wolfe. Bell System Technical Jl., vol. 4, no. 1, Jan. 1925, pp. 152-177, 27 figs. High-frequency attenuation of Power Lines; high-frequency characteristics of power transformers; coupling between carrier equipment and power line; design of carrier equipment; signaling system; coupling by condensers and by distributed capacity; protective measures; transmission level characteristics.

TRANSMISSION STANDARDS. Telephone Transmission Standards, F. Breisig. Electrician, vol. 94, no. 2437, Jan. 30, 1925, pp. 114-115. Natural versus transmission unit system; reasons for not adopting latter.

TELEVISION

BAIRD SYSTEM. Television, J. L. Baird. Wireless Wld., vol. 15, no. 17, Jan. 21, 1925, pp. 533-535, 3 figs. Description of Baird system by its inventor.

TEMPERATURE CONTROL

CRYOSTATS. A Sensitive Temperature Control for a Cryostat Working Between—180° and 0° C., L. C. Jackson. Jl. Sci. Instruments, vol. 2, no. 5, Feb. 1925, pp. 158-160, 1 fig. Describes a sensitive temperature control, involving use of triode valves, whereby any temperature between—180 deg. and 0 deg. cent. can be maintained constant by means of a cryostat of type described by Keyes and Young with an accuracy of about 0·.01. Device is also applicable to other than low temperatures.

TEMPERATURE MEASUREMENT

STEAM PIPE LINE. Pipe Line Temperature Measurements, E. S. Bristol. Optical Soc. Am.—Jl., vol. 10, no. 2, Feb. 1925, pp. 243-251, 3 figs. Investigation for purpose of acquiring better understanding of errors involved in applying electrical temperature indicator or recorder to commercial superheated steam pipe line; for saturated steam, temperature of well-covered pipe is only 1 or 2 deg. fahr. below that of steam, so that no appreciable errors should arise except those inherent in measuring apparatus.

TERMINALS, LOCOMOTIVE

CONSTRUCTION. Locomotive Sheds, R. E. L. Maunsell. Int. Ry. Congress Assn.—Bul., vol. 7, no. 2, Feb. 1925, pp. 501-570, 30 figs. Arrangement of locomotive sheds; installations for inspecting engines, for washing out boilers and blowing through tubes, for lighting up of engines and getting rid of smoke, and for loading fuel on engines; mixing fuels; disposal of ashes.

NEW YORK CENTRAL, SELKIRK, N. Y. New Engine Terminal of the New York Central Railroad at Selkirk, N. Y. Ry. Rev., vol. 76, no. 10, Mar. 7, 1925, pp. 426-443, 27 figs. Modern buildings with improved facilities arranged to accommodate freight power of four divisions.

ORGANIZATION OF. The General Organization of Running Sheds. Engineer, vol. 139, no. 3610, Mar. 6, 1925, pp. 260-263, 13 figs. Notes relating to running shed having about 50 engines in steam daily, engaged in general, that is, local and main-line freight and passenger work; subject considered under headings of organization, operation, and repairs.

TESTING MACHINES

PENDULUM BEARING TESTER. Pendulum Bearing Tester, L. C. Price. Sibley Jl. of Eng., vol. 39, no. 1, Jan. 1925, pp. 239-241, 4 figs. Describes machine designed and built by Dept. Experimental Eng., of College of Eng., to make friction tests of some small pulley-block bushings.

TESTS AND TESTING

VALUE OF. The Value of Some Workshop and Laboratory Tests. Metallurgist (Supp. to Engineer), Feb. 27, 1925, pp. 25-27. Review of discussion on testing of engineering materials head by West Yorkshire Met. Soc.

TEXTILES

HEAT-INSULATING PROPERTIES, TESTING. Specifications for Constructing and Operating Heat-Transmission Apparatus for Testing Heat-Insulating Value of Fabrics, P. D. Sale. U. S. Bur. Standards, Technologic Paper No. 269, 1924, pp. 595-607, 6 figs. Detailed specifications for construction and operation of an apparatus which has proven satisfactory for this type of test; gives electric wiring diagrams for power and measurement circuits.

TEXTILE MACHINERY

CARDED-YARN PROCESS. Textile Machines, L. Börnstein. Eng. Progress, vol. 6, no. 2, Feb. 1925, pp. 45-47, 5 figs. Description of carded-yarn process; details of willow, carding engine, ring-spinning frame, and ring-twining frame.

ELECTRIC CONTROL. Textile Machinery Mechanisms, F. Nasmith. Electrician, vol. 96, no. 2441, Feb. 27, 1925, pp. 230-231, 3 figs. Place of electric control in their operation; speedy reproduction of designs by electrical means.

TEXTILE MILLS

BUILDING DESIGN. Extension to Textile Mill at Tallassee, Ala. Eng. News-Rec., vol. 94, no. 5, Jan. 29, 1925, pp. 202-203, 2 figs. Column spacing, size and height of building all determined by manufacturing processes and machinery layout; tarred sand between wood floor aud concrete slab.

Electric Drive. Spinning and Weaving Mills, H. Fuhrken. Electrician, vol. 94, no. 2441, Feb. 27, 1925, pp. 235-237, 7 figs. Modern methods of electric driving used in Germany; careful installation essential.

The Driving of Spinning Frames. Electrician, vol. 96, no. 2441, Feb. 27, 1925, pp. 239 and 245, 3 figs. Advantages of possible types of motors; starting and speed control factors.

Engineering Principles, Application in. Application of Engineering Principles to Economic Problems in the Textile Industry. Mech. Eng., vol. 47, no. 4, Apr. 1925, pp. 274-276. Discussion of paper by E. Szepesi published in Mid-November 1924, issue of Journal.

Prime Movers for. Developments in Textile Power-Plant Prime Movers. South. Engr., vol. 43, no. 1, Mar. 1925, pp. 35-38, 10 figs. How water wheels, engines and turbines are operated in same plant, representing oldest and latest type of prime movers.

Steam-Waste Elimination. Operating Plan Cuts Industrial Steam Loss, H. M. Burke. Power Plant Eng., vol. 29, no. 8, Apr. 15, 1925, pp. 424-427, 6 figs. Recording instruments, power despatching and bonus system for steam saving make it possible to have accurate plant records, to trade power losses, to revise operating practices and secure co-operation in textile finishing plant. Paper read before New Haven Section of A.S.M.E.

Weaving Sheds, Drive for. Modern Weaving Shed Operation. Electrician, vol. 96, no. 2441, Feb. 27, 1925, pp. 238 and 245, 3 figs. Comparisons of mechanical and electrical drive; some essentials in employment of gearing.

THERMIT WELDING

Steel Works. Thermit Welding, H. D. Kelly. Iron & Steel Engrs., vol. 2, no. 3, Mar. 1925, pp. 119-121, 11 figs. Author gives results of his practical experiences with thermit process in steel industry.

THERMODYNAMICS

Tables and Charts. Thermodynamic Tables and Charts, G. T. Voorhees. Ice & Refrigeration, vol. 68, no. 1, Jan. 1925, pp. 75-79, 3 figs. Author claims that practically all thermodynamic tables and charts are seemingly in error because of apparently unsound premise on which they are based.

THERMOMETERS

Platinum-Resistance. Platinum-Resistance Thermometry at Low Temperatures, M. S. Van Dusen. Am. Chem. Soc.—Jl., vol. 47, no. 2, Feb. 1925, pp. 326-332. Simple modification of Callendar equation used in platinum-resistance thermometry above 0 deg. is given, which will express accurately resistance of platinum as function of temperature on thermodynamic throughout range 0 deg. cent. to —190 deg; recalculations of data on resistance thermometers at low temperatures obtained by Reichsanstalt and Bureau of Standards, showing modified equation, expresses experimental results within error of observation.

TIMBER

Conservation of Resources. Preservation of Forest Products, H. von Schrenk. New England R. R. Club, Jan. 13, 1925, pp. 213-246 and (discussion) 246-250, 4 figs. Notes on timber resources of United States and what is being done to conserve them.

TOOLS

Forming, Circular. Circular Forming Tool Dimensions, L. W. Close. Machy. (N. Y.), vol. 31, no. 8, Apr. 1925, pp. 630-632, 3 figs. Describes method with which forming tools of any shape may be easily designed and no correction is necessary after sample pieces have been cut.

TORSIONMETERS

Direct-Vision. The Denny-Edgecombe Direct Vision Torsionmeter. Engineer, vol. 139, no. 3612, Mar. 20, 1925, pp. 345-349, 14 figs. Details of non-electrical torsionmeter manufactured by Kelvin Bottomley & Baird, Glasgow.

TRANSFORMERS

Design. The Design of New Transformers to Operate in Parallel with Existing Transformers, S. A. Stigant. Elec. Rev., vol. 96, no. 2467, Mar. 6, 1925, pp. 365-367, 3 figs. Features that are involved in design of transformers for parallel operation.

Oil, Corona in. Corona in Oil, A. C. Crago and J. K. Hodnette. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 3, Mar. 1925, pp. 219-222, 7 figs. Experiments made to determine certain effects of high local voltage stresses in transformer oil; resistivity of oil was measured by special method immediately following period of voltage stress; results were: (1) greatly reduced resistivity when stressing voltage was greater than that producing visible corona; (2) gradual increase in resistivity following removal of stress.

Oil Maintenance Methods. Oil Maintenance Methods. M. Linn. Elec. World, vol. 85, no. 16, Apr. 18, 1925, pp. 819-821. Decreasing service interruptions by care of switch and transformer insulating oil; chemical changes not restored by present filtering methods; experiences on Duquesne light system.

1,000,000-Volt Cascade. Development and Characteristics of a 1,000,000-Volt Cascade Transformer at California Institute of Technology, R. W. Sorensen. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 4, Apr. 1925, pp. 373-378, 13 figs. Described cascade connection for transformers, and shows standard characteristics of such equipment.

TRANSPORTATION

International Aspects. Recent Developments in the International Aspects of Transportation, H. O. Mance. Inst. Transport—Jl., vol. 6, no. 4, Feb. 1925, pp. 223-232 and (discussion) 232-238. Discusses effects of division of different parts of transport system into national areas; restrictions due to crossing frontiers; other problems and regulations.

Rate Making. Rate-Making in Great Britain and the U. S. A., J. G. Smith. Inst. Transport—Jl., vol. 6, no. 3, Jan. 1925, pp. 205-208. Determines, as far as possible, what general principles underlie transport rate making in Great Britain and United States and examines briefly recent attempts in each of these countries to embody these principles in legislation.

TUBES

Brass and Copper, Manufacture. The Manufacture of Brass and Copper Tubes, G. Evans. Metal Industry (Lond.), vol. 26, no. 10, Mar. 6, 1925, pp. 229-230, 3 figs. Main equipment and methods of pickling department, drawing interesting comparisons between English, French, and Italian practice.

Strip Stock. Tubing Made from Strip Stock, Chas. O. Herb. Machy. (N.Y.), vol. 31, no. 8, Apr. 1925, pp. 602-605, 8 figs. How flat stock is rolled and sweated into double-wall tubing.

TUNNELS

Florence Lake, California. Construction of 13-Mile Florence Lake Tunnel Sets Many Records. Jl. of Elec., vol. 54, no. 5, Mar. 1, 1925, pp. 161-165, 8 figs. Main features of construction of large power tunnel built by South. Cal. Edison Co. in connection with Big Creek development.

Lining. Lining the Connaught Tunnel, C. P. Ry. Ry. Rev., vol. 76, no. 11, Mar. 14, 1925, pp. 491-497, 12 figs. Account of lining world's largest double track tunnel through Selkirk, at Glacier, B.C.

Plugging High-Pressure. Plugging a High Pressure Tunnel, Buffalo Filter Plant, C. S. Rindsfoos. Eng. News-Rec., vol. 94, no. 16, Apr. 16, 1925, pp. 641-643, 2 figs. Water-bearing shaft to tunnel under 66-ft. head; balancing pressure difficult; third trial method successful.

Ventilation. Ventilating the New Liberty Tunnel in Pittsburgh, A. McGenagle. Elec. Jl., vol. 22, no. 3, Mar. 1925, pp. 102-108, 11 figs. System of ventilation; direction of air in tubes is always with traffic; half of each tube from entrance to mid-length is ventilated by exhaust fans bringing fresh air from entrance; current for operation of fans, lighting, etc. is obtained from several sources; lighting of tunnel; traffic conditions.

V

VALVES

Engine Tests of Steel for. Valves (Note sur les soupapes), M. Mahoux. Revue de Métallurgie, vol. 22, no. 1, Jan. 1925, pp. 29-51, 16 figs. Study of behavior of exhaust valves; tests of alloy steels used in making valves.

Pressure-Reducing. How to Select a Pressure-Reducing Valve, W. Sommer. Heat. & Vent. Mag., vol. 22, no. 3, Mar. 1925, pp. 59-61, 4 figs. Based upon article by A. Eigenmann in Gesundheits-Ingenieur, Sept. 16, 1924.

VARNISHES

Hardness of Films. A Study of the Hardness of Varnish and Other Films, H. A. Gardner and H. C. Parks. Paint Mfrs'. Assn. of U. S., Circular No. 228, Mar. 1925, p. 195-205, 16 figs. Describes various methods that have been proposed for determining hardness of films, together with apparatus devised for this purpose.

The Swinging Beam Method of Testing Varnish Films, P. Walker and L. L. Steele. Paint Mfrs'. Assn. of U. S., Circular No. 229, Mar. 1925, pp. 207-219, 5 figs. Describes device which will classify varnishes in order of hardness of a dried varnish film and furnish a practical measure of that property.

Synthetic Lacquers. Synthetic Lacquers and Insulating Compounds (les laques synthétiques et les progrès qu'elles ont permis de réaliser dans l'électro-technique), R. van Muyden. Revue Générale d'Electricité, vol. 17, nos. 5 and 6, Jan. 31 and Feb. 7, 1925, pp. 173-178 and 228-233, 9 figs. Reviews history of synthetic-lacquer industry in general and describes its gradual development in France and its noteworthy accomplishments; describes various manufacturing methods, starting with different raw materials; physical and chemical properties of these compounds, with particular reference to their resistivity to water, oil and vibrations; new French product, called "isole-mail," is specially suited for electrical purposes, such as impregnation of motor windings and transformer coils; advantages of this lacquer over ordinary varnish treatment.

VENTURI METERS

Obstruction in. An Obstructed Venturi Meter, Rob. W. Angus. Power, vol. 61, no. 14, Apr. 7, 1925, pp. 532-533, 2 figs. Describes how large piece of wood lodged in upstream cone of meter which was 6-in. tube with 3-in. throat used by Mimico, Ont., for measuring amount of municipal supply furnished them by New Toronto, Ont.; water bill corrected by calibrating venturi meter with obstruction in place.

VISCOSITY

Liquids, Coefficient of. Measuring the Co-efficient of Viscosity in Absolute Value (Sur la mesure des coefficients de viscosité en valeur absolue), G. Baume. Chaleur & Industrie, vol. 5, no. 56, Dec. 1924, pp. 638-642, 4 figs. Discusses principle of experimental determination, and apparatus used; describes new viscosimeter with which absolute viscosity is calculated in dyne per cm^2.

W

WAGES

Production Merit Bonus Plan. Reducing Operating Costs, J. F. Sherman. Paper Trade Jl., vol. 80, no. 11, Mar. 12, 1925, pp. 63-65. Discusses obtaining of greatest degree of efficiency co-operation through shop forces. Describes Production Merit Bonus Plan, a satisfactory and economic method of wage payment.

WASTE HEAT

Utilization. Utilizing Waste Heat in Local and District Heating Plants (Die Abwärmeverwertung in Orts- und Fernheizwerken), C. Eberle. Gesundheits-Ingenieur, vol. 48, no. 10, Mar. 7, 1925, pp. 109-119, 27 figs. Discusses waste heat from industrial furnaces, internal-combustion engines, steam engines, electric centrals, etc.; heat transmission and piping; progress in utilization for heating.

Utilization. Waste-Heat Utilization, E. Blau. Power, vol. 61, no. 14, Apr. 7, 1925, p. 552, 3 figs. Describes apparatus for use of waste gases to preheat water; Petersen waste-heat boiler; waste heat for drying purposes in driers of tower type, and to produce steam for gas generation; waste gases used to pre-heat feedwater and air at same time; etc. (Abstract.) Translated from Helios.

Waste-Heat Utilization in Heating Plants (Die Abwärmeverwertung in Orts- und Fernheizwerken), Chr. Eberle. Zeit. des Vereines deutscher Ingenieure, vol. 69, nos. 10 and 12, Mar. 7 and 21, 1925, pp. 297-301 and 376-381, 28 figs. Desiderata for utilization of waste heat from industrial furnaces and from internal-combustion engines, as well as exhaust steam from steam engines; gives examples showing economic importance of waste-heat utilization.

WATER GAS

Pier Process. Use of Illinois Coal with the Pier Process, M. P. Novak. Gas Age Rec., vol. 55, no. 13, Mar. 28, 1925, pp. 441-444, 3 figs. It is found that by application of Pier process very substantial improvement in set capacity is obtained, such that it very closely approaches capacity of good coke operation, and considerable improvement in economy is obtained; various designs of Pier are outlined; operating results.

WATER POWER

Canada. Preliminary Water Power Investigations, B. M. Beale. Can. Engr., vol. 48, no. 14, Apr. 7, 1925, pp. 381-384. Water power resources in Dominion estimated to justify turbine installation of 40 million horsepower; hydrometric surveys, land surveys and hydraulic studies. Paper read before Assn. Dominion Land Surveyors, Ottawa.

Water Power Resources of Canada. Contract Rec., vol. 39, no. 14, Apr. 8, 1925, pp. 340-343. Review of water-power resources of Dominion, based on systematically collated data from federal, provincial and private sources. Figures are conservatively taken, and may be regarded as representing minimum possibilities.

WATER PURIFICATION

Methods. Water Pure and Otherwise, F. J. Browne. Can. Inst. Min. & Metallurgy.—Trans., vol. 28, Mar. 1925, 10 pp. Deals with impurities caused by solids in suspension and bacteriological impurities and makes suggestions for their removal.

WATER TREATMENT

Chlorination. New Type of Chlorinating Apparatus at Albany Water-Works, T. Horton. Eng. News-Rec., vol. 94, no. 16, Apr. 16, 1925, pp. 650-651, 2 figs. Control valve, pressure gage, U-tube manometer and rate-of-flow chart based on pressure loss and density of gas.

WATER WORKS

Quebec, Canada. Water Works Practice in Quebec, T. J. Lafrenière. Contract Rec., vol. 39, no. 10, Mar. 11, 1925, pp. 236-238. History of development of municipal water works from time of Montreal's first installation in 1800; number of purification plants at present time; operating practice.

WELDING

Electric. *See Electric Welding; Electric Welding, Arc; Thermit Welding.*

Handling of Gases for. Safe Handling and Use of Welding Gases, G. D. Carter. Am. Welding Soc.—Jl., vol. 4, no. 2, Feb. 1925, pp. 17-24. Discusses receiving, storage and transportation of oxygen cylinders; hazards in use of oxygen about furnaces in steel plants and foundries and ways of avoiding them.

WIND

Velocity in Conical Ducts. Velocity of Wind in Conical Ducts, A. Thom and J. Small. Engineer, vol. 139, no. 3610, Mar. 6, 1925, pp. 262-263, 13 figs. Investigation of suggestion that modern windmill might be much improved in matter of power developed with given diameter of wheel by directing wind upon wheel through conical duct.

WIND TUNNELS

Air Balance and. New Air Balance and Small Wind Tunnel, A. Merrill. Aviation, vol. 18, no. 13, Mar. 30, 1925, pp. 350-351, 2 figs. Characteristics of new balance developed by author and its operation.

WINDING ENGINES

Electric. Three-Phase Electric Winders, Schade. Iron & Coal Trades Rev., vol. 90, no. 2975, Mar. 6, 1925, p. 398. Describes safety-device developments in Germany. Translated from Deutsche Bergwerks Zeitung.

WINDMILLS

Airplane-Type Propeller. Progress in the Utilization of Wind Power for the Generation of Electrical Energy (Ein Fortschritt in der Ausnutzung der Windkraft zur Erzeugung elektrischer Energie), H. Nottelmann. Elektrotechnische Zeit., vol. 46, no. 11, Mar. 12, 1925, pp. 365-368, 6 figs. Rapid development of aerodynamics, brought about by airplane practice, has been responsible for radically different wind turbine recently designed and built; main characteristic of windmill is 4-vane propeller, similar to airplane type; first of these mills has been erected on tall, slender tower constructed of reinforced concrete and gives with wheel of 19-sq. m. surface average output of 10 kw.; switchboard with 4 relays makes entire plant fully automatic.

WIRE DRAWING

Six-Block Continuous. Six-Block Continuous Wire Drawing. Iron Age, vol. 115, no. 14, Apr. 2, 1925, pp. 972-973, 4 figs. Differential gearing arranged to handle blocks without undue tension or slackness in wire; dry drawing to no. 21 wire.

WIRE ROPE

Manufacture. Manufacturing Wire Rope and Cable, H. Horsfall. Can. Machy., vol. 33, nos. 11 and 12, Mar. 12 and 19, 1925, pp. 19-22 and 13-16, 12 figs. Brief description of drawing of wire from 800 B.C. to present day. Outlines methods by which the different qualities of steel wire rope is made.

WOOD

Decay. The Diagnosis of Decay in Wood, E. E. Hubert. Jl., Agricultural Research, vol. 29, no. 11, Dec. 1, 1924, pp. 523-567, 17 figs. Discusses stages of decay, decay processes, classification of wood rots, microscopical and cultural characters of decay.

WOOD PRESERVATION

Impregnation. A One-Movement Process for Impregnating Timber with Zinc Chloride and Petroleum Oils, A. M. Howald. Wood Preserving News, vol. 3, no. 2, Feb. 1925, pp. 26-27. Process worked out at Mellon Inst. of Indus. Research of University of Pittsburgh; by employing emulsion of zinc chloride solution in petroleum fuel oils, timbers have been impregnated satisfactorily with oil and zinc chloride in one movement; method of operating, including equipment required, has been worked out and cost data assembled.

WOODWORKING MACHINES

Planing and Dovetailing. Wood Planing and Dovetailing Machines. Engineering, vol. 119, no. 3090, Mar. 20, 1925, pp. 367-368, 2 figs. Machine of four-cutter type capable of panel planing, thicknessing and molding; and semi-automatic dovetailing machine which can be used to make either secret or open dovetails.

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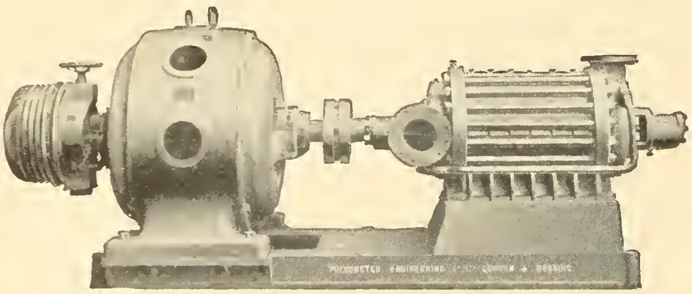
Reading, England.



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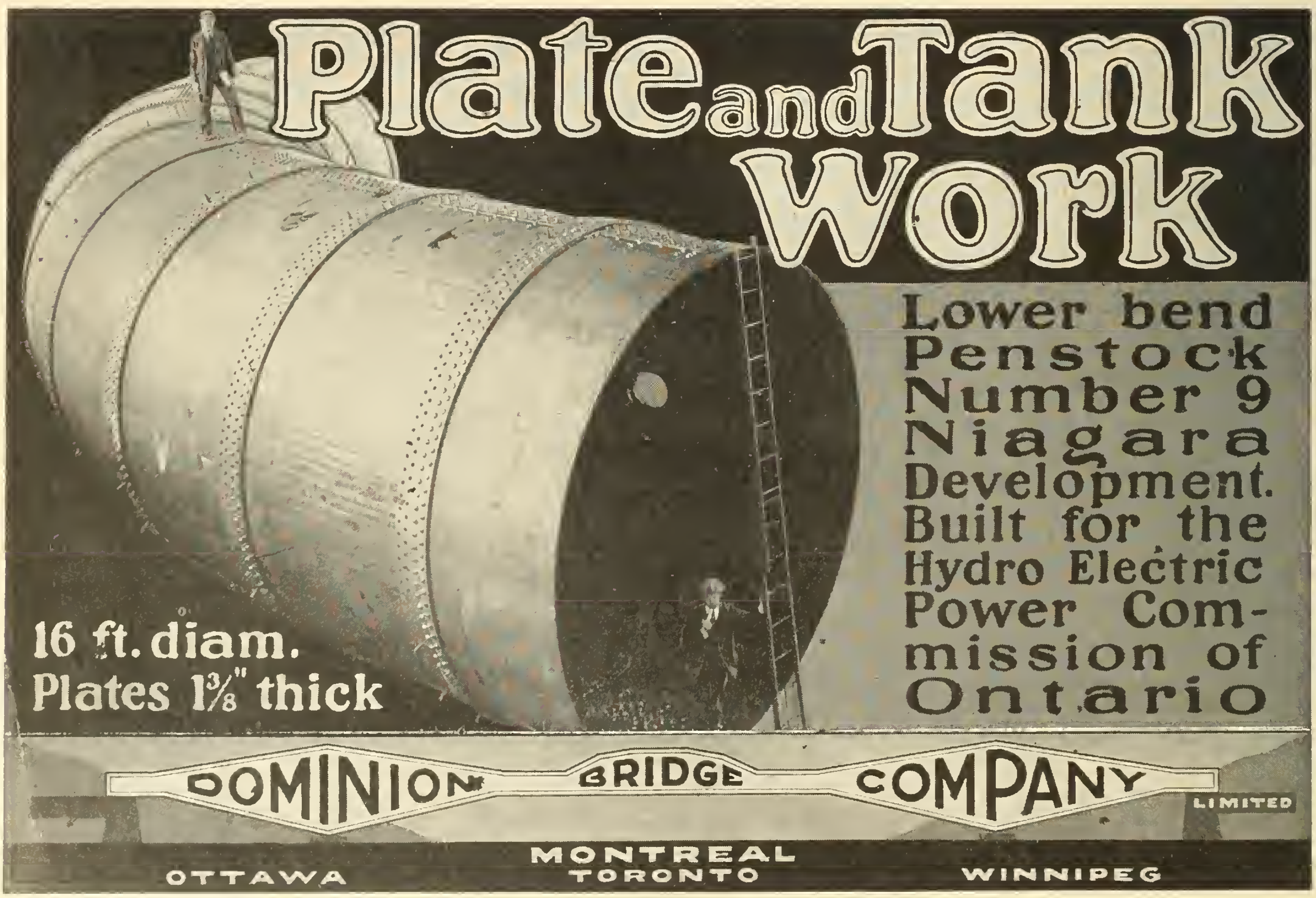

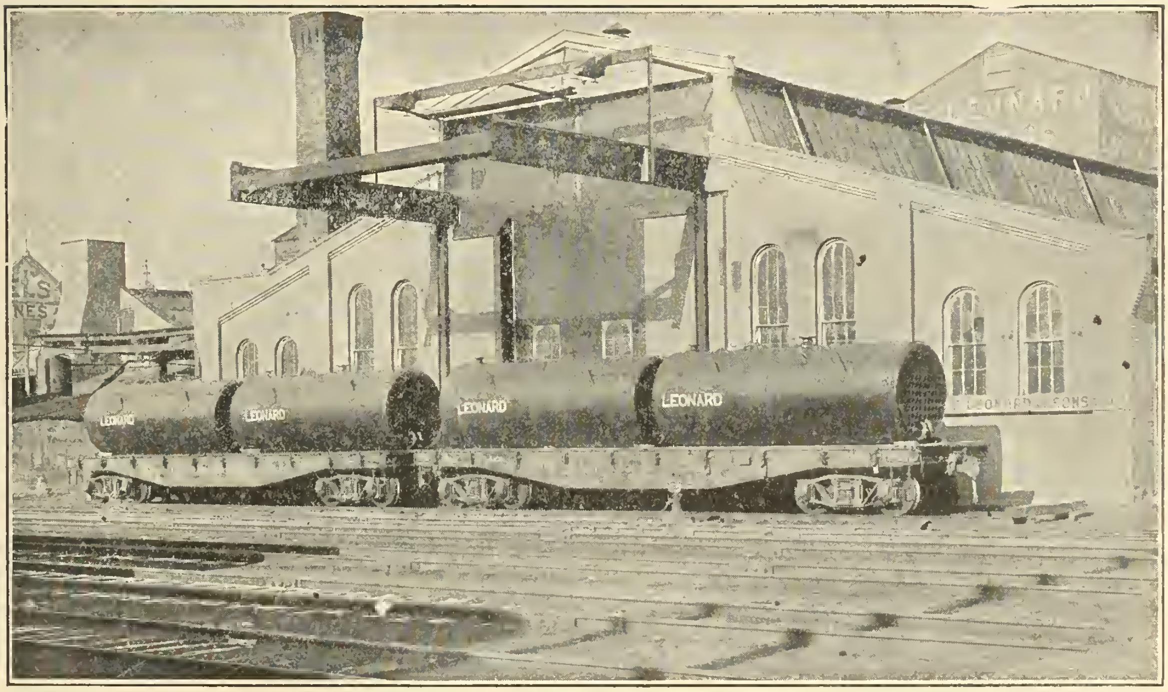
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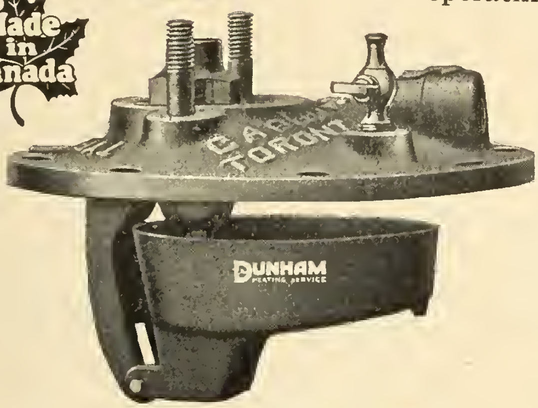
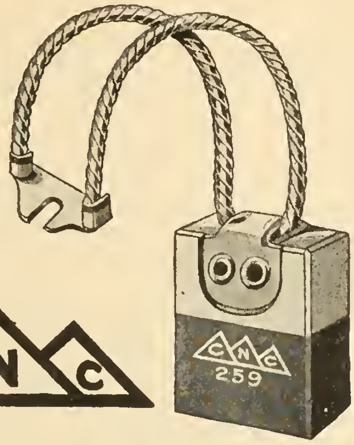
Dunham Bucket



Showing Cover and Bucket Assembly

259



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For Alphabetical List of Advertisers see page 50

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THE ENGINEERING JOURNAL

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

"TO FACILITATE THE ACQUIREMENT AND INTERCHANGE OF PROFESSIONAL KNOWLEDGE AMONG ITS MEMBERS, TO PROMOTE THEIR PROFESSIONAL INTERESTS, TO ENCOURAGE ORIGINAL RESEARCH, TO DEVELOP AND MAINTAIN HIGH STANDARDS IN THE ENGINEERING PROFESSION AND TO ENHANCE THE USEFULNESS OF THE PROFESSION TO THE PUBLIC"

THE ENGINEERING INSTITUTE OF CANADA FOUNDED 1887

JULY 1925

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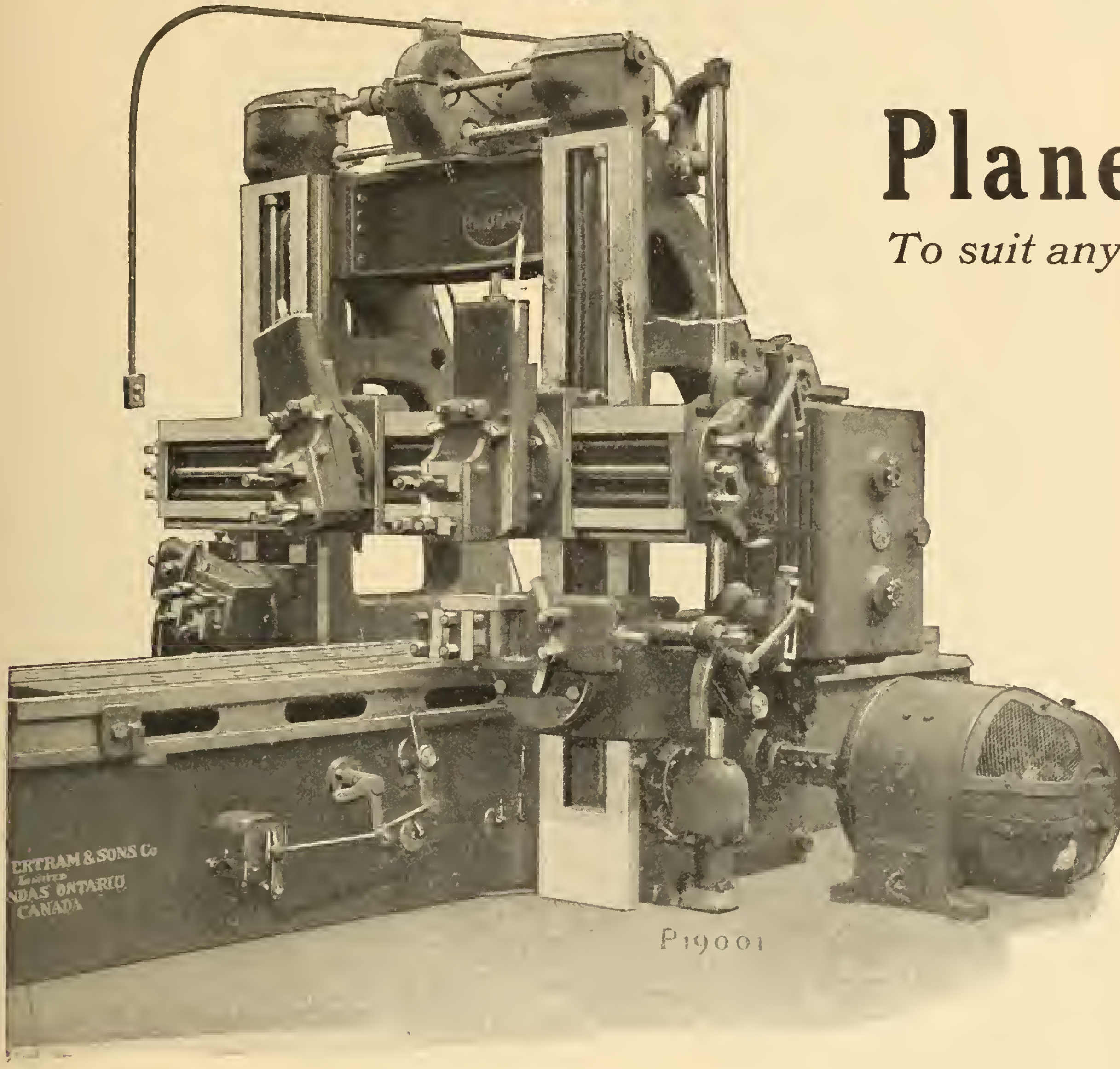
AT 176 MANSFIELD STREET, MONTREAL

Vol. VIII No. 7

GEARS OF FINEST QUALITY

BERTRAM MACHINE TOOLS

HEAVY MACHINING FACILITIES



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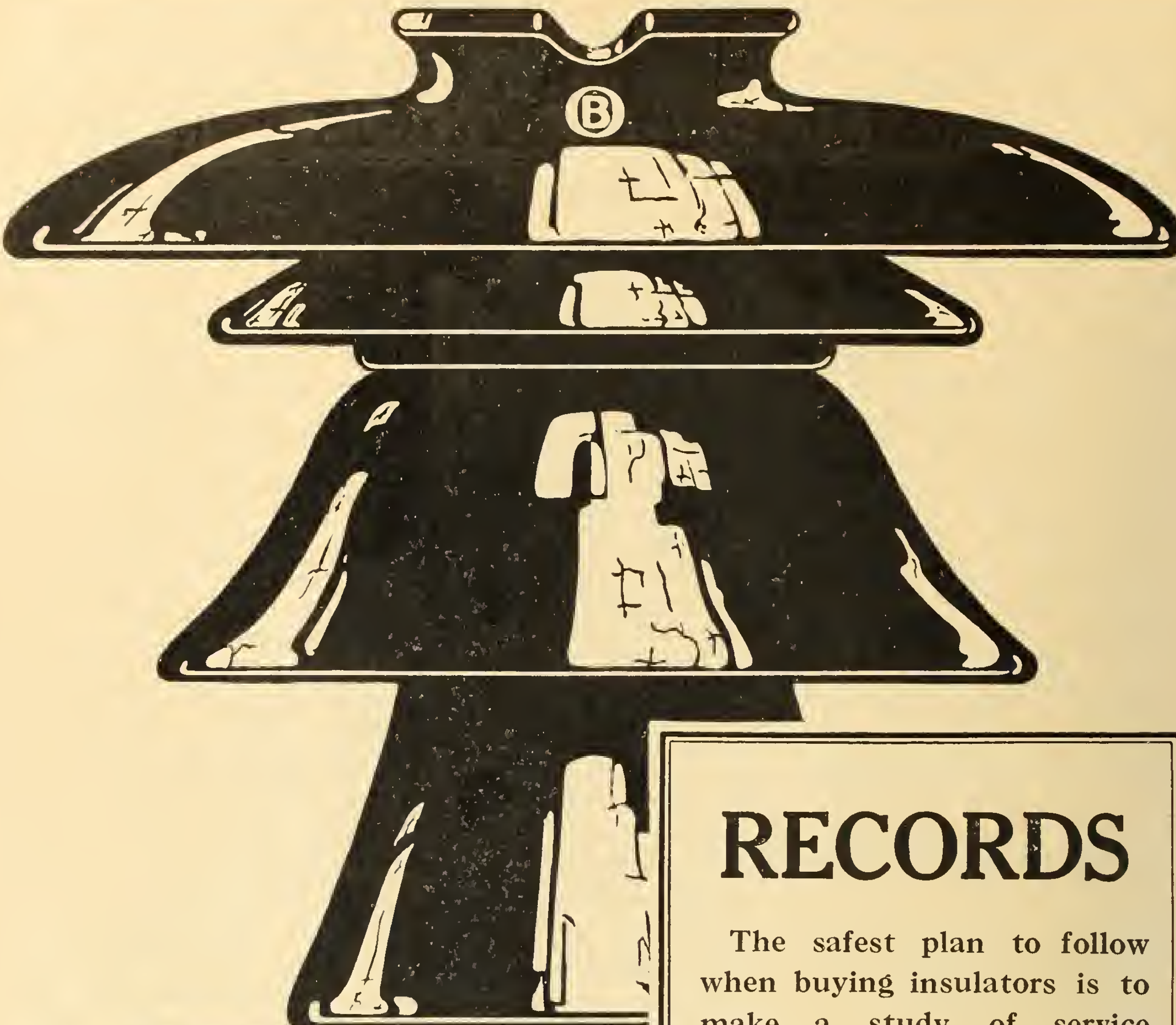

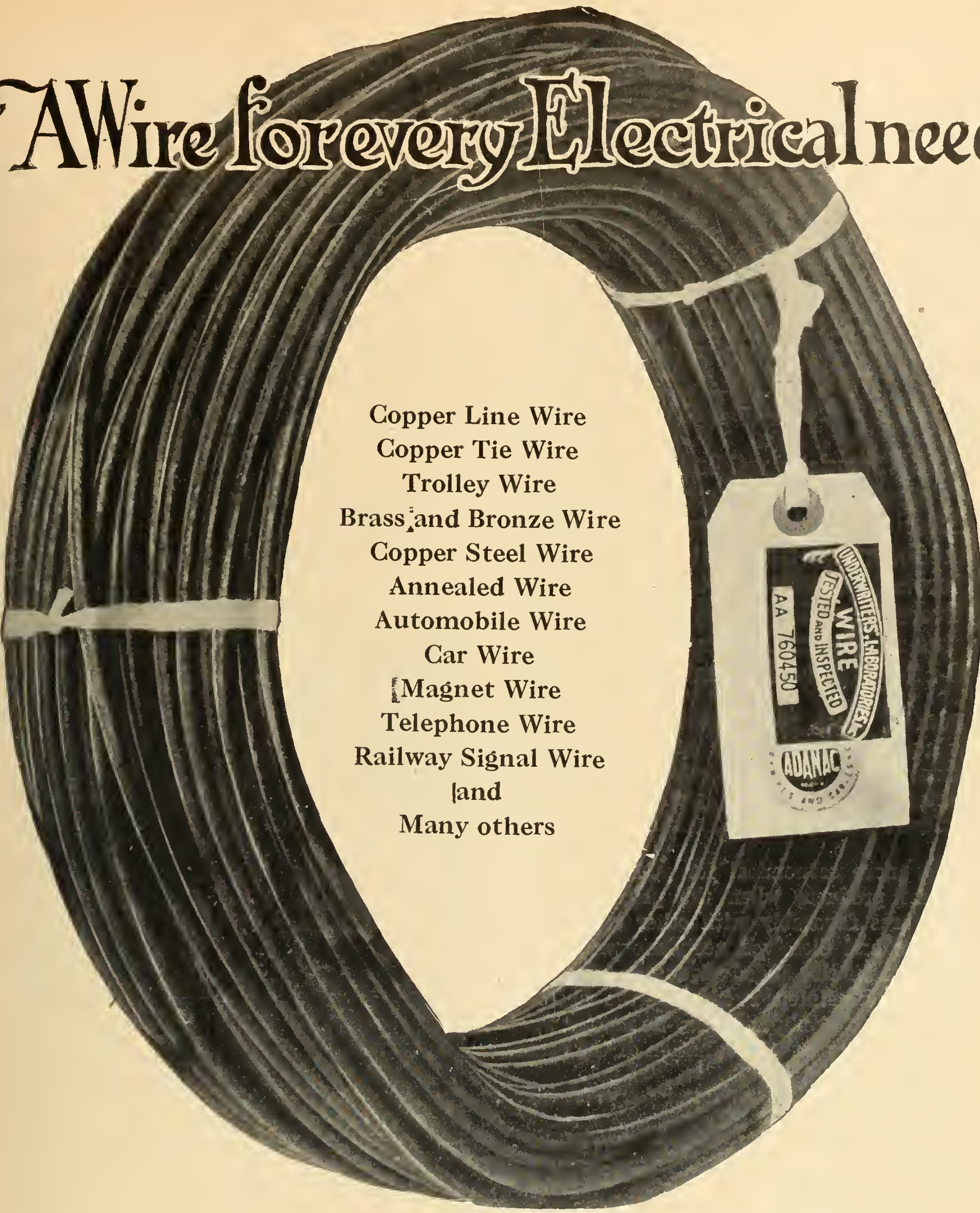
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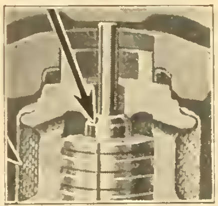
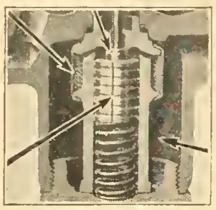
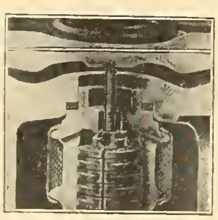


Scoring minimized — seat opening relatively small.

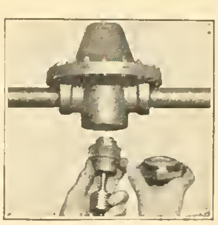


No seizing or sticking — working parts completely surrounded by steam.

Self-contained strainer —note what this strainer removed in a short time.

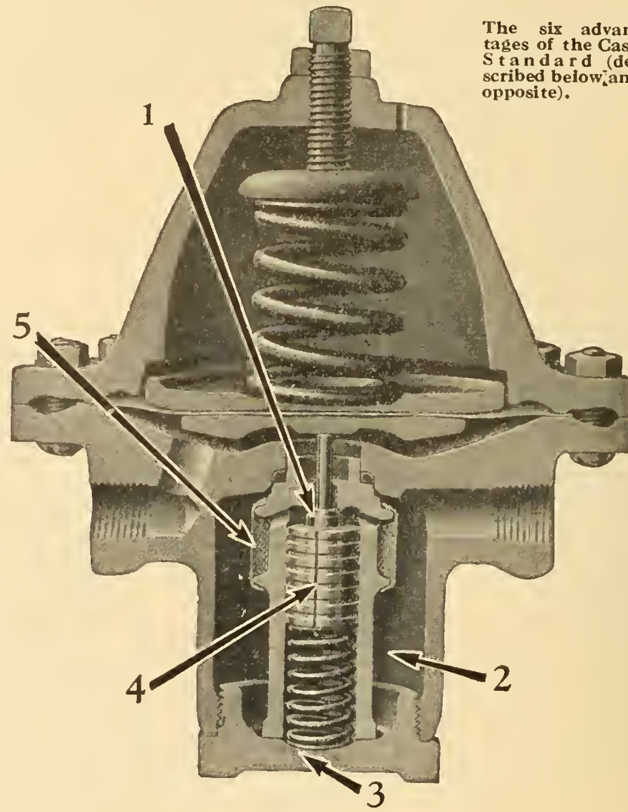


Closes with high pressure—note duct in piston.



Accessible — unscrew cap, remove operating parts.

The six advantages of the Cash Standard (described below and opposite).



There are no "apologies" in Cash Standard design

CASH Standard design doesn't fight trouble; it avoids it. There are no complicated provisions for combating trouble--no apologies for incorrect construction.

Sticking, for instance, is the result of uneven expansion. The ordinary way is to deal with the sticking, but the Cash Standard way is to avoid the causes of sticking. The illustration above (arrow 2) shows how the whole working unit is surrounded with steam at the same temperature. All parts must expand and contract equally. So the Cash Standard can't seize or stick.

The illustration (arrow 1) shows why the Cash Valve practically avoids wire drawing, therefore minimizes scoring. The seat opening is so small in comparison to the inlet opening that the valve must necessarily open wide to pass the required volume — and a wide open valve doesn't score.

The Cash Standard piston isn't closely fitted or packed—it doesn't have to be. The illustration (arrow 4) shows why no packing is needed. Steam circulates around and behind the Cash Standard piston. It's sure to work right!

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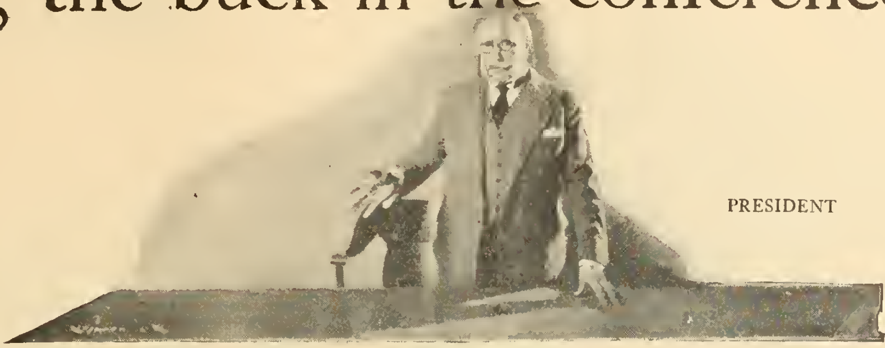
RECO PRODUCTS

OUR SERVICE IS NOT COMPLETE UNTIL YOU PROFIT BY IT

Passing the buck in the conference room



PRESIDENT

PRODUCTION MANAGER

CONSULTING ENGINEER

"WHAT'S this? What's this?" exclaimed the President. "You mean I should have hung around here to buy materials for a power-piping job we were going to install with our own men? There's going to be some fireworks around this plant," he added testily. "When I get to the bottom of this costly delay somebody is going to be fired from these works."

The President's frown warned the group about him not to laugh at his inadvertent pun.

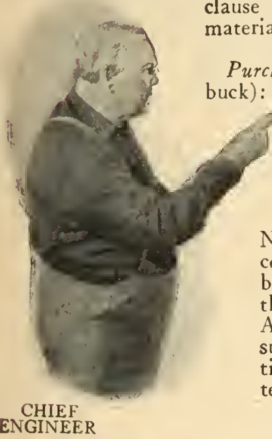
Production Manager: "As I wired you in Quebec I lacked the authority to get out of this hole."

President: "The same old alibis. I'm tired of having the buck passed from department to department every time I leave town for a few weeks. I certainly thought I could count on an experienced chief engineer to get a piping job properly installed, especially when it was planned and specified in detail by our consulting engineer."

Chief Engineer (First buckholder): "Any contractor or even our own men could have put in this piping work easily in two weeks with anything decent to put in."

President (turning to Purchasing Agent): "Didn't my last memorandum to you explicitly state that our prompt shipment clause was to be a part of every order for material?"

Purchasing Agent (who now holds the buck): "Yes sir, and the original materials all arrived on time. But the Chief Engineer rejected so much stuff that we've had a flock of manufacturing representatives bothering us for two weeks. They've been dealing direct with him. Nothing but constant bickering. No correspondence. No record. I'll never be able to straighten things out with the half dozen people I've dealt with. All I could do was to call in the Consulting Engineer to see if his specifications were sufficiently definite to protect me."



CHIEF ENGINEER

President: "Mr. Consulting Engineer, will you please put this buck where it belongs?"

Consulting Engineer: "Mr. President, hold out your hand. In going over the records yesterday with your Purchasing Agent I found this personal memorandum in your handwriting—it says—'Re bids on piping materials for Plant B power work. Prices from individual manufacturers $1,000 lower than any bid for the complete materials called for in the specifications. Save this money by picking up materials in lowest markets.'"

President: "Certainly. That's always been our practice. Saved us a lot of money."

Chief Engineer: "That practice . . . "

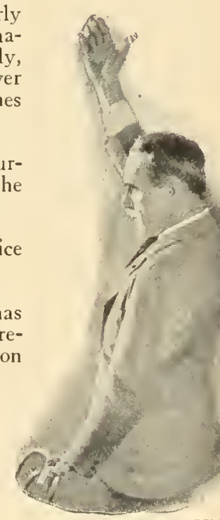
Consulting Engineer: "That practice, Mr. President, is obsolete, especially where so much material is involved. Apparent savings turn into actual losses, as your cost-sheets show. That's why I invariably advise placing the entire specification for piping materials with one company that can properly interpret my plans, take off the list of materials, supply the bends and welds accurately, cut and thread the pipe carefully and deliver the whole job in accordance with my sketches *and* in time."

Chief Engineer: "I tried to get the Purchasing Agent to give Grinnell Company the order for materials but your memo—"

Consulting Engineer: "And a wise choice it would have been."

President: "Well, I guess the old buck has finally parked itself right with those fireworks I was going to set off. From now on *I'll consider myself fired* while you engineers are placing the orders."

* * * * *



PURCHASING AGENT

IF it's an industrial piping specification of any kind, see Grinnell Company, Ltd., about the materials or suggest to your contractor the simplicity and satisfaction of placing all orders for piping supplies with one large and responsible firm.

Send for the Revelation Bag

WE'LL send you the "Revelation Bag" free—*on this one condition:* That you will compare the Grinnell Fittings it contains with the fittings you are now using and judge the difference.

See for yourself what 100% fittings look like. Send for them today! Address Grinnell Company of Canada, Ltd., 2440 Dundas Street West, Toronto, Ont.

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of CANADA, Limited

Grinnell Cast Iron Fitting

Fittings, Hangers, Valves, Pipe Bending, Welding, Piping Supplies, Etc.

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CONCRETE
FOR PERMANENCE

New Government Elevator at Edmonton, Alta.

Concrete Facilitates Rapid Construction of New Big Elevator

One of the terms of the contract for the erection of the new Edmonton Elevator specified that the plant should be finished sufficient for the complete handling of grain by Sept. 15th, 1924. The contract was awarded March 28th of that year, ground was broken the first week in Apıil, and the first yard of concrete poured May 8th.

Despite the short time availing, the plant was able to handle grain on Sept. 15th, and was put into full commercial operation on October 1st.

This splendid addition to Canada's chain of grain-handling plants has a capacity of 2,350,000 bushels and is equipped in accordance with the most expert modern practice.

This is a good building year.

The price of cement continues low and building costs generally are reasonable. This means economy in all types of construction work, especially when concrete is used. Many are taking advantage of this situation. Are you?

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CANADA CEMENT
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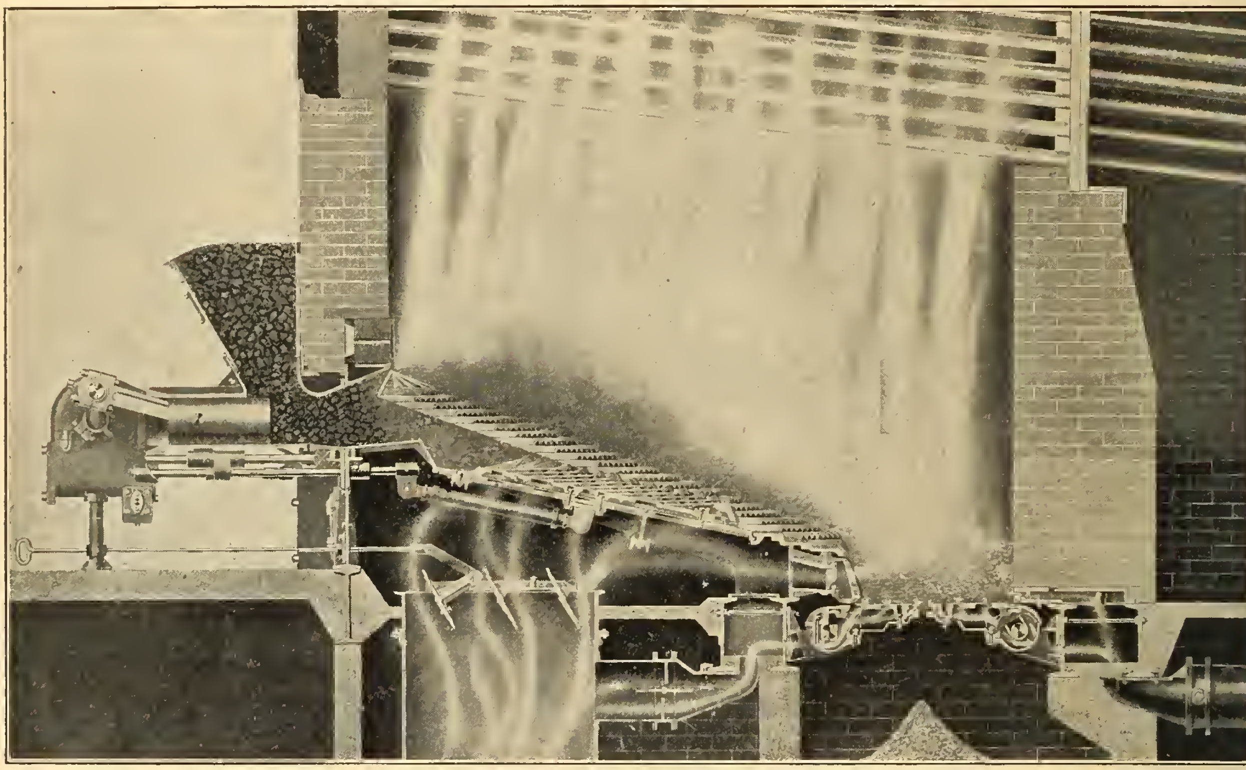

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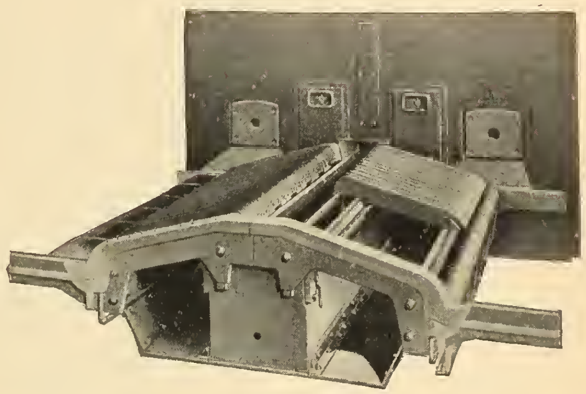

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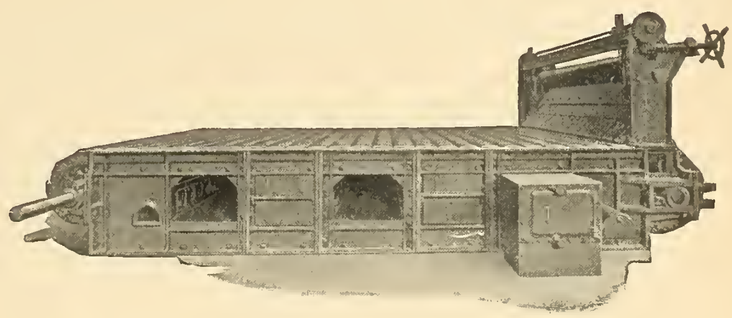

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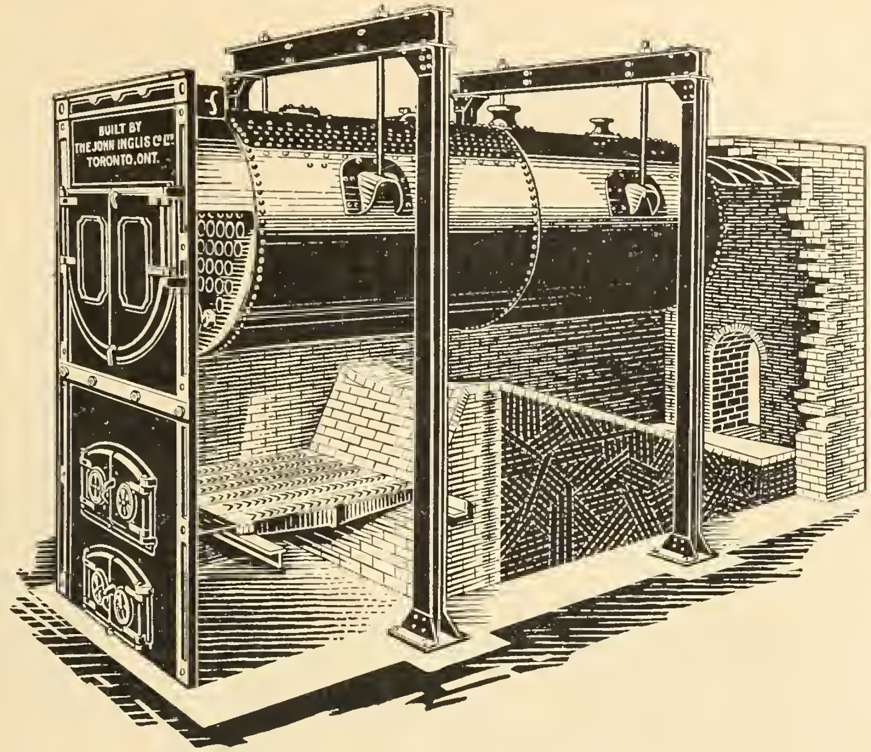
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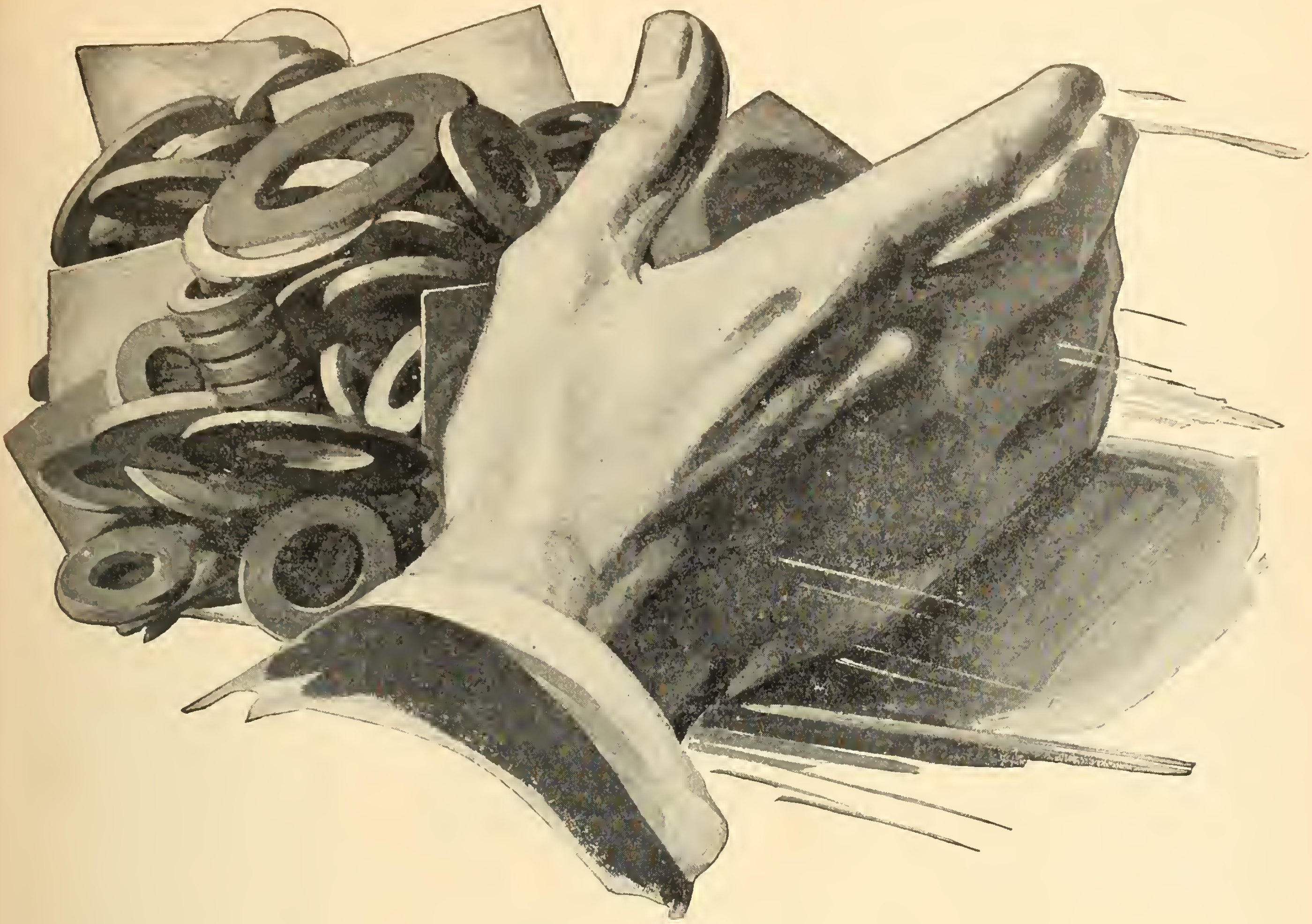

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OF CANADA

JULY, 1925

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Hydraulic Mining*

The Hydraulic Removal of the Overburden from a Stone Quarry

W. D. Armstrong,

Superintendent of Plant No. 12, Canada Cement Company, Exshaw, Alta.

Paper read before the Calgary Branch of The Engineering Institute of Canada, March 30th, 1925.

In presenting this subject to the Calgary Branch of *The Engineering Institute* it is felt that it may be of special interest at the present time, due to the rumored construction of a hydraulic-fill dam in the mountains of the district. Also on account of the very small amount of hydraulic mining that has been done in this province in the past, there may be some points in this work of general interest to all engineers.

At the outset, I wish to state that this was a very small piece of work from the hydraulic engineer's standpoint, involving the removal of about sixty thousand cubic yards of overburden. There were, however, two points of perhaps unusual interest in engineering. One was the utilization of a small lake as both a waste area and a source of supply for the water for the monitor; the other was that this work was carried on during the normal operation of the quarry at a point roughly fifty feet above the quarry floor without any inconvenience or delay in the production of the rock.

Work prior to use of Hydraulic Mining

It may be permissible to offer a few words of explanation as to why this work became necessary at this time. When the cement plant was built at Exshaw in 1906, the limestone quarry was located about one-third of the way up on the side of a small mountain and at a point about six hundred feet north-west of the mill. Being on the side of the mountain, the beds are sharply tilted with a dip of from thirty-six to forty-four degrees to the southwest, and with a northwest strike. At the level of the quarry floor these beds were covered with a heavy deposit of debris and soil, the result of ages of disintegration of the mountain slopes. This material was quite unsuitable for the manufacture of Portland cement. Prior to 1921 the rock had been loaded by hand, eleven spur tracks running in to various parts of the quarry face. By loading in this manner the overburden was left in the quarry, and when it had accumulated sufficiently, was loaded into cars and dumped over the bank. In 1921 a railroad type steam-shovel was installed and the hand loading discontinued. Due to the localized work of a shovel and the fact that the machine could not separate the rock from the dirt, it immediately became apparent that steps would have to be taken to remove the overburden from the limestone beds.

An attempt was made using horses and slip-scrapers, but was not successful on account of the large amount of boulders and gravel encountered. During the spring of 1923 the steam shovel was tried on the overburden, but after a month's operation was discontinued, as the work was very slow, due to the encountering of the top of another unsuspected rock bed. It was finally recognized that hydraulic mining was the solution of a problem, the failure of which would mean locating and opening up a new quarry or abandoning the entire plant.

Preliminary Surveys and Installation of Equipment

During the summer of 1923 surveys were made of the whole area involved, a suitable area for depositing the waste material was located, and the preliminary plans for the work were drawn up. It was found that from a hydraulic mining standpoint the location was almost perfect, there only being lacking a natural head of water. However, unlimited supplies of water were available for "pump-sluicing." We had ample grades for the return sluice to enable us to sluice large rocks with small amounts of water. We had a solid rock bed which

*This paper was awarded first prize in a competition held by the Calgary Branch.

would not absorb the water at all and which, from its sharp dip, permitted under-cutting of the bank to be carried on with a minimum of time and water, also ample power for raising the water the desired height and for maintaining ample pressures at the nozzle at all heights.

Early in the spring of 1924 the installation of the equipment was commenced. Some little difficulty was experienced owing to the fact that both the water pipe and the sluice had to cross the main highway to Banff overhead, and great care had to be taken to make the work absolutely water-tight and to prevent damage to passing traffic on the road from flying rocks.

The water required for the work was secured from a small lake formed between the main line of the Canadian Pacific Railway and the Government highway. This lake has a connection with the Bow river but has no current, the water being practically stationary. Discovery of this fact led to the decision to make the spoil area at the southeast end of the lake, while the suction pipe for the pumps was located about two hundred and fifty feet from that end of the lake.

As it was found that there would be a maximum head of about six hundred feet, we decided to install two pumps, one located at the lake to elevate the water to the quarry floor, and the other located in the quarry as a "booster" to raise the water to the necessary height on the quarry face and to provide a constant pressure at the nozzle. We then decided on a minimum quantity of one thousand U.S. gallons per minute and to maintain a pressure of 150 pounds per square inch at the nozzle. These were found to be the smallest amounts which would satisfactorily do the work under the conditions, as determined by all the data we could procure.

A two-stage, belt-driven, centrifugal pump was installed at the lake, with an eight-inch suction and six-inch discharge. This pump was driven by a 100-horse-power induction motor and discharged into 320 feet of six-inch standard wrought iron pipe. The static head (or vertical distance the water was lifted) was 109 feet. This pump discharged in the quarry at a pressure of 10 pounds per square inch to a six-inch, two-stage, centrifugal pump direct connected to a 150-horse-power induction motor. This latter pump acted as a booster and the length of its discharge line was varied as the bank was washed away. The maximum static head against this pump was 101 feet. The line was connected to a No. 1 Hendy Hydraulic Giant, fitted with a two-inch nozzle. We tried a three-inch nozzle for this work, but found that we did not have pressure enough to cut the hard face of the overburden.

The spoil was carried away through a concrete sluice 350 feet long, 3 feet wide and 18 inches high, with walls and bottom 8 inches thick, the bottom of the sluice being lined with 3-16 inch steel plate. The grade of the sluice was 15 degrees for 200 feet from the quarry, increasing to 17 degrees for the remainder of its length. As was mentioned before, the sluice discharged to the south end of the lake. A suitable area for the deposition of the spoil had been prepared by cutting off the end of the lake with a close board fence made of one-inch boards, and, in spite of the fact that the pump suction was only about 250 feet distant, no trouble was experienced with fouling of the pump. This was, as before stated, from the fact that the lake had no current and the silt settled out without travelling any appreciable distance.

Quarry with Equipment Installed Ready to Commence Work.

Removing Overburden.

Discharging Soil at South End of Lake.

Stripping Operations Commenced

The installation of the equipment was completed in May, but we decided that, rather than risk any chance of failure, we would not start the actual stripping until the frost was out of the ground. Finally, on June 3rd, the pumps were started and a very few minutes' operation showed that the method was going to be a success. As none of our men had any previous experience with this kind of work, some delay was experienced in breaking in the operator to handle the giant effectively. In passing it may be remarked that considerable experience is necessary in order to "get" the dirt with a minimum of time and water. It was necessary to smooth out a few kinks before we had things working smoothly. We had originally planned to operate 24 hours a day, but made so much better progress than we anticipated that the night shift was not put on.

During July and August the work was practically completed. As a maximum depth of the bank encountered was 30 feet, with an average depth of 12 feet, there was little danger of being buried by the bank caving in. We were thus enabled to place the giant as close to the face as the lengths of the pipe would permit. In some cases this was so close that the nozzle could not be moved until it had cut a path for itself. It was found necessary to move the giant after about every 30 hours running,

The Quarry with Overburden Completely Removed.

Two-Stage Belt Driven Centrifugal Pump Installed at Lake.

as when the bank was more than 150 feet distant then rate of cutting dropped very considerably. The most effective range for this size machine and the pressure used was between 25 and 125 feet.

As the spoil area filled up much faster than had been expected, we had to extend the sluice much farther across the dump than we had planned. In order to maintain the necessary velocity of the water, we narrowed the sluice to 18 inches wide over the dump. This gave rise to some trouble with large rocks plugging the sluice, but we found that by putting a man at this point with a rake, we were able to keep operating continuously. We had expected that the major part of the spoil would be clay, but found that it was practically all gravel, which would not flow at all in the dump and piled up very high instead of spreading out flat. This forced us to leave the end of the sluice free so it could be swung from side to side and the whole section filled before another length was added. Additions to the sluice and changing the position of the giant in the quarry were the only delays experienced and occurred about every third day, usually both changes being made together.

Special Considerations Based on Experience

From the experience gained in this work I would offer the following suggestions for consideration before attempting this method of earth removal. Hydraulic mining, while apparently a cheap and simple method of moving material, has many pitfalls for the unwary and must be very carefully considered before being attempted, or the cost may become inordinate and the whole operation a failure. First a thorough examination should be made of the deposit to be hydraulicked to determine the amount of material to be handled. Equipment for hydraulic mining is very simple, but is highly specialized and consequently expensive. The nature of the material should be tested thoroughly in all parts of the area, as there may be unsuspected rock ledges which would prevent the water flowing in the desired direction. Hard pan or large rock deposits might require blasting, with consequent delay, if a small outfit was installed, where a larger one would remove the material by its own power. The amount and nature of the material to be removed determines the size of equipment required and the pressures to be used. It is better to use high pressures with small nozzles than a larger nozzle with a lower pressure. Whenever possible, undercutting of the bank is the most effective method of gaining dirt, as the large slides will be washed away by the water used in undercutting the next piece. This makes a continual washing of the bank possible.

Naturally, ample water supplies must be obtainable, preferably at an elevation, to permit the natural head being used for the work. If the water must be pumped, ample cheap power should be available. A suitable place must be found for the waste area. This item is of great importance, and the area must be located in such a place that the material can be readily sluiced into it and the water drained out of it. Needless to say the area must be large enough to accommodate all the spoil to be put in. The whole equipment must be located in such a manner that the sluice will have ample grades to carry the class of material encountered, and the bottom of the area to be hydraulicked should, if possible, be impervious to water, to prevent serious losses. Where the work is large enough to warrant the expense, if suitable grades cannot be obtained naturally, hydraulic elevators may be installed. These, however, require very large quantities of water to handle the material and add naturally to the cost. A booster nozzle may be installed driving down the sluice where no elevator is used, permitting the sluicing of very large boulders without rehandling. However, both these methods add to the trouble encountered, and, if possible, natural grades and heads should be used.

Operating Data

Finally, some of the data procured on this operation are appended.

Lower Pump

Static head	109 ft. or	47 lbs./sq. in
Friction head	54 " "	23 " " "
Head from delivery to upper pump	23 " "	10 " " "
Total delivery head	186 " "	80 " " "

Motor speed 580 r.p.m. (20 r.p.m. lag from 600).
Pump speed 1,140 r.p.m.
Electrical h.p. 100.

Upper Pump

Static head (max.)	101 ft. or	43 lbs./sq. in.
Friction head (max.)	40 " "	17 " " "
Head due to pressure at nozzle	346 " "	150 " " "
Total delivery head	487 " "	210 " " "

Pump speed 1,700 r.p.m.
Electrical h.p. 150.

Total overburden removed	65,680 cu. yds.
" hours run of giant	716 hours
" labour hours	4,577
Cu. yds. overburden removed per giant hr.	92
" " " " " labour hr.	14.3
" " " " " k.w. hr.	2
Estimated average per cent of solids transported in water sluice	3%
Approximate cost per yard including installation and removal of equipment	13 cents

I might add in conclusion that these figures are not a true guide under average conditions, and would estimate that on level ground about four times the above quantities of water would be required to handle this material. The cost per yard may range anywhere from 5 cents a yard to 50 cents, depending on the locality and nature of the material to be moved.

Forestry

A review of Canada's Forest Resources and a Plea for Greater Protection and Conservation of these Resources

Francis Kiefer,
Formerly member of United States Forestry Service.

Paper read before the Lakehead Branch of The Engineering Institute of Canada, March 23rd, 1925.

An earnest effort to give you a correct understanding of what forestry is and the important problems of forestry in Canada is the purpose of this paper. At the annual meeting of the Canadian Society of Forest Engineers a resolution was adopted to make the major project of the society a campaign to disabuse the public mind of erroneous opinions it is forming as to what the important forest problems really are, what forestry is, and to insist upon the necessity of federal and provincial policies based upon a sustained yield.

The Importance of Adequate Forest Cover

Let me say at the start that forestry has developed as an art or science from necessity. Forestry has not come into being through sentiment. Society has from the beginning of man been dependent upon the forest and the products of the forests; and the threat of their disappearance, through the centuries, has created and developed the practice of forestry in almost every nation. Forests exert a great influence upon water supply, agriculture, industry and are indispensable to our general welfare.

As a preface, I wish to comment briefly on three points, which, indeed, must be well known to everyone. That forests as a whole have a very marked effect on our welfare; that wood is an indispensable necessity to society; and that forests and forest products are such a powerful factor in the national wealth and industry, the nation can not afford not to conserve and maintain its forests.

It is accepted by students of the subject, that a country suffers if less than 30 per cent of its area is timbered. Ordinarily a country in which the forest area has been reduced to 20 per cent or less shows to a marked degree bad climatic conditions with prolonged droughts, frosts and alternating floods and low water. Spain has 14 per cent of its area under forest, Greece 15 per cent and Italy 18 per cent. They are all good examples of the unfavourable conditions attending inadequate forest cover. In this age of rapidly expanding hydro-electric development, to which regular stream flow is a matter of prime consideration, healthy and adequate forest cover is of utmost importance.

Forest cover, in regulating stream flow, at the same time greatly influences the silt content of streams. Rain washes unprotected soil into stream beds and the silt thus clogs the navigable channels of rivers and harbours, and otherwise obstructs the flow. In some cases this is a serious situation. The destruction of bridges, trestles and railroad embankments, highways and other property is another instance wherein the maintenance of healthy forest cover is of great interest to the engineer for the protection of his works against damaging torrents. Thus forests, in their entirety, are of immeasurable value to our welfare.

Wood is a Vital Necessity

Wood in itself is a vital necessity to us. It is one of the materials that was given man in great abundance to work with. Its abundance and its unequalled convenience and adaptability to every conceivable use has brought it so intimately into our lives that we can not do without it. As forests have been depleted and the cost of wood has increased many substitutes have been developed. Steel for ships and buildings, railway cars and furniture, is merely one example. But notwithstanding, with the increased use of substitutes, the consumption of wood is constantly mounting. Over half our houses are built entirely of wood and the other half require wood as an indispensable part in their construction. More than two-thirds of the people use wood for fuel, and for every one hundred tons of coal mined, two tons of wooden sills and props are needed to support the miners excavations. There is hardly a utensil, tool or machine in the construction of which wood does not play a part, if only to furnish the handle, mould or pattern. In our railroad systems millions of wooden ties are used, freight cars are built of wood and millions of tons of freight are moved in wooden containers. More important than all perhaps, wood is used for making paper. Until wood was used for paper making, there never was enough paper. The use of paper is constantly increasing and has become an absolute necessity to our civilization. Leading economists have said that the so-called modern democracies could not be maintained without a cheap and plentiful supply of paper.

The importance of the forests and their products to industry and to our national wealth and prosperity is not appreciated by everyone as clearly as it should be. The Dominion Bureau of Statistics estimates that the value of the accessible raw materials, standing timber and pulpwood and the capital invested in forest operations is close to one and one-fifth billion dollars. In this sense the value of the forests and forest activities hold fourth place in the country's assets. In the past five years the products of the forests have amounted to nearly a billion and a half dollars. At this rate the annual value of the products of the forests of Canada is $300,000,000.

Nothing equals the forests for the production of wealth in Canada except farming. Farm products have four times the value of forest products. But let it be emphasized, that aside from farming, forest products produce more national wealth than any other thing. How the products of the forest contribute to other activities of the nation is well illustrated by an announcement of the Canadian National Railways to the effect that during 1923 they carried more than 9,850,000 tons of forest products. To move this vast tonnage 250,000 freight cars were required and if these cars were placed end to end they would occupy 2,000 miles of track. In 1923 forest products formed 17 per cent of the entire tonnage for the National Railways alone.

Canada's Forest Resources

Now let us turn attention to the extent of our forest resources and to the extent and rate of their depletion. It is estimated that Canada has a total forest area of

765,000,000 acres of all classes and species of timber merchantable and unmerchantable. The total stand including merchantable size is estimated to be 246,791,532-000 cubic feet. The total annual depletion is estimated at 5,500,000,000 cubic feet. Divide the annual depletion into the total stand and we have approximately 50; 50 years as the remaining life of the Canadian forests. It is an alarming statement. The condition is bad, but not by any means beyond remedy. With 475,000,000 acres potential, but at present unmerchantable, forest land, an average increment of 11.5 cubic feet per acre would more than supply the nation's needs. But in view of the destruction of young growth and deterioration of forests and soil by repeated fires there is no hope that this increment is being produced. The annual depletion of Canadian forests is 5,500,000,000 cubic feet, of this only 2,600,000,000 cubic feet or 47 per cent are used, and 53 per cent feed the bugs, fungi and forest fires. That is a bad state of affairs. Annually 2,000,000 acres of forest land in Canada are burned over and of this amount 1,300,000 acres of young growth are wiped out. Two-thirds of the forest wealth of British Columbia have been destroyed by fire. The point is that more timber is being wasted annually than is being used, and most of the destruction is caused by forest fires.

The greatest single contribution that can be made to forestry is undoubtedly fire prevention. But I wish to dispel the idea that forestry consists merely of fire protection and tree planting. A forester must have a technical education and training; knowledge of forest trees regarding their life history, growth and production, and how to manage forest property so as to produce the highest possible revenue from the soil by the production of forest crops. The forester's purpose is to make a forest continuous. He tries to utilize the present products of the forest with the greatest possible economy and provide for the continuance of the forest. The lumberman, on the other hand, in general exploits the ripe crop of timber and makes no provision intentionally for the replacement of the crop he has removed.

Moreover, forests may be found upon rich fertile soils that would be much more profitable under agricultural crops, and, again, the forests may be sparse or entirely absent from thin, rocky or sloping soils not at all adapted to agriculture. Furthermore, the virgin forests, in general, are conglomerate in their makeup as to useful and useless species, well formed and malformed individual trees. Trees in a virgin forest may grow so closely together as to choke out and retard each other's growth, and on other areas trees may be so widely separated as not fully to occupy the soil and thereby be heavily branched and form knotty timber.

The Aim of Forestry

It is the aim of forestry to maintain the forest upon lands not more valuable for agriculture, to improve the composition, volume and development of the stand of timber. This is accomplished by classifying lands to designate the forest lands, by removing the mature, over mature and defective trees, and the undesirable species, by encouraging and protecting young growth, middle aged and merchantable trees. Before the intensive methods applied in Europe can be underfollowed our economic conditions, only a common sense management will be possible, wherein protection is afforded against fire, young growth of the better kinds is fostered and more care given to the utilization of the natural forest.

I want to leave the impression very clearly that forestry is the business of managing forests so as to make them permanent with a sustained yield, constantly improving as to volume of the most useful and valuable species, in successive crops on lands not more useful for other purposes. Such is the aim of forestry, to concentrate upon suitable areas and there produce as much of the best timber the area will yield.

The situation in Canada to-day is that the forest capital is being rapidly consumed by industry and fire, with ineffectual attempts at the protection of the entire forest area against fire. The greater part of the accessible forest areas belonging to the Crown are under license for exploitation and the entire revenue therefrom is poured into the general treasury for expenditure on every kind of government activity. Little revenue taken from the Canadian forests is put back into the forests. It is a case of using the capital for the payment of dividends. In other words the assets of the forest business of Canada are being converted into cash and the cash is being used to pay the expense of government operation other than forestry. It is as though a man who had inherited a fully stocked grocery store proceeded to sell all of his goods and use all the cash received for the maintenance of his home and family. Unless the goods sold from the store are replaced and the cash received for the sale of the goods, except profit, is used, to replace the goods, the store will come to a sad end. In a properly managed forest business not more timber is removed than is being produced and the cash received, except the profits, is kept in the business to continue and maintain the production of successive crops. It is a slow moving business wherein the turnover is slow and the yield not very high, although profitable, and investment very great. To be successful, forestry projects cannot be limited to the life of one man. The projects begun by one man may not be completed for many generations hence. Forestry therefore is primarily a government business.

The conditions for the various governments in Canada to carry on a properly conducted forest business are unusually favourable. The Dominion and provincial governments are in the exceptional position of owning four-fifths of the timberland of the nation as compared with Sweden where only 24 per cent belongs to the State, 35 per cent in France, 53 per cent in Germany and 20 per cent in the United States, in which latter country, by the way, the money put into the national forests exceeds the revenue derived from them. The ownership by the Crown of the necessary land is a tremendous advantage and reduces the forestry problem in Canada to the single feature of designating a sufficient number of specified areas for permanent forest purposes and of applying proper management to them.

In the matter of land examination and classification a beginning has been made, but the work needs to be greatly extended. Ontario has covered 10,000,000 acres by ground parties, 8,000,000 acres by ground parties and air work and 6,500,000 acres from the air, making a total of 24,500,000 acres covered by some form of survey. Ontario has a total of 153,600,000 acres of forest land so that about 15 per cent of the total forest area of Ontario has so far been examined in one way or another. What has so far been accomplished in Canada is the dedication of 156,960,000 acres as parks and reserves, 28,000,000 acres are in Dominion parks and reserves, 128,000,000 acres are in provincial parks and reserves. Of this area in provincial parks, and reserves, 108,000,000 are to the credit of Quebec, and but 11,000,000 acres are to the credit of Ontario. But most of these dedicated areas, parks and reserves, are not under forest management, except the Dominion reserves which are being administered as far as funds will permit. The parks are administered solely as parks. The exact steps that need to be taken can be summarized as follows:

1. The declaration of a harmonized policy as a law by the Dominion and the provinces.
2. The examination and classification of the forest areas.
3. The establishment of the permanent forest areas as permanent forest units.
4. The proper management of the permanent designated forest units.
5. The development of an adequate personnel.
6. The application of sufficient funds derived from forests to the management of the permanent forest areas and for research.

To gain this end, education of the public to correct appreciation of the needs of forestry in Canada is required, and a consciencious responsibility on the part of the public with reference to fire protection. I have said that 2,000,000 acres are burned over annually in Canada. This annual loss is computed to be $14,500,000. seventy-five per cent or more of the fires in Canada are caused by human agencies. Rigorous care of fire in the forests by the public would prevent much, in fact all of this loss. There needs to be developed in the public a sentiment such as exists in Sweden in the protection of forests against fire. In that country, it is said that the forest fire danger can be looked upon as a past thing; the amount of burn each year being quite negligible from our viewpoint. To illustrate what this means let me quote an example from a first hand observer, who said: "I remember how, one day, during a dry storm in the hay season in Varmland, the lightning struck on a mountain side, causing a little cloud of smoke to rise from the trees. Although, owing to damp weather, there was no particular danger, an alarm was set up by all who had observed the smoke, and at once a regular stampede took place toward the distant spot. From the noise and energy displayed it seemed the poor fire must die of fright." That is the kind of spirit we need in Canada.

British Columbia Dams

A brief description of the Principal Features of the more important Dams in British Columbia

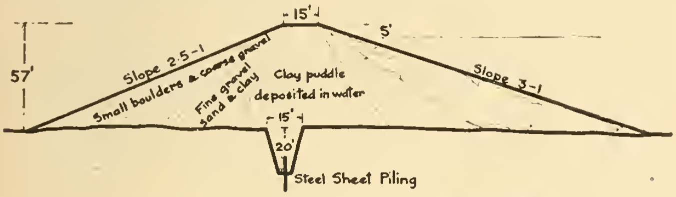
E. Davis, M.E.I.C.,
and
E. G. Marriott, A.M.E.I.C.
Water Rights Branch, Department of Lands, Victoria, B.C.

Paper read before the Victoria Branch, of The Engineering Institute of Canada, Sept. 24th, 1924.

For convenience the descriptions of the dams have been divided into four groups, viz. earth, rock and earth, timber crib, and concrete both gravity and multicellular. The earth type will be referred to first.

Bear Lake Dam at Jordan River

Bear Lake dam was constructed by the Vancouver Island Power Company on a tributary of Jordan river. The cost was about $275,000 and it stores approximately 7,530 acre-feet at present; its ultimate capacity being 21,580 feet. The area flooded is 285 acres, and the catchment basin above the dam 8 square miles. The length on the crest is 1,020 feet and the height at the deepest point is 57 feet. The ultimate height when, constructed, will be 87 feet. The volume of earth fill is 148,400 cubic yards.



Vancouver Power Company — Bear Creek Dam.

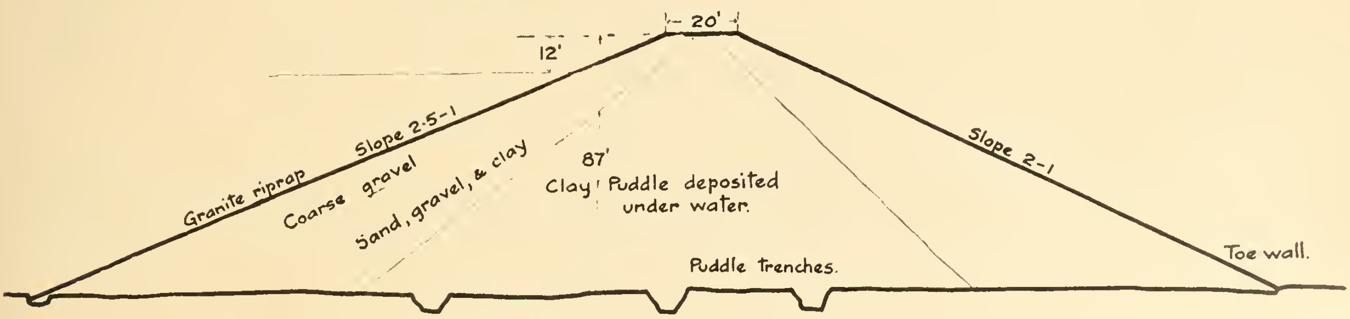
The dam has a puddle core in the centre of which is 28,500 lineal feet of 12-inch, 40-pound, Carnegie interlocking steel sheet-piling acting as a watertight curtain. This is the only example in British Columbia where steel sheet-piling is used exclusively as the watertight curtain in an earth dam.

The earth was hydraulicked into place using a gravity supply from a small stream and also by water pumped by a steam driven plant, using two 6-inch belt driven centrifugal pumps.

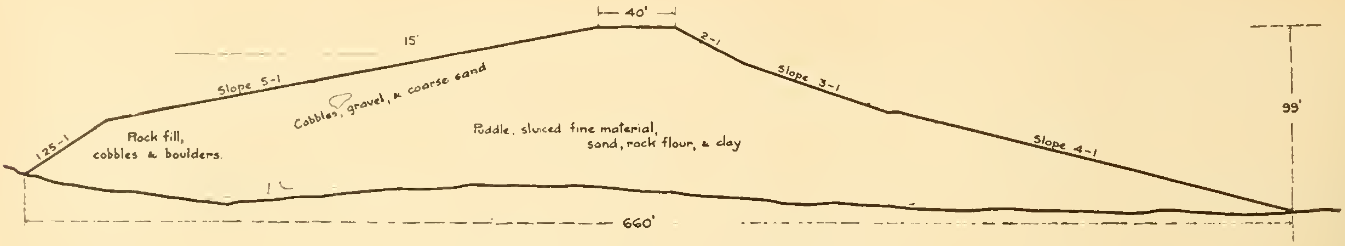
Coquitlam Dam of the Vancouver Power Company

This dam is built at the outlet of Coquitlam lake, and the impounded waters are used as a domestic water supply to the city of New Westminster, and for the generation of power by the Vancouver Power Company.

This is another type of a hydraulic filled dam and is the highest of this particular construction in British Columbia. The cost was just over two and a quarter million dollars. The quantity of water stored is 180,500 acre-feet. The length on the crest including spillway is 1,200 feet and the maximum height 99 feet. The volume of material in the fill was 544,710 cubic yards.



Coquitlam Dam as originally proposed.

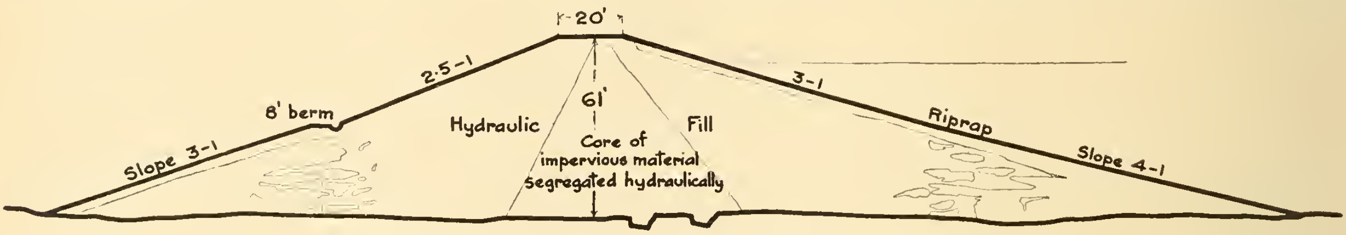


Vancouver Power Co.,—Coquitlam Dam.

This is an excellent example of an hydraulic filled dam and no expense was spared to make it safe. As the dam is situated in the territory known as the "Railway Belt", which land is administered from Ottawa, the Dominion authorities engaged Mr. John R. Freeman, as a consulting engineer while the work was in progress and the Vancouver Power Company had the benefit of the advice of the late Mr. James D. Schuyler, both men in the foremost rank on the construction of dams.

Alouette Dam on Alouette Lake

This dam is now under construction by the Burrard Power Company, a subsidiary company of the British Columbia Electric Railway Company. It is situated at the outlet of Alouette lake and the stored waters will be utilized in a power house located on Stave lake about 35 miles east of Vancouver. On being discharged into the lake the waters will again be used to develop power on the Stave river by the Western Canada Power Company. The dam, which is to be a hydraulic fill structure, is curved on plan which is rather unique for an earth dam. The length of the crest including the spillway will be 1,170 feet, and the maximum height 61 feet. Special provision is being made in the spillway to permit of the discharge of large quantities of water in the freshet season for log driving on the river below the dam.

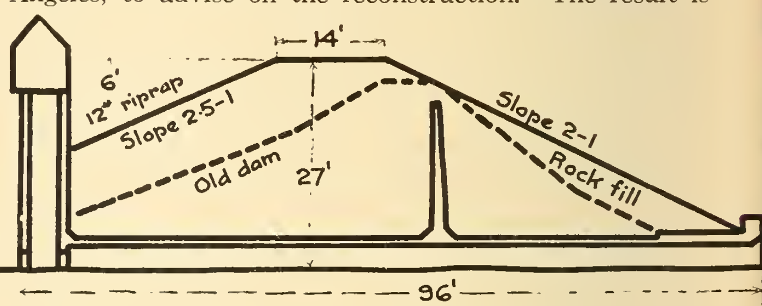


Burrard Power Company — Alouette Lake. Proposed Dam.

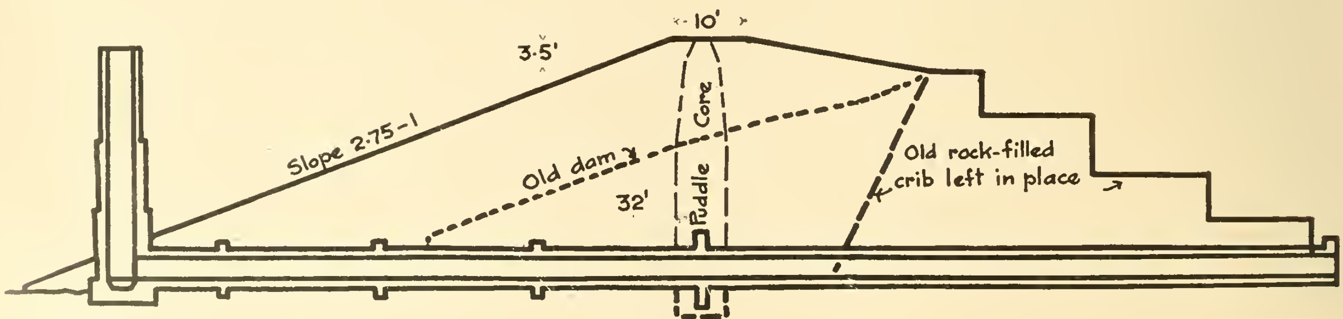
Aberdeen Lake Dam near Vernon

This dam is situated on the headwaters of Jones creek just south of Vernon and is used to store water for irrigation by the Vernon Irrigation District. The original dam of this reservoir of the timber crib type was constructed about the year 1906, but owing to the poor foundations, the site not being stripped down to an impervious stratum, a washout occurred underneath the structure and the upper portion was left high and dry by the scouring action of the water.

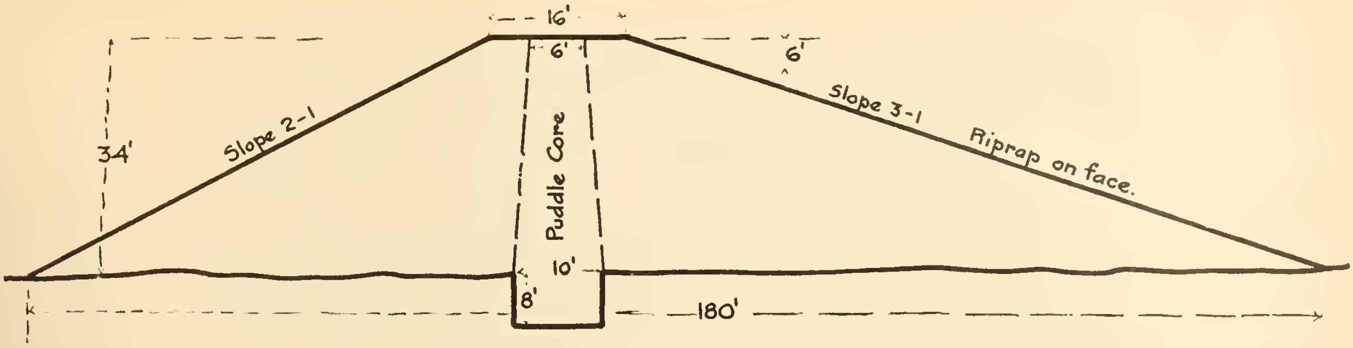
A new dam of similar construction to the original was erected in 1907 or 1908 at a site a short distance above the old dam and this remained until 1921 when it was considered advisable to rebuild owing to the deterioration of the timbers. In the reconstruction most of the timbers were removed and an earth dam with a concrete core-wall erected in its place. The core-wall extended only along a portion of the axis of the dam and this feature led to considerable criticism of the construction, as, early in 1923, a large leak occurred through the earth fill and threatened the destruction of the whole structure. This led to the dam being thoroughly examined and the Vernon Irrigation District secured the services of Mr. J. B. Lippincott, a consulting engineer of Los Angeles, to advise on the reconstruction. The result is



Vernon Irrigation District — Aberdeen Lake Dam, Jones Creek.



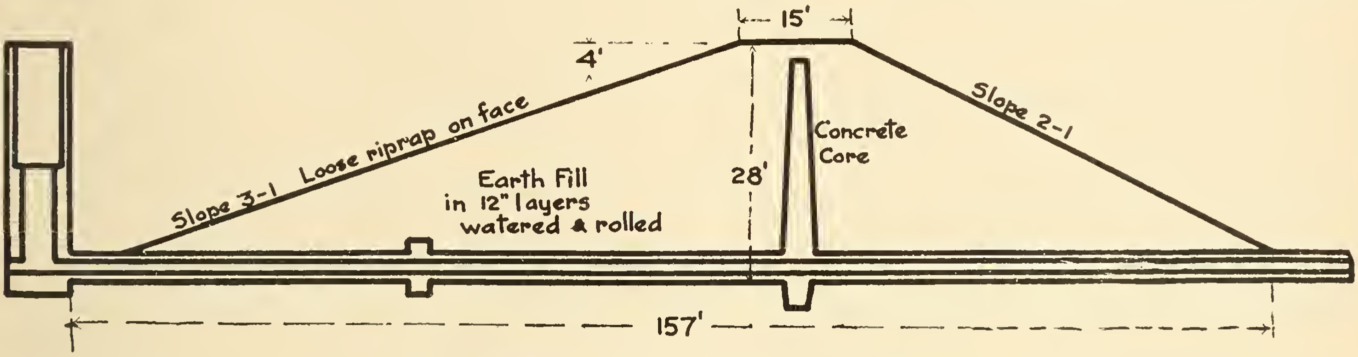
Glenmore Irrigation District—Mill Creek Reservoir No. 1.



South Kelowna Hydraulic Creek Dam.

the present structure which was completed early in 1924 and is of very massive proportions, more so than would appear necessary although criticism on this point was met by the statement that the character of the soil used was of a very friable nature and could not be relied upon as might be the case with other material.

The length along the crest of the dam is 1,480 feet, the maximum height 27 feet, and the quantity of water stored about 8,000 acre-feet. Six feet of freeboard is provided from the crest of the spillway to the crest of the dam.



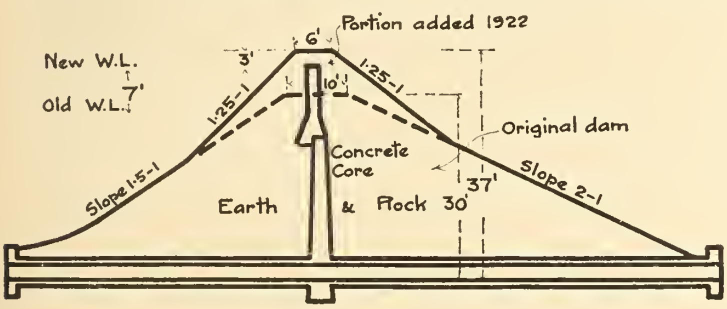
Kaleden Irrigation District — Marron Lake Dam.

Glenmore Dam near Kelowna

This dam although placed under the heading of earth dams is really of a composite nature, being a rock-filled crib dam and earth dam combined. The original dam, built in 1907, was constructed to store water for irrigating land in the vicinity of Kelowna and was of the rock-filled crib type with earth on the upstream side. In 1911 it was reconstructed, the upstream side of the crib being made watertight by timber sheeting and additional earth placed on the apron.

The design has now been considerably modified owing to the timber in the cribs having more or less deteriorated. About 10 feet upstream from the face of the crib work, a puddle clay core has been used to provide a watertight curtain and additional earth laid to a slope of 2¾ to 1 has been placed on the upstream side, thereby making the structure now an earth dam with a portion of the downstream side rock-filled.

The length of the dam on the crest is 636 feet and the maximum height is 32 feet, while 3,010 acre-feet of water can be stored in the reservoir created.



Black Mountain Irrigation District Dam No. 1.

Hydraulic Creek Dam of the South East Kelowna Irrigation District

This dam was built by the South East Kelowna Land Company for irrigating land in the vicinity of Kelowna. Chiefly owing to the World War, the land did not sell as anticipated and the stored water was sold to the owners of land adjacent to the project. On return of the more normal conditions the people who had been using the water wished to continue, so a co-operative organization, called the South East Kelowna Irrigation District was formed, which purchased the reservoir and irrigation system and is now operating it.

The dam is 562 feet long on the crest, with a maximum height of 24 feet, and stores about 7,000 feet of water. The core is of puddle clay and 6 feet of freeboard is provided above the crest of the spillway. It was originally intended to be 694 feet long and 34 feet maximum height, but has not been completed to these dimensions.

Marron Lake Dam of the Kaleden Irrigation District

The reservoir formed by this dam is at Marron lake, about 12 to 15 miles south of Penticton. The dam was built in 1923, is 260 feet long, maximum height of 28 feet, stores 450 acre-feet of water and has a 4-foot freeboard above the crest of the spillway. A concrete core-wall provides a watertight curtain. This dam may be considered as a very desirable type in the matter of permanency. Unfortunately in this case only a relatively small quantity of water is stored but owing to its value for irrigation in the vicinity the construction of the reservoir was very desirable.

Ocean Falls Dam.

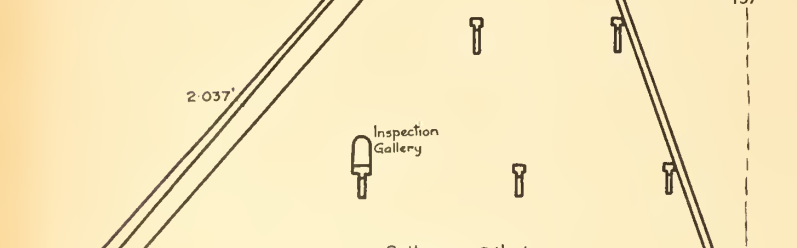
Belgo Creek Reservoir Dam of the Black Mountain Irrigation District

The original dam built by the Black Mountain Water Company was acquired by the Black Mountain Irrigation District a few years ago. There are two dams of this reservoir of similar construction, the main dam being 445 feet long, and with a maximum height of 37 feet. There are 7,045 acre-feet stored in the reservoir and it is used for irrigation purposes on land near Kelowna.

The dams are loose rock structures with concrete core-walls along the axis of each, which provide the watertight curtains. The height of the dams were recently increased, and it is of interest to note that the slopes of the rock-fill are fairly steep.

Wentworth Lake Dam of the Kamloops Irrigation and Power Co.

The reservoir formed by this dam is used to regulate the flow of water in Jamieson creek from which a supply of water is drawn for the irrigation of land in the vicinity of Kamloops. The dam is 400 feet in length along the crest, has a maximum height of 27 feet, and stores 1,134 acre-feet of water. This dam was designed by Prof. Etcheverry of California.



Granby Consolidated Mining and Smelting Company, Anyox Eastwood Multiple Arch Dam.

Diversion Dam on Anyox Creek of the Granby Consolidated Mining and Smelting Company

This dam is of the rock-fill timber crib type and is the highest dam of this construction in British Columbia. The cross-section shows a massive body of material and the timbers rest on what would appear to be a fill of broken rock. The length on the crest is only 160 feet and the maximum height 115 feet, 70 of which is formed by the timber work. Only 500 acre-feet are stored here so that it might be considered as only pondage. The dam is also used for diversion purposes for the penstock. The spillway which is at the side of the dam is excavated out of solid rock.

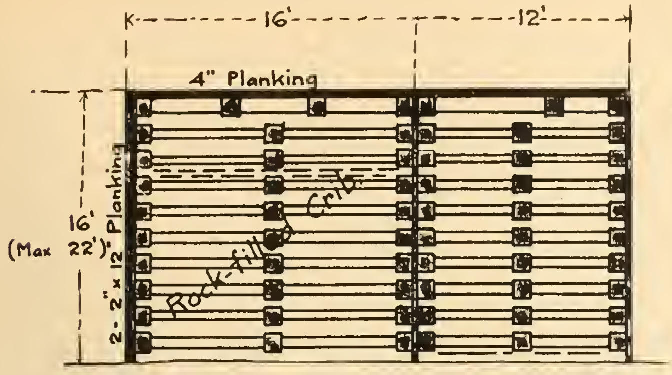
The water is used for the development of power, driving electric generators and air compressors for the Anyox smelter and copper mine.

Upper Bonnington Weir of the West Kootenay Power and Light Co.

This submerged weir was completed a couple of years ago to create additional head at the Upper Bonnington plant of the West Kootenay Power and Light Company during periods of low water in the Kootenay river. Flash-boards had been utilized previously but being only of a temporary nature they were washed out at high water. Owing to the large floods which came down this river at high water the stability of this structure was calculated for a maximum depth of 14.8 feet of water passing over the weir. As the length is 1,130 feet, provision is made for a flood discharge of approximately 200,000 cubic feet per second. The maximum height of the crib is 21½ feet. The power developed at Upper Bonnington is primarily used for the electrolytic refining of zinc, lead and copper at the Trail smelter.

Powell River Dam of the Powell River Company Limited

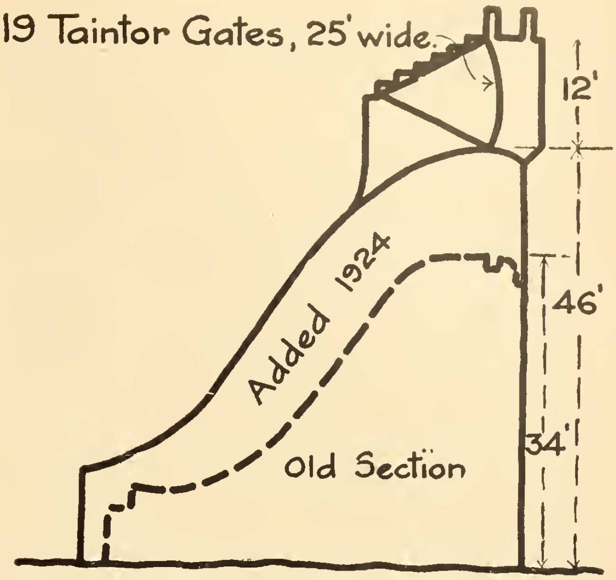
This dam, situated at the outlet of Powell lake, stores the water for the development of power for use in the pulp and paper plant of the Powell River Company.



West Kootenay Power and Light Company, Bonnington Falls — Typical Cross-section of submerged dam Kootenay River.

The dam has recently been increased in height, and is now 845 feet long on the crest, 58 feet high at the maximum point and stores water over a lake surface of 48 square miles. About 25,000 horse power is developed and is used directly off the turbine shafts for grinding wood pulp and in the generation of electrical energy.

For some years past it has been the practice of the company to erect horses with flash boards along the crest of the spillway, these being carried away at periods of high water but the crest has now been raised an additional 12 feet, and permanent structures in the form of Taintor gates, each 25 feet long, now installed and anchored to the dam. The increased height to which the water is being raised necessitated adding to the stability of the dam by increasing the mass of the dam proper. This

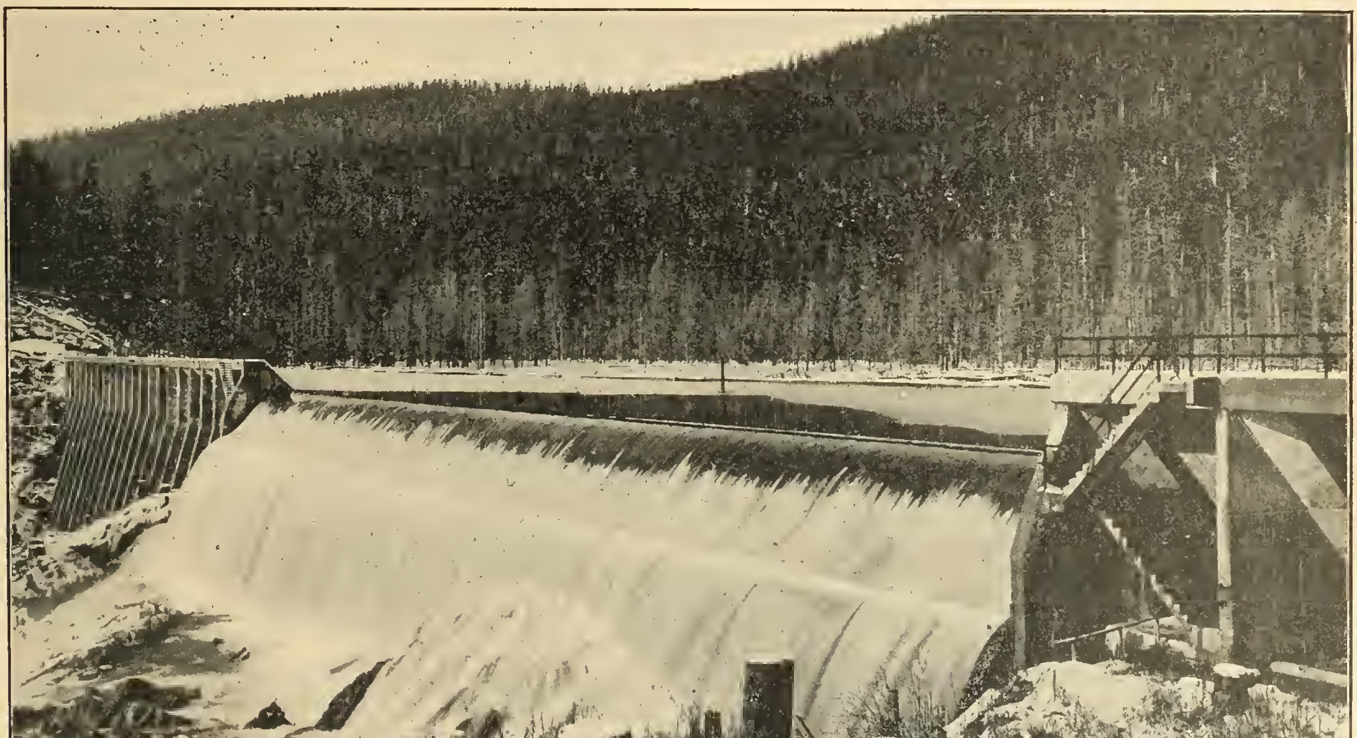


Powell River Company Limited — Powell Lake Dam.

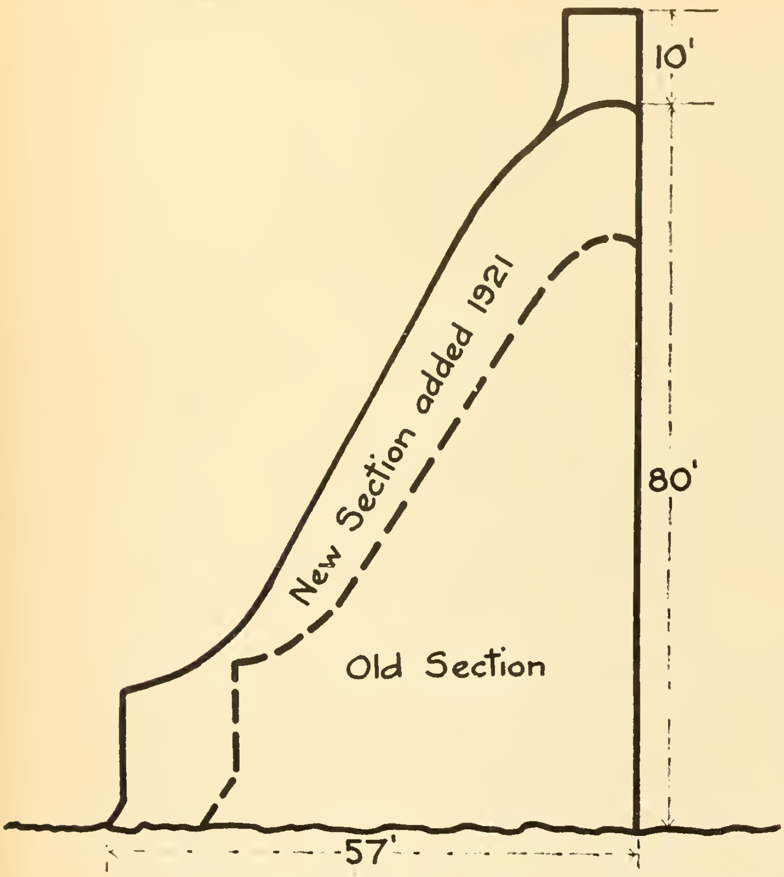
new portion which is about 9 feet thick has been added to the downstream side and has been bonded to the old portion by means of rods spaced on 4-foot centres.

Link Lake Dam of the Pacific Mills Limited

This dam, owned by the Pacific Mills Limited, is located at Ocean Falls and is used to store water for the development of power for use in a pulp and paper mill.



Jordan River Diversion Dam.



Pacific Mills Limited Ocean Falls — Link Lake Dam.

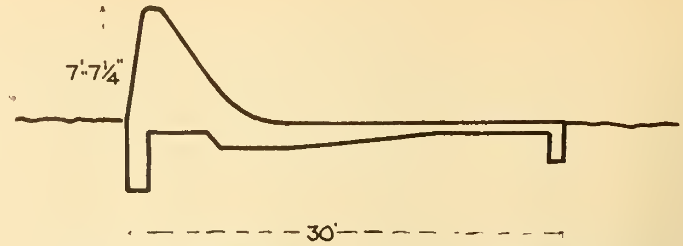
The dam has recently been enlarged similarly to the Powell river dam and it is now 644 long and 80 feet high at the maximum point. Although curved in plan, the dam does not rely upon the curvature for its stability but is of the straight gravity type. The crest of the dam has been raised 15 feet and a portion 9 feet thick has been added to the downstream face. This portion was bonded to the old section by re-inforcement on 4.5-by 4-foot centres.

Stave Lake Dam of the Western Power Company of Canada

This dam is located at the Upper Stave falls and is 7 miles below the outlet of Stave lake and about 36 miles east of Vancouver. The original portion was commenced in 1909 by the Stave Lake Power Company and the power plant to which it belongs was placed in operation at the end of 1911.

In 1920, the British Columbia Electric Railway Company acquired a controlling interest in the Western Power Company, and in 1922 a fourth generating unit was installed. To provide sufficient water for this additional unit the dam has recently been enlarged and it is now almost completed. The new work necessitated not only the enlarging of the main dam but the building of an entirely new structure in a channel of the river known as the Blind Slough.

The main dam originally contained a spillway section but this has now been entirely altered and the spillway is provided in the Blind Slough dam. Taintor gates formerly controlled the water passing into the penstocks but these have been removed and placed in the Blind Slough dam. An interesting feature in this work is the



Southern Okanagan Irrigation Project Diversion Dam, Okanagan River.

provision made for passing shingle bolts through the dam in a chute, the inlet to which is controlled by stop logs in order to permit of operation during varying stages of the water in front of the dam.

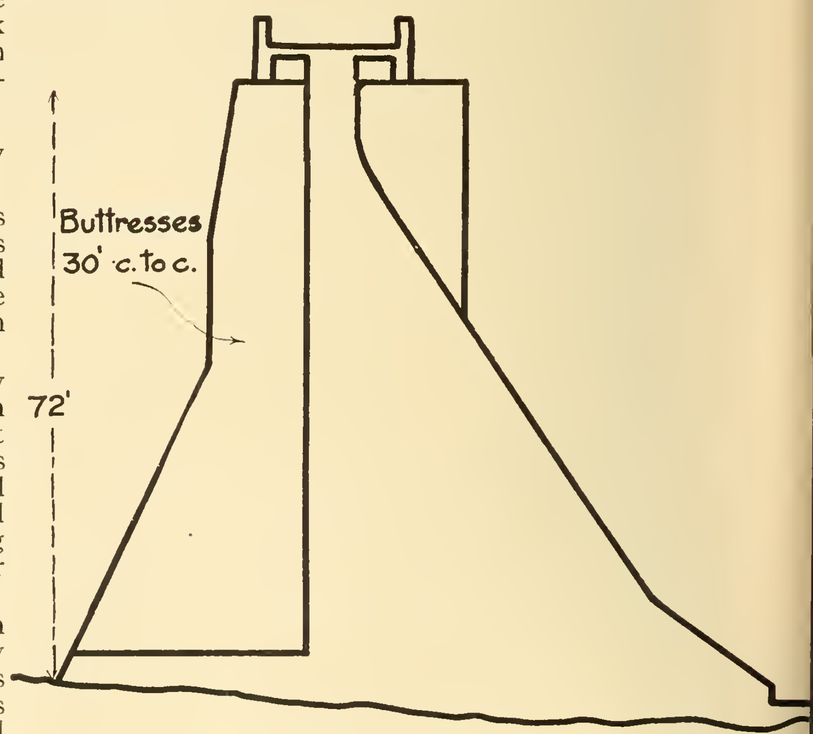
The main or intake dam is 560 feet long with a maximum height of 72 feet while the Blind Slough dam is 620 feet long and 57 feet maximum height. Both dams are of the gravity type.

Oliver Dam of the Southern Okanagan Irrigation Project

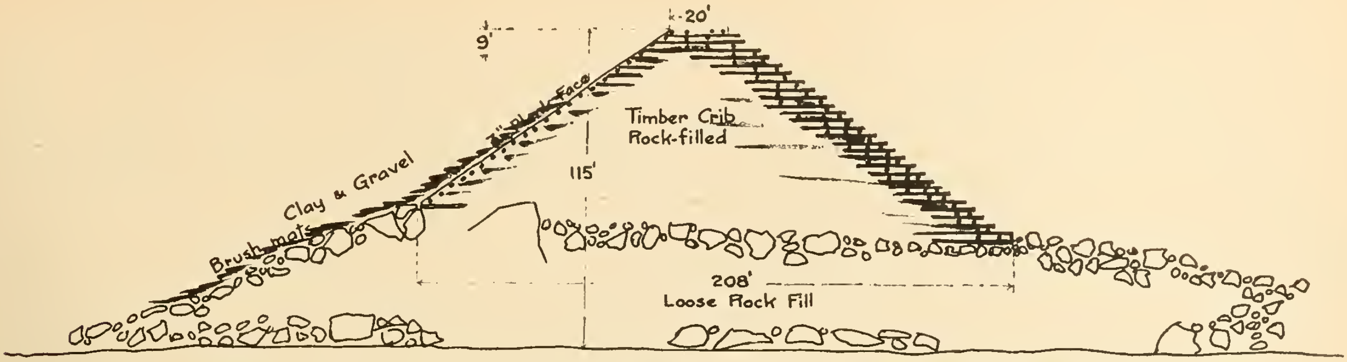
Although only a small dam it is interesting on account of the long apron with which it is provided to prevent scouring. This dam is used to divert water into the canal of the Southern Okanagan Irrigation project. It is 210 feet long and 8 feet high at the maximum section.

Woodworth Lake Dam of the City of Prince Rupert

This dam, owned by the city of Prince Rupert, is at the outlet of Woodworth lake on the Shawatlans river, and regulates the flow of the river for the power plant of the city. The dam is also used for diverting the water into the 45-inch diameter penstock which is connected directly to the structure. It is 107 feet long, is 43 feet maximum height and stores about 7,500 acre-feet.



Western Power Company of Canada-Stave Lake Dam.



Granby Consolidated Mining and Smelting Company, Anyox — Diversion and Storage Dam Falls Creek.

Anyox River Dam of the Granby Consolidated Mining and Smelting Co.

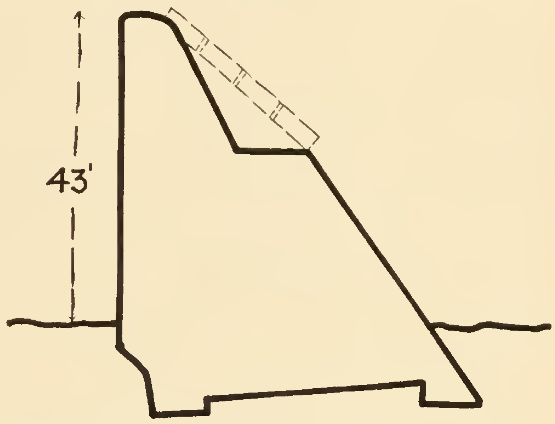
This dam, which is probably the highest in Canada at the present time, is a reinforced concrete structure of the multiple arch type, and was designed by the late Mr. Eastwood of California. It is particularly pleasing in design and it is a pity that it is in such a remote place.

It has a crest length of 684 feet, a maximum height of 137 feet and stores 28,000 acre-feet. The spillways, which are of the siphonic type, are the only ones of their kind in British Columbia, and although they have recently been slightly modified from the original design, they now function very satisfactorily. The water is released through the dam by three 37-inch butterfly valves in tandem with 30-inch gate valves.

The water is used in the development of power for the mining and smelting operations of the company at Anyox.

The Elk River Dam of the East Kootenay Power Company

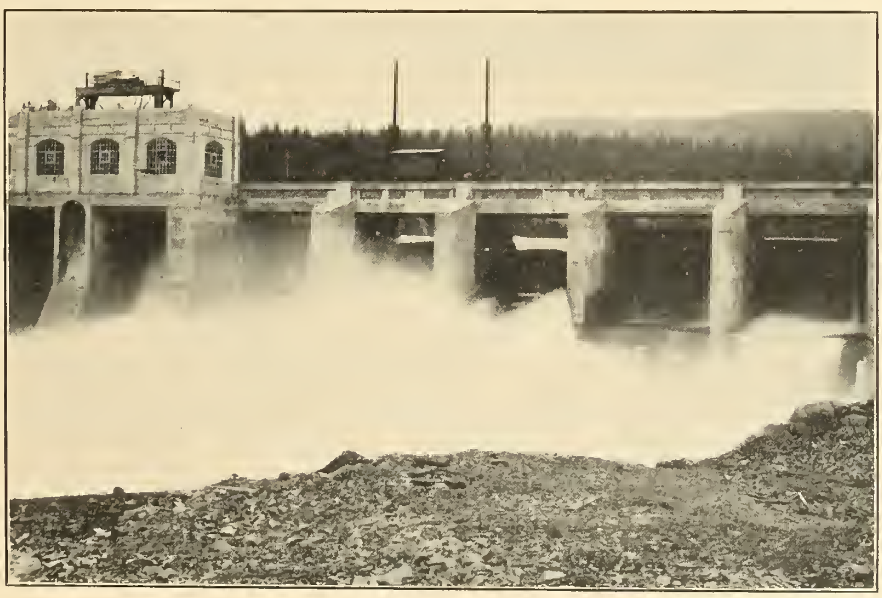
The dam located just south of the town of Elko is used for diverting water for the development of power. Built of reinforced concrete of the slab and buttress type, it has a total length of 300 feet and a maximum height of 50 feet. The spillway, at an elevation of 35 feet above the base, consists of a section 82½ feet long provided with stop logs, a section 78 feet long arranged for the use of flashboards, and two Taintor gates each 20 feet wide, making a total length of 190 feet and providing for a discharge of 25,000 c.f.s.



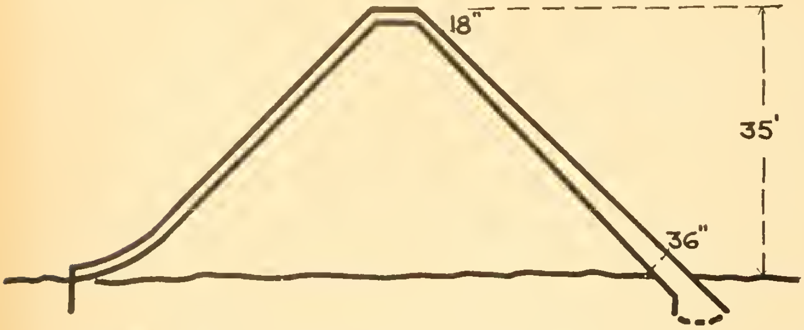
City of Prince Rupert, Woodworth Lake Dam.

Bull River Dam of the East Kootenay Power Company

This dam is located on the Bull river near Wardner, East Kootenay. It is a reinforced concrete dam with an earth fill extension, the length being 270 feet and the maximum height 33 feet. The concrete portion is 170 feet long, 118 feet of which, at an elevation of 23 feet



Blind Slough Dam.



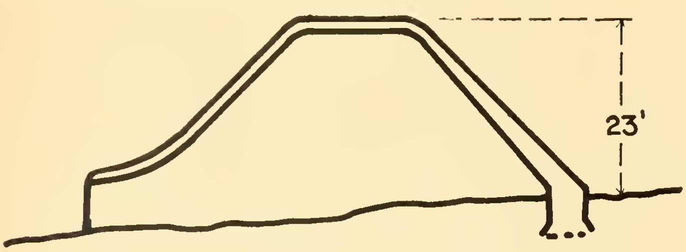
East Kootenay Power Company—Elk River Dam.

above the base, is used for a spillway, while the earth fill which is provided with a concrete core is 100 feet long with a maximum height of 11 feet.

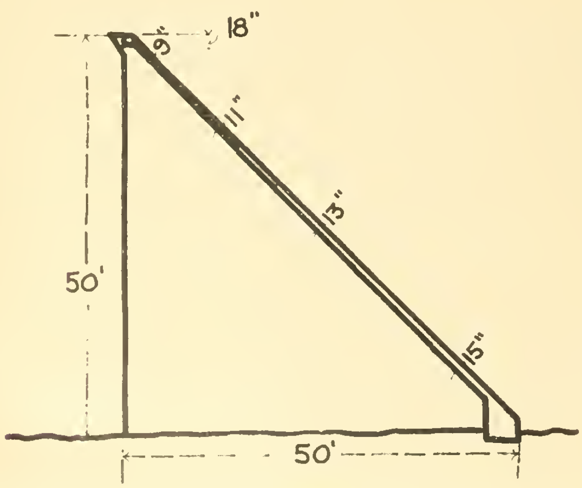
The dam is for the purpose of diverting the water into the penstocks for developing electrical energy for the East Kootenay Power Company's system.

Jordan River Dam of the Vancouver Island Power Company.

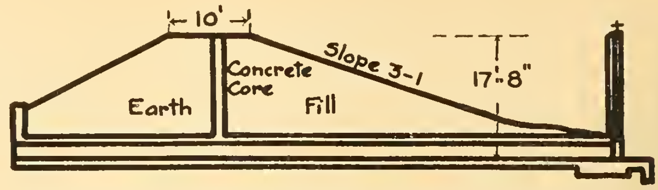
This dam is of the Ambursen type and is an excellent example of the slab and buttress form of construction. It is 891 feet in length, is 126 feet high at the maximum section and stores 14,000 acre-feet of water. The water is used in the development of power at the Jordan river plant of the Vancouver Island Power Company. The spillway, which is 305 feet in length, is capable of discharging 23,000 c.f.s. The volume of concrete in the dam is 21,185 cubic yards and there are 380 tons of 5/8 and 7/8 inch diameter reinforcement bars. The cost was about three-quarters of a million dollars.



East Kootenay Power Company — Bull River Dam.



Britannia Mining and Smelting Company-Utopia Lake Dam.

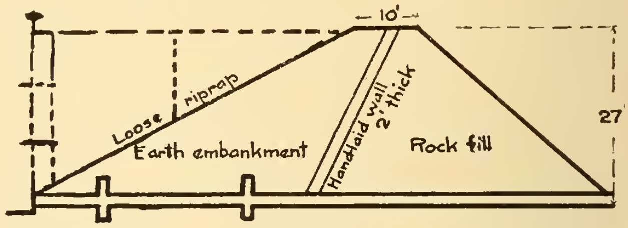


Peachland Irrigation District North Fork Dam.

Utopia Lake Dam of the Britannia Mining and Smelting Co.

This is a dam of the straight slab and buttress type and is 225 feet long, 50 feet maximum height and stores 700 acre-feet of water. It is located near the headwaters of Britannia creek which flows into Howe sound.

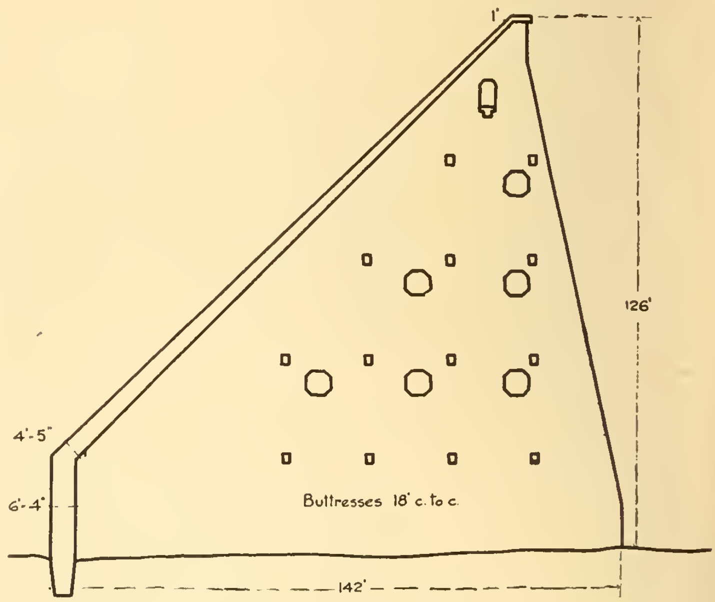
The water stored is used for the development of power for mining.



Kamloops Irrigation and Power Company — Wentworth Lake Dam, Jamieson Creek.

Puntledge Lake Dam of the Canadian Collieries Co.

This dam is of the Ambursen flat slab and buttress type and is located at the outlet of Puntledge lake near Cumberland. It is 300 feet in length and of a maximum height of 23 feet. The storage capacity of the reservoir formed by the dam is 132,000 acre-feet. The spillway is 100 feet long, and in addition an opening, controlled by stop logs, is provided to pass flood waters. The discharge from the reservoir is through six outlets, each 5 by 6 feet, provided with gates of the butterfly type, and the water passes 2½ miles down the Puntledge river to the diversion dam and thence through the canal and pipe lines to the power house. The electrical energy is used in the town and around the mines at Cumberland and also in the town of Courtenay.



Vancouver Island Power Company-Jordan River Dam.

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THE

ENGINEERING JOURNAL

THE JOURNAL OF
THE ENGINEERING INSTITUTE
OF CANADA

VOL. VIII JULY 1925 No. 7

Western Professional Meeting,
Banff, Alta.,
Saturday, July 11th to Thursday, July 16th, 1925, inclusive.

An Appreciation

The twenty-four branches of The Engineering Institute of Canada desire to join with Council in expressing appreciation of Mr. Keith's many services to The Institute, regret at the loss The Institute is sustaining at his departure, and best wishes for his success in his new sphere of work.

The Western Professional Meeting

Most elaborate plans are being completed for the Western Professional Meeting of *The Institute* which is to be held at Banff, Alta., commencing Saturday, July 11th, and continuing until Thursday, July 16th. A preliminary notice of this committee appeared in the June issue of *The Journal* and the committee has since completed arrangements for the programme, details of which are given below. Few organizations have convened meetings under such favourable circumstances, where the members will be brought together with intimate association afforded in camp life and where the entire meeting with its well balanced programme of technical papers and entertainment will have for its setting Canada's most famous resort in the heart of the Rocky Mountains.

Programme

Saturday, July 11th, 1925

Camp will be pitched and all who wish may go under canvas.

Sunday, July 12th, 1925

Registration.
Lunch (first meal at camp).
Visit to Zoo, C.P.R. Swimming Pool, and other local points of interest.

Monday, July 13th, 1925

Opening addresses by:
Chairman,—Vice-President A. S. Dawson, M.E.I.C.
Lt.-Governor Hon. R. G. Brett.
J. B. Harkin, Parks Commissioner.

Representatives of visiting organizations.

"Park Highways" by J. M. Wardle, A.M.E.I.C., Chief Engineer, Parks Department.

Discussion led by P. Philip, M.E.I.C., Deputy Minister, Public Works, British Columbia.

"Reconstruction of Lake Louise Hotel, during winter 1924-25" by H. S. Bare, A.M.E.I.C., Hotel Construction Department, C.P.R.

"Vancouver Harbour Development" by Major Geo. A. Walkem, A.M.E.I.C.

Discussion to be led by William Pearce, M.E.I.C., Calgary.

Lunch.

Sightseeing drives, Banff and vicinity.

Information and prices of various drives can be obtained from Camp Office. Saddle horses can be obtained for those wishing to visit these places in this manner.

A climb to the Government Observatory at top of Sulphur Mountain will be arranged if a sufficient number express their desire to do so, under the guidance of Mr. N. B. Sanson. Please notify Camp Office of intention as early as possible.

Illustrated lecture on Rocky Mountains by M. P. Bridgeland, Topographical Surveys Branch, Department of the Interior.

Swimming at Cave and Basin. By special arrangement the swimming pool is being reserved.

Tuesday, July 14th, 1925

Trip to Exshaw, by automobile, to the Cement Plant. The distance is approximately 24 miles through beautiful mountain scenery. Lunch will be provided at Exshaw through the courtesy of the Canada Cement Company Ltd.

Golf and Tennis. All those desirous of playing either of these games should give their names into the Camp Office as early as possible after arrival in camp.

Camp Fire — sing song, etc.

Wednesday, July 15th, 1925

"Alberta Natural Resources" by Edgar Stansfield, M.E.I.C., Fuel Engineer, Scientific and Industrial Research Council of Alberta.

"Aerial Photography", by F. H. Peters, M.E.I.C., Director of Topographical Surveys Branch, Department of the Interior.

Discussion led by Squadron Leader A. L. Cuffe, A.M.E.I.C., R.C.A.F.

"Alberta Petroleum Geology", by Dr. O. B. Hopkins, Chief Geologist, Imperial Oil Ltd., Toronto, Ont.

Lunch.

Picnic Sports. Lists of events will be published on Camp Office Notice Board. Everyone expected to enter at least 100 per cent of events.

Dance at Banff Springs Hotel.

Thursday, July 16th, 1925

Get away day.

Golf and tennis events to be continued.

Invitation to Members of The Institute

The American Railway Engineering Association, Committee No. 17, and the American Wood Preservers Association, have kindly extended an invitation to all members of *The Institute*, to join them on the occasion of their meeting in Montreal, on July 8th and 9th, 1925. Following the business session of this organization on the 8th of July, a dinner and open meeting will be held at the Windsor hotel. On the 9th of July the sessions of the meeting will be devoted to the discussion of the following subjects:—

Penetration and absorption tests on Canadian woods.

Seasoning study of maple ties with special reference to the moisture content in checking after treatment.

Effect of crude oil creosote mixtures in preventing checking.

Some tests to determine the value of Wolman Salts as a wood preservative.

It is hoped that as many members of *The Institute* as possible will avail themselves of this kind invitation.

OBITUARY

Richard Henry Smith, A.M.E.I.C.

It is with regret that we record the death of one of *The Institute's* esteemed members, the late Richard Henry Smith, which occurred in Montreal, on May 8th, 1925. The late Mr. Smith occupied the position of assistant engineer in the office of the engineer of standards, Canadian National Railways, Montreal, and was well and favourably known throughout railway engineering circles in Canada, having been engaged in railway construction work in the Maritime Provinces, Ontario and Manitoba. The late Mr. Smith was born at Sydney, N.S., on May 29th, 1881, and commenced his engineering career in Nova Scotia in February 1903 when he joined the staff of the Dominion Iron and Steel Company as instrumentman, and was connected with that company for the next two and a half years. In August 1905 he commenced his railway work and was engaged as leveller and instrumentman on the construction of the Grand Trunk Pacific Railway, and in May 1906 was appointed resident engineer for this railway at Portage La Prairie, Man. He remained at this work until the year 1914 when he returned to Nova Scotia as resident engineer on the construction of the Halifax Ocean Terminals. Five years later he was transferred to Campbellton, N.B., as division engineer on maintenance for the Canadian National Railways and remained there until last year when he was transferred to Montreal to the position he occupied at the time of his death. The late Mr. Smith joined *The Institute* as a Student on November 1st, 1904, and was transferred to Associate Member on May 2nd, 1907.

PERSONALS

Frederick W. Bradshaw, S.E.I.C., who graduated this year from McGill University, with honours in chemical engineering, is located at St. Joseph D'Alma, Quebec, with Messrs. Price Bros., and Co., Limited.

W. P. Dobson, M.E.I.C., laboratory engineer with the Hydro-Electric Power Commission of Ontario, has been elected to the directorate of the American Institute of Electrical Engineers at New York.

J. L. Balleny, S.E.I.C., has been appointed to the students' course with the Canadian General Electric Company at Peterborough, Ont. Mr. Balleny graduated from McGill University this year.

W. J. Shortall, S.E.I.C., is located at Schenectady, N.Y., where he is taking the students' course with the General Electric Company. Mr. Shortall graduated from McGill University in electrical engineering this year.

J. D. Fraser, S.E.I.C., of Halifax, N.S., who graduated from McGill University this year in electrical engineering is taking the students' course with the General Electric Company at Lynn, Mass.

C. F. Campbell, S.E.I.C., of St. Johns, Newfoundland, who graduated from McGill University this year with honours in electrical engineering is taking the students' course of the General Electric Company at Schenectady, N.Y.

R. McK. Morton, S.E.I.C., of Vancouver, B.C., who has recently graduated from the University of British Columbia, has been appointed to the test course of the Canadian General Electric Company and is located at Peterborough, Ont.

L. S. Sterns, S.E.I.C., is on the engineering staff on the construction of the new mill for the Canadian International Paper Company at Three Rivers, Quebec, the resident engineer of which is A. I. Cunningham, A.M.E.I.C. Mr. Sterns graduated from Dalhousie University, May 1922.

Clarke W. Gamble, A.M.E.I.C., partner in the firm of Messrs. Layard and Gamble, engineers and contractors, Sidney, B.C., has opened an office at 318 Central building, Victoria, B.C. Mr. Gamble has engaged in considerable engineering work, surveys and supervision of construction on British Columbia projects.

Mr. Gamble was lately employed by the Public Works Department of British Columbia. He is a son of W. C. Gamble, who was chief engineer of the Provincial Public Works of the British Columbia Government.

John A. Hehn, Jr.E.I.C., who has been employed at the Algoma Steel Corporation and the Algoma Central and Hudson's Bay Railway of Sault Ste. Marie, Ont., for the past three years has moved to Hammond, Indiana, where he is now employed with the New York Central Railway.

N. F. Nutter, A.M.E.I.C., of Truro, Nova Scotia, engineer with the Western Union Telegraph Company, has been appointed by the New Brunswick Board of Public Utilities to supervise the elimination of interferences between the distribution systems of the New Brunswick Power Company and the City Power Commission in the city of St. John, N.B.

C. M. Low, A.M.E.I.C., formerly with the Temiskaming and Northern Ontario Railway at North Bay, Ont., is now located in Toronto with Meldrum's Canada

Limited, engineers and contractors. Subsequent to his service overseas during the war, Mr. Low was attached to the staff of the Railway Department of the Hydro-Electric Power Commission of Ontario.

K. C. Berney, A.M.E.I.C., has been transferred from Springfield, Ohio, to Brantford, Ontario, where, in accordance with his recent appointment he has taken over the duties of manager of Messrs. Robbins and Myers of Canada Limited. Mr. Berney who is a graduate of Queen's University of 1906, was formerly with the Robbins and Myers Company at Springfield, Ohio.

C. S. Creighton, A.M.E.I.C., of Dartmouth, N.S., is located at Boston, Mass., with the New England Structural Company. Mr. Creighton graduated from the Nova Scotia Technical College in 1913 and was for several years with the Dominion Iron and Steel Company at Sydney, N.S. He was later on the engineering staff of the Cape Breton Engineering Works and its successor the Verner Engineering and Manufacturing Works, Limited.

W. Chase Thomson, M.E.I.C., consulting engineer of Montreal, has been appointed bridge and structural engineer on the staff of the Canadian section of the Joint Board of Engineers engaged in the study of the St. Lawrence river development project and is located in Ottawa. As announced in another part of this issue, Mr. Thomson was awarded the second prize for his design in the Montmorency Falls Bridge competition.

R. E. Jamieson, A.M.E.I.C., lecturer in mathematics and civil engineering at McGill University, has been appointed assistant professor in these subjects. Mr. Jamieson received his degree of Bachelor of Science from McGill University in 1914 and his degree of Master of Science from the same university in 1920. Prior to joining the staff of McGill University he had extensive experience on railway location and construction as well as on structural design.

Arthur J. Chabot, S.E.I.C., of Outremont, Que., has been appointed to the students' course with the General Electric Company at Schenectady, N.Y. Mr. Chabot graduated this year from McGill University and, in addition to graduating with honours, he was awarded the Association Medal; the Montreal Light, Heat and Power Consolidated, first prize; Undergraduate Society second prize for summer essay and the Electrical Club prize for summer essay.

F. M. Wood, A.M.E.I.C., of the hydraulic department of the Dominion Engineering Works, Limited, Montreal, has been appointed lecturer in civil engineering at McGill University. Mr. Wood graduated from Queen's University, receiving his degree of Master of Arts in 1911 at which time he was awarded the gold medal in mathematics, and his degree of Bachelor of Science with honours in civil engineering in 1914. For two sessions, from 1919-1921, he was lecturer in mathematics at Queen's University. Subsequently he was appointed resident engineer on location and construction in connection with the irrigation system of the Lethbridge Northern Irrigation District, which position he occupied until joining the staff of the Dominion Engineering Works Limited, in 1923.

W. D. Adams, A.M.E.I.C., has resigned his position as assistant engineer with the Walter J. Francis and Company, Montreal, and has been appointed to the staff of the railway and bridge section of the Department of Works of the city of Toronto. After graduating from the Royal Military College, Kingston, in 1908, Mr. Adams was appointed assistant engineer, middle division of the Grand Trunk Railway. In 1910 he was in charge of the engineering department of the Canadian Buffalo Forge Company, Montreal, and from June of that year until August 1914, he was assistant engineer grade separation, railway and bridge section of the Department of Works of the city of Toronto. On returning from overseas in September 1919, he became a partner with Adams Brothers of Toronto, until he joined the staff of the Toronto Transportation Commission as assistant engineer in 1921 and subsequently became connected with Messrs. Walter J. Francis and Company of Montreal.

Lt.-Col. T. Sydney Morrisey, D.S.O., A.M.E.I.C., receives Appointment

Lt.-Col. T. Sydney Morrisey, D.S.O., A.M.E.I.C., has been appointed sales manager of the eastern district of the Combustion Engineering Corporation, with offices in the Canada Cement Company Building, Montreal.

Lt.-Col. Morrisey is a native of St. John, N.B., and graduated with honours from the Royal Military College

LT. COL. T. S. MORRISEY, A.M.E.I.C.

in 1910, and from that date until the outbreak of war was engaged on design and construction of various engineering projects.

In August 1914 he joined the 13th Battalion, the Royal Highlanders of Canada, and proceeded overseas with that unit. He served continuously for three years in France and later in Siberia, and was demobilized in 1919 with the rank of Lieut.-Colonel. During the war he was awarded the D.S.O., the Japanese Order of the Rising Sun, and the Czecho-Slovak War Cross, and was several times mentioned in despatches.

More recently Mr. Morrisey was employed as construction and operating engineer on some of the largest installations for the American company of the Combustion Engineering Corporation, and has also served for some time in the head office in New York, so that he is well qualified to advise, from practical experience, in matters pertaining to combustion.

Western Manager Appointed for Combustion Engineering Corporation

Edgar A. Jamieson, A.M.E.I.C., of the Jamieson Engineering Company Limited, of Vancouver, B.C., has been appointed western manager for the Combustion Engineering Corporation Limited.

Mr. Jamieson was born in Pakenham, Ontario, in 1884, where he received his early education. He is a graduate in mechanical and electrical engineering of the University of Toronto, and took post-graduate work on the metallurgy of iron and steel in Sheffield and at the Royal Ordnance College, England. His early work was with the Canadian Pacific Railway, when he was engaged on the construction of docks, etc., in the Okanagan Valley, B.C., and on terminal work at Vancouver, B.C. He was later engaged on various investigations in connection with water powers and subsequently was on the staff of the Water Rights Branch of the Department of Lands, B.C., in charge of surveys for investigation of water power and water rights. During the war he was inspector of guns and steel on the general staff of the C.E.F. At the end of the war he returned to Vancouver and in 1919 instituted the engineering company which bears his name, and specialized in power investigation, pulp and paper and bridge work.

E. A. JAMIESON, A.M.E.I.C.

Mr. Jamieson is the only member of the Iron and Steel Institute of Great Britain west of the Sault in Canada; a Fellow of the Royal Society of Arts, London; a member of the American Academy of Science, Association of Professional Engineers of B.C.; and a charter member of the University Club, Gyro Club and Point Grey Golf and Country Club. Mr. Jamieson received his early business training in the Union Bank of Canada.

Additional Students of The Institute Who Have Graduated This Year

The following list of Students of The Institute who have graduated during the present year, and to whom congratulations are in order was received too late for publication with the general list in the June Journal:

Ecole Polytechnique, Montreal

Maurice Royer, Quebec.
Camille Perras, Montreal.
Lucien Roy, Lachine.
Valérien Toupin, Montreal.
Charles Valiquette, Montreal.
Emilien Dagenais, Montreal.
Joseph Ethier, Montreal.

ELECTIONS AND TRANSFERS

At the meeting of Council held on June 23rd, 1925, the following elections and transfers were effected:—

Member

LECLAIRE, Joseph Paul, B.A.Sc. (C.E.), (Laval Univ.), chief engr., Harbour Commissioners of Montreal, Montreal, Que.

Associate Members

BROWN, Harry Cleophas, B.Sc. (McGill Univ.), electr'l. engr. responsible for design and purchase of equipment for 100,000 h.p. substation and 400 ton paper mill for Newfoundland Power & Paper Co., and in charge of electr'l. constrn. of above plant for Sir W. G. Armstrong-Whiteworth Co., at Cornerbook, Nfld.

DAVIES, Stanley James, M.C. and Bar, Assoc. (Royal School of Mines), on the staff of the Institute of Technology and Art, Calgary, Alta.

DICKENS, Harry B., dftsman., York Township, Toronto, Ont.

GEMMILL, James Dunlop, (Grad. R.M.C. Gold Medallist), statistician, Winnipeg Hydro-Electric System, Winnipeg, Man.

GURNHAM, Robert Allan, sales engr., Darling Bros., Montreal, Que.

LATREILLE, J. Raymond, B.Sc. (C.E.), (Ecole Polytech.), engr., hydraulic service, Prov. Govt., Quebec, Que.

Juniors

JOY, Clyde Barber, B.A.Sc. (Univ. of Tor.), struct'l. dftsman., American Bridge Co., Pencoyd Plant, Pencoyd, Pa.

MacDONALD, Donald Stewart, B.Sc. (Queen's Univ.), supt., Sask. Dist., with headquarters at Winnipeg, for Hurst Engrs. & Construction Co. Ltd.

Transferred from the class of Associate Member to that of Member

VIENS, Ephrem, B.A. (McMaster Univ.), director, Laboratory for Testing Materials, Dept. Public Works, Ottawa, Ont.

Transferred from the class of Junior to that of Associate Member

CHAPMAN, Edward Willard Gordon, S.B. (C.E.), (N.S. Tech. Coll.), instr'man., C.N.R., New Glasgow, N.S.

OWENS, Edward James, B.Sc. (Univ. of N.B.), office engr., N.B. Electrical Power Commission, St. John, N.B.

THEAKSTON, Harold Raymond, B.Sc. (N.S. Tech. Coll.), asst. professor of engrg., and engr. in charge of bldgs. and grounds, Dalhousie University, Halifax, N.S.

Transferred from the class of Student to that of Junior

COOPER, Paul Emerson, B.Sc. (McGill Univ.), topog'l. engr. and senior dftsman., Singer Mfg. Co., Ottawa, Ont.

LAINE, Darby John, B.A.Sc. (Univ. of Tor.), 314 Bain Avenue, Toronto, Ont.

NORMAND, Edmond, B.Sc. (Ecole Polytech.), engr., Montreal Water Board, Montreal, Que.

POWELL, Morley Vincent, B.A.Sc. (Univ. of Tor.), Canadian General Electric Company, Peterborough, Ont.

The following students were admitted:—

FLEMING, Ian Torrens, B.A., B.A.I., (Trinity College, Dublin), 950 Tupper Street, Montreal, Que.

LUTZ, Randolph Bertram, B.Sc. (Univ. of N.B.), 179 Dominion Street, Moncton, N.B.

MacRAE, George Francis, B.Sc. (Univ. of N.B.), 26 McTavish Street, Montreal, Que.

PETCH, Frank Grant, 72 Devonshire Road, Walkerville, Ont.

Presentation Tray to Fraser S. Keith

This tray was presented to Fraser S. Keith, by the members of Council during the years 1917-1925, as will be seen by reading the inscription. The tray is of sterling silver, and is eighteen inches in diameter.

To the names engraved should be added those of Professor E. Brown, and Messrs. Frederick B. Brown and D. O. Lewis.

Fraser S. Keith, M.E.I.C.

Following the announcement made at the annual meeting in Montreal, in January of this year, the members of *The Institute* learned through the pages of *The Journal* of the resignation of Fraser Sanderson Keith, B.SC., M.E.I.C., for eight years general secretary of *The Institute*, and editor and manager of its official publication, *The Engineering Journal*.

The untiring energy and boundless enthusiasm which were characteristic of Mr. Keith's work in *The Institute*, are well known to all members, and to none better than the officers who have served *The Institute* during the period since Mr. Keith's appointment as the first full-time secretary. This appointment, made in 1917, was the recommendation of the special committee on society affairs, and in the subsequent progress of *The Institute* can be read the verdict on the wisdom of this committee's decision.

FRASER S. KEITH, M.E.I.C.

Hailing from Smith's Falls, Ontario, where he was born on June 8th, 1878, and where he received his primary education and early experience, Mr. Keith entered the electrical course at McGill University, and graduated with honours in the year 1903. Subsequently he gained a very extensive experience in editorial work with a number of well known Canadian technical publications, occupying such positions as editor and managing editor. In February 1917, Mr. Keith assumed the duties of general secretary of the Canadian Society of Civil Engineers. Early in the following year was witnessed one of the outstanding events in the history of the organization, the change of the Society's name to *The Engineering Institute of Canada*, and the fuller development of the policy of embracing in one society all branches of the engineering profession. Not many months later *The Engineering Journal* was inaugurated, the publication of which was also the recommendation of the special committee on society affairs. From that date, helped by the energy and ability of Mr. Keith, *The Institute* made rapid and constant progress. In 1917 its organization consisted of nine branches, with a total membership of thirty-one hundred. At the present time there are twenty-four active branches and the membership has increased to approximately fifty-four hundred. This progress is indicative of the carefully planned policies of the Council, and the sound judgment displayed in the carrying out of these policies by *The Institute's* executive officer.

Through *The Journal*, Mr. Keith aimed to keep the members in close touch with each other, binding them more closely by the ties of an intimate knowledge of the professional activities of their fellow engineers.

In the policy of holding professional meetings at the headquarters of the different branches throughout Canada, greater strength was given to these ties of friendship, and to-day we have in *The Institute*, an organization remarkable among engineering societies in that the members of all branches of the profession are included in one national society.

The present high position held by *The Institute*, the fulfillment of so many of its aims and ambitions during the past eight years, the marked degree of goodwill and good fellowship among its members, are a measure of Mr. Keith's valuable services to the engineering profession in Canada.

Mr. Keith after acting in an advisory capacity during the six months that have elapsed since his resignation, now severs his official connection with *The Institute*.

Abstracts of Papers read before the Branches

Contracts

Col. N. R. Robertson,
Niagara Peninsula Branch, March 24th, 1925.

It is a fiction of law that 'all persons are supposed to know all law'. Ignorance of the law excuses no one. As lawyers and judges spend their lives trying to learn all law and never succeed, naturally laymen fall short also. Not being able, therefore, to know *all* law, the next best thing is to learn that part of it which most affects oneself. For this reason I choose as my subject, not criminal law, which, I presumed, would hardly apply to this gathering, but 'Contracts', a topic which should be of interest to the engineer.

What is a Contract?

A contract is an agreement, enforcable at law, made between two or more persons, whereby rights are acquired by one or more to acts or forbearances on the part of the other or others. The necessary elements for a valid contract are:

(1) A distinct communication by the parties, one to the other, of their intention. In other words, there must be offer and acceptance.

(2) The presence of certain evidence, required by law, of the intention of the parties to affect their legal relations. Social engagements are not contracts. This evidence is either 'form' or 'consideration'.

(3) The capacity of the parties to make a valid contract.

(4) The genuineness or reality of consent expressed in offer and acceptance.

(5) The legality of the objects which the contract proposes.

Where these five elements co-exist there is a valid or good contract. Where one or more is absent, there is a monkey in the machinery and the contract may be: Unenforcible, i.e., valid but incapable of proof; voidable, i.e., capable of being affirmed or rejected at the option of one of the parties; or void, i.e., destitute of legal effect, in which case there is no contract in existence.

Offer and Acceptance

From this every contract springs. An offer is made, you signify your acceptance. This constitutes a contract. A merchant displaying goods makes a silent offer. If you pick an article up and say 'I'll take it' you are presumed to intend to pay the price.

Offer and acceptance may be by words or conduct. The intention of the parties may be inferred by their conduct. If a labourer applies for a job and you agree to pay him and he starts to work, this constitutes a contract. If a labourer comes on the job and starts to work and you see him working and raise no objection, — he stays there with your tacit consent, — you are presumed to have intended to pay him.

An offer is made when, and not until, it is communicated to the offeree. You may have intended to offer a contract to 'A', but unless this actually takes place, 'A' cannot accept. There is no contract. Acceptance of an offer must be communicated by words or conduct. An offer may be withdrawn any time up to acceptance. Acceptance is communicated when it is made in the manner prescribed by the offeror, even if it does not reach the offeror. The offer remains open during a time prescribed by the offeror or reasonable under the circumstances. An offer by mail invites a reply by mail, then if the letter of acceptance is lost in transit, the offeror is still bound. The offer having been made by mail, the offeror thereby chooses the mail as his agent, and the acceptor has done all that was required of him when he drops the letter of acceptance in the mail. An offer lapses on the death of the offeror prior to acceptance. An offer is irrevocable on being accepted. Acceptance must be absolute, and must correspond with the terms of the offer. A counter-offer revokes the original offer, and an offer once refused is dead and cannot be revived.

Form or Consideration

These are necessary, as showing the intention of the parties to create obligations. A formal contract, under seal, is binding and nothing set out in the deed may be denied. A seal is usually a red patch, but it may also be a piece of a postage stamp or similar sticker. It is none the less a formal act. When something is paid for something, *quid pro quo,* as '$1.00, and other valuable consideration' as the expression goes, then a bargain is made and is binding.

A simple contract, not under seal, is void in six years. A formal contract, one under seal, holds for twenty years. There are special exceptions to this. A contract with a corporation must, in order to bind the whole corporation, be under the corporation seal. In the case of MacKay versus the City of Toronto, an extensive survey was ordered by the mayor. The work was done at considerable cost to the engineer. The council turned down the project. The engineer was unable, even in the courts, to recover his fees.

Capacity of the Parties to Contract

Contracts with alien enemies were void during the war, and during that period it was not permitted to make contracts with them. A contract with a minor, a person under twenty-one years of age, is not binding, even though the minor has since come of age, unless he later affirm the contract. This holds for everything except personal necessaries. A contract made during temporary or permanent aberration is not binding, but it may later be affirmed, and is then valid.

Genuineness of Consent

If the parties, through mistake, make a contract, when some other thing entirely was intended, — if their minds were not together on what was meant, — the contract is void.

If there is innocent misrepresentation, false facts stated, not knowing them to be false, if these facts concern condition the contract may be upset, if they concern warranty damages may be collected.

If fraud, wilful misrepresentation, enters into the deal, the contract may be set aside and damages collected. Contracts made under duress, actual or threatened violence, or undue influence, are void.

Legality of the Objects of the Contract

Contracts contrary to statute, common law or public policy, are void. Under this head may be cited, betting contracts, agreements to commit an indictable offense or civil wrong, to take part in hostile dealings with a friendly state, to cause injury to the public service, to pervert justice or to effect an immoral purpose. Agreements for the restraint of trade are also void.

Remedies

When a contract is not being lived up to, and things go wrong, the complaining party may ask for one of five things, namely: *Damages,* i.e., compensation for loss caused by non-performance of the contract; *specific performance,* i.e., an order that the contract may be carried into effect by the other party, according to its terms; *an injunction,*— the restraint of an actual or contemplated breach of contract; *cancellation,* — the setting aside of the contract; *rectification,* — the alteration of the terms of the contract to express the true intention of the parties.

Engineering Contracts

The same principles govern engineering as any other contracts, except for the fact that engineers and architects usually make them so involved and cumbersome that they are hardly understandable, with the result that the unfortunate contractor signs without reading any more than is sufficient for him to tender on. He trusts to luck to get through without being wrecked.

An engineering contract usually consists of the contract or agreement and the plans and specifications. Each of these should refer to the other on the face of them. An important rule of evidence is that a written instrument cannot be varied, added to, or detracted from by oral evidence. Anything that you think may be of importance to you, have it incorporated in the contract or specifications.

Where there are clauses that neither party desires to disclose to others who might see the main contract, these may be contained in a schedule, such as 'Schedule A', which should be initialled and made to refer to the contract.

Sometimes plans and specifications are the only evidence of a contract which in the main is oral. This is foolish procedure, and gives rise to many arguments and misunderstandings, from which the contractor usually suffers most. Beware of these "Standard Specifications and Plans" which carpenters and plumbers frequently offer, at a price, to the owner who is trying to do it on the cheap. A clause providing penalties is usual, as, 'If this contract is not completed by ——— day of ———, a penalty of $——— shall be collected from the contractor'. Where equity and common law are administered together, the rules of equity shall prevail. The conscience of equity is shocked by the sound of the word 'penalty', and the clause cannot be enforced. At the same time, if one party to a contract suffers damage through the fault of the other, it is but fair he should be compensated to the extent of the damage he has suffered. If, therefore, the parties agree that in case of default, as above, the damages to one party shall amount to so much per day, by way of liquidated damages and not by way of penalty, the court will raise no objection and usually allows it.

Extras

The clause about extras is a great source of revenue to lawyers and of heartburnings to the parties involved. The only safe way is to have it distinctly written into the contract that there shall be no extras except when ordered in writing and signed by the parties to the contract, then live up to this clause and not merely let it become a dead letter. It is often wise to have an arbitration clause in an engineering contract. This may not only save time but law costs, and at the same time the decision is usually as fair as possible to both sides.

The hiring and firing of labour is a branch of the law of contracts. Where everything is reduced to a written contract beforehand, trouble is avoided, but this is unusual, and when it is not done and trouble does arise, the law of contracts is invoked to settle the differences. Unless otherwise agreed, if a man is hired by the week and paid from week to week, a week's notice ending on the week, or a week's salary in lieu of notice is necessary to discharge him. When there is no mention at time of hiring as to how the employee is hired, but if he is paid 'so much per week', this is interpreted as a weekly hiring and a week's notice is required. If an employee refuses to work properly within the terms of his employment, or insubordinately disputes the employers control of the works, he may be discharged without notice or wages in lieu thereof. This, however, you must be prepared to prove against him.

Expert Evidence

Hearsay evidence is not admissible in court. The general reputation prevailing in the community and the opinions, inferences or beliefs of individuals, (whether witness's or not), are inadmissible in proof of material facts. A witness should speak as to facts. A judge wants a surer foundation than a witness's 'I think', on which to base his judgment. An exception to this is allowed or called for on questions of science. Persons versed in the subject may deliver their opinions, under oath, on the case proved by others, or experts may be called on to express opinions as to value of property, etc. Books are admissible to show the opinions of their writers on a given subject, or the sense in which words are used, but such opinions cannot be made evidence of specific facts.

The opinions of skilled witnesses are admissible where the subject is one upon which competency to form an opinion can only be acquired by special study or experience. When the subject is one on which the jury is as capable of forming an opinion as the witness, the reason for the admission of such evidence fails and it is rejected.

The evidence of experts is usually considered to be of slight value since they cannot be indicted for perjury and are proverbially, though perhaps unwittingly, biased in favour of the side which calls them and pays them. They are over-ready to regard harmless facts as confirmation of preconceived theories, moreover, support or opposition to a given hypothesis can generally be multiplied at will.

Technical terms may be explained by experts, unless equally intelligible to ordinary readers. The opinions of experts are not receivable on disputed points of professional duty, morality or etiquette, except so far as they may be necessary to elucidate the rules of a particular profession. An expert may give his opinion on facts which are either admitted or proved by himself, or others in his hearing, or which are matters of common knowledge, as well as on hypotheses based thereon. He must adhere to the set of facts before the jury and not roam afield on other sets of facts. He may, on questions of professional skill, state in general form what would be the proper course to pursue under the circumstances proved. Where the issue before the jury involves other elements besides the purely scientific, the expert must confine himself to the latter and must not give an opinion on the legal or general merits of the case. If, however, the issue be substantially one of science or skill merely, the expert may, if he himself has observed the facts, be asked the very question which the jury have to decide.

In giving evidence, do not under-estimate the knowledge of the opposing counsel, or the jury and judge. They may have studied up the subject beforehand. It is wise to study up the subject yourself, to know what you are likely to be asked and the answers you expect to give. Do not exaggerate. Speak with quiet dignity, but positively. Do not 'guess' or 'suppose'. Do not let the opposing counsel put words or sentences in your mouth which you have not uttered. Do not permit yourself to be led too far afield. Never play into opposing counsel's hands by losing your temper, and answering hastily or thoughtlessly.

Fuel Problems in New Brunswick*

Report on Some Phases of the Fuel Situation in New Brunswick.

Professor J. Stephens, M.E.I.C., Professor, Mechanical Engineering University of New Brunswick, Fredericton, N.B.

General Considerations

Users of fuel may be, perhaps, roughly divided into three classes:—

1. Public utility companies, railroads and other large organizations who employ engineering advice. With a few exceptions, this class is not wasting fuel. Where plants are operated under bad furnace conditions it is in consequence of financial or other business conditions and not through ignorance. It does not appear that this class can be helped by any analysis of a local fuel situation. Its members are already in possession of adequate technical data.

2. Public boards, trustees and others who are responsible for the operation of large buildings, which require large quantities of fuel for heating and ventilation purposes. This class appears to be, locally, without adequate technical knowledge or advice. Some of our large public buildings, where careful measurements have been made, have been running under furnace conditions which give a furnace efficiency of the order of 30 per cent. This class should be helped by any propaganda which will spread a knowledge of the very great saving that can be made by operation under proper furnace conditions.

3. Users of fuel for domestic purposes. This class presents a very difficult problem as it appears to involve radical changes in the heating equipment offered for sale to the public. The furnaces which are legitimately looked on as unsuitable for the high volatile and low carbon fuels, both coal and wood, which are available at a reasonable cost in New Brunswick.

In general, the existing difficulties are not caused by any lack of cheap and suitable fuel. It is rather that the plants operate at very low load factors and under bad furnace conditions. In view of this, it is proposed here to deal only with the problems of institutional and domestic users of heat, and to consider only the fuels of local origin, — high volatile coal and wood.

Institutional and other Comparatively Large Heating Plants

These plants, burning local coal, using steel boilers and without specialized technical supervision, often experience very bad furnace conditions. The boilers are either return tube boilers set low and with ordinary bridge wall construction, or locomotive type with large grate area, slow combustion and, sometimes inaccessible tubes. In either case the high volatile coal, particularly if firing is heavy and infrequent, produces a volume of gas which cannot mix and burn in the small and cool combustion space.

The result of this is that the gas strikes the cool heating surface before combustion is complete and the flame goes out in the tubes, the latter acting like the meshes in the miner's lamp. The losses are excessive. Fuel is not completely burned, and in an effort to get clean combustion far too much air is used. The idea that a cool chimney means efficiency is prevalent. The fallacy of this need not be pointed out here.

Another loss is caused by the low load factor commonly met with in heating boilers. The radiation for the building is worked out by the well known rules, extreme climatic conditions being assumed, and boilers are supplied to carry the load at rather under normal rating. This gives, in this climate, a seasonal load factor, for a building heated 24 hours a day, of about 30 per cent, which is too low for economy either of fuel or capital.

The brick boiler settings are in many cases defective. It has become the custom to lay the common brick dry, in green mortar with thick joints. The infiltration of air is thus very serious. In some cases it has been found impossible to raise the CO_2 above 8 per cent.

The grate area is commonly much too large. Whatever historical reasons may underlie this practice, its only function now is to encourage the fireman to drive gas off the green coal at a higher rate than it can be mixed and burnt. In a large local institution, built in 1922, and provided with central heating, the grate area has been reduced to one-half that originally provided and the result has been a saving of 30 per cent in the fuel bill.

As is, of course, well known all the above defects in furnace condition can be remedied by standard methods. But the fact of the existence of these conditions shows that knowledge on the subject is not sufficiently widespread. The methods outlined below for removing the common sources of loss have all been tried and their results made the subject of careful measurement which constitutes their only claim to consideration.

With Minto coal (of New Brunswick) about 6 cubic feet of furnace volume per square foot of grate area is required to give the necessary space to mix and burn the gas at 150 per cent rating. If this cannot be done owing to low boiler fronts or other reasons, it has been found that very fair furnace condition can be attained by building the bridge wall up to the boiler and providing ports in the wall for the passage of the gas. This prevents the untimely condensation of the gas on the cool boiler shell and also mixes and prevents stratification in the gas. At light loads this method loses some of its efficiency, but the fire brick bridge wall, even if not at a high temperature, is at least a warm non conductor and infinitely less harmful than cold steel in contact with unburned gas.

It has been found easily possible to run a return tube boiler, with fair furnace conditions and small grate area, at 150 per cent rating with Minto coal, and at 200 per cent with wood. The run at

*Report presented at the Annual Meeting of the St. John Branch of the Engineering Institute of Canada, on May 6th, 1925.

high rating is always short as the extreme temperatures do not persist during the hours of daylight.

A building of about 160,000 cubic feet capacity and of three floors is now being heated in Fredericton by a boiler of one-half, and a grate area of one-third of those given by the so-called standard rules. The marked increase in economy is largely due to the improved load factor. Fuel cost $500. in 1923-1924 and $175. in the season just completed. In another local case where the plant is very much larger similar results have been attained.

The remedies for leaky setting are obvious. Wet brick laid with thin and full joints in seasoned mortar will give a tight setting. Heating boilers are loaded for such short intervals that the brickwork never gets very hot.

About one square foot of grate area to sixty square feet of heating surface seems to work well with local coal up to 150 per cent rating. It has been suggested that small grate areas necessitate more frequent attention. This is true, but heavy firing with soft coal only leads to the making of producer gas and leaves only the heat content of the fixed carbon available. Local fuels are all low in fixed carbon.

Wood Fuel

The use of wood under steel boilers presents fewer difficulties than that of high volatile coal. Owing to its high oxygen content and persistent flame, two pounds of wood, (any kind), containing about 18 per cent water, is as good as one pound of local coal.

The dutch oven in the saw mills and the excellent means devised for burning waste wood in some of the pulp mills, attain very high efficiency, but these are outside the class of the non-technical user whose problem is being discussed. The dutch oven is too bulky to be popular when placed in the cellar of a building. It has been found, however, that the pierced bridge wall, referred to above, is very suitable for use with low grade wood, this, in conjunction with a fire brick dead plate which occupies three-quarters of the grate area, has been found to work well. A small return tube boiler with this setting has been run up to 150 per cent rating with white birch and poplar in four-foot lengths, the maximum efficiency being 71 per cent at 130 per cent rating and the average efficiency doing heating work in cold weather 60 per cent. Hot fire brick in contact with the fire is essential, and if provided, the combustion conditions with wet wood are surprisingly good and even suggest the formation of water gas.

Domestic Conditions

The domestic furnaces available have been evolved for hard coal or dry wood. It is necessary to carry a thick fire which makes the production of soot and smoke inevitable and leaves only the fixed carbon to be used. As this amounts to only about 50 per cent in local coal the results are not good. Tar and soot are deposited on the coal iron surfaces and cannot be wholly removed. A cast iron boiler taken down last year which had been in use with soft coal had its heating surface covered with a compound of tar, soot and sulphur which was one-half inch thick and could only be removed with a cold chisel. In the case of hot air furnaces the cast iron fire pot is at a higher temperature and the results are a little better, but this advantage is often lost by putting a pipe coil in the combustion space and thus chilling the gas and putting out the flame.

Small cast iron furnaces are hard to test unless the heat carrier is steam. Tests of small cast iron steam boilers using local coal with 50 per cent fixed carbon have only given an efficiency of about 30 per cent. As long as the makers of such boilers find the bulk of their customers in regions where anthracite and semi-bituminous are used, there does not seem to be much hope of change.

Wood is a better fuel than soft coal in the small domestic furnace. Its clean persistent flame in contact with cool metal is a great advantage, but it lacks the hard hot carbon which the American cast iron furnace requires in contact with its thick walls to effect the necessary heat transfer. However, the cheaper varieties of wood contain too much water to be burnt without a fire brick setting. Wet wood cannot be burned quicker than it is dried or volatilized. The radiation from fire brick is needed for this purpose. Possibly the incorporation of a brick arch in the fire pot might lead to a little improvement.

Co-operation between the public and the manufacturers is necessary, as the present domestic heaters are only efficient with hard coal, coke or dry wood. The process of evolutionary change should be started as soon as may be.

Link-Belt Limited have recently published a new sand and gravel handling equipment book. This book is intended for the use of those who are interested in the latest designs and the most modern methods used in the production of sand and gravel. The fore part of this 72 page book is given over to the description and illustration of various types of screening, washing and handling equipment used in the preparation of sand and gravel, followed by photographs of typical installations operating under varied conditions. A copy of this book No. 540 will be mailed free upon request to Link-Belt Limited, Toronto or Montreal, Canada.

EMPLOYMENT BUREAU

Situations Wanted

Civil Engineer

Civil engineer with twenty-five years' experience in charge of highway, irrigation and railroad construction. Location immaterial. Apply box No. 184-W.

Electrical Engineer

Electrical engineer, university graduate 1924, desires position with Public Utility Company or with Electrical Contractor. One year's experience in testing of all kinds of apparatus, with large manufacturer. Several years experience in accounting and general office work. Available at short notice. Apply box No. 185-W.

Electrical Engineer

B.A.Sc., University of Toronto, 1922. One year demonstrator in electrical laboratory, University of Manitoba, two years Canadian Westinghouse engineering course, ten months machine installation experience. Single, 24 years of age, location immaterial. Apply box No. 186-W.

Civil Engineer

Engineer, A.M.E.I.C., seven years with Canadian Pacific Railway on maintenance work, two years instrumentman overseas with railway construction unit, three years with general contractor. Desires a position where the above experience could be used to advantage. Apply box No. 187-W.

Electrical Engineer

Technical graduate in electrical engineering, age 26, will consider connection with an engineering firm, or power company. Two years' experience in the testing departments of the two largest electrical manufacturing companies in the U.S.A., covering power, transformer, railway, control and detail tests. Salary as experience warrants. Apply box No. 188-W.

Civil Engineer

Graduate 1914, eight years experience on design and construction of two of the largest construction projects in Canada. Three years in responsible charge of construction design: — concrete, steel, timber, earth and rock work, plant layout and design. At present employed but available in a short time. Apply box No. 189-W.

Situations Vacant

Sales Engineer

Engineering firm with headquarters in Montreal will pay from 15 to 20 per cent commission to engineer who will devote full time to selling refrigerating machinery in the province of Quebec. Apply box No. 134-V.

CITY OF PRINCE RUPERT

City Engineer

Applications will be received by the City of Prince Rupert for the position of City Engineer. Applications should state qualifications, age, experience and salary.

All applications to be in the hands of the undersigned not later than Monday, July 20th, 1925.

E. F. JONES,
City Clerk.

Effect of End Condition of Cylinder on Compressive Strength of Concrete

Data of value to testing engineers and others interested in concrete tests have just been published in Bulletin 14 of the Structural Materials Research Laboratory, Lewis Institute, Chicago, "Effect of End Condition of Cylinder on Compressive Strength of Concrete" by Harrison F. Gonnerman. The report is reprinted from the 1924 Proceedings of the American Society for Testing Materials.

Map of Lockhart River Basin, Northwest Territories

Those persons interested in the exploration of the great northern wilds of Canada will be pleased to know that a new map of the Lockhart river basin in the Northwest Territories has just been issued by the Topographical Survey, Department of the Interior, Ottawa. This map is published in two colours on a scale of one inch to six miles on a sheet twenty-four by thirty-four inches and may be obtained from the Department for the nominal price of twenty-five cents per copy.

The map is compiled from northern control and exploratory surveys by Topographical survey parties during the years 1922 to 1924 and includes the area from which the headwaters of the Lockhart, Coppermine, Backs, and Hanbury rivers take their rise.

BRANCH NEWS

Calgary Branch

G. P. F. Boese, A.M.E.I.C., Secretary-Treasurer.
W. St.J. Miller, A.M.E.I.C., Branch News Editor.

A general meeting of the branch was called on May 18th, for the purpose of discussing the proposal to hold the Western Professional Meeting at Banff and also to discuss a paper "The Motor Vehicle as a Transportation Facility", by R. A. C. Henry, M.E.I.C., which appeared in the May issue of *The Journal.*

In regard to the latter Col. Fetherstonhaugh, M.E.I.C., by way of opening the discussion, suggested the feasibility of increasing the tax on gasoline, but at the same time he was doubtful as to the justification for such action. He advocated feeder automobile lines throughout the country not traversed by the railroads and not in competition but rather in co-operation with them. This, however, was a matter that he thought it would be exceedingly difficult to legislate for.

During the discussion, in which Messrs. Ross, Spreckley, Dingwall, Marshall and others took part, many points of interest were brought forward. It was apparent that the railroad had to build and maintain expensive roadbeds, whereas the truck owners got off with a comparatively small tax, at the same time utilizing the highways which were maintained by the public. It was emphasized, as the author had pointed out, that more use might be made of the motor truck within a short radius of town, as much time could be saved by hauling produce direct to the city under co-operative arrangements among farmers.

The opinion was expressed that the railroads should receive all the necessary protection, and that it was impossible to compete with them by the use of the motor truck when it came to long hauls and heavy commodities, such as machinery, etc.

It was eventually proposed to table the matter and refer to it at a future meeting at which it was suggested that the Calgary Auto Club might be invited to attend and continue the discussion of this important subject.

The Banff Meeting

The matter of the Banff meeting was thoroughly overhauled, and considerable time was spent discussing the pros and cons in connection with same. Ways and means, financing, arrangements regarding camping accommodation, transportation and entertainment were fully dealt with in a general way, the details being left to the various committees to work out. Saturday, July 11th, was set as the unofficial opening day of the camp and on Sunday the official opening would take place at the luncheon hour. The first business meeting of the convention would take place on Monday morning, and it was suggested that such meetings would continue during the mornings only; the afternoons to be devoted to entertainment, sports, trips, etc. The camp would close on Thursday evening, July 16th.

It may be opportune to herewith express appreciation of the E.I.C. for a donation of $100 from the Alberta Association of Professional Engineers towards defraying the expenses of the convention in which they are also taking part.

The Calgary Branch is out to give every assistance within the power of its members to make this western meeting a "top hole" affair, — an interesting gathering so far as professional matters are concerned, and also an interesting gathering so far as entertainment of a varied description is concerned. Banff lends itself especially to gatherings of this nature and it is an ideal spot for sports of all kinds.

Bring your brassies, irons and putters;
Dancing shoes and running boots,
Kodaks, kars, and ukeleles;
Racquets, base balls, bathing soots!

Montreal Branch

C. K. McLeod, A.M.E.I.C., Secretary-Treasurer.
Stanley A. Neilson, A.M.E.I.C., Branch News Editor.

Visit to Shawinigan Falls and La Gabelle

Saturday, June 6th, 1925, will be remembered for a long time by the members of the Montreal Branch, for not only was it the hottest June day on record but it was the occasion of their visit to the Shawinigan Falls district.

The main party left Montreal midnight Friday in two special cars arriving at Shawinigan Falls in time to breakfast at the Cascade Inn. A dozen or so motored down Friday evening.

After breakfast the party were taken in motors, provided by the Shawinigan Company, to the various power plants, to the falls, and to the works of the Canada Carbide Company. At each plant guides had been provided to point out the interesting features and to answer the thousand and one questions that were asked. A tour of the city was then made after which the party returned to the Cascade Inn for lunch.

The programme called for a golf match in the early afternoon but the weather man decided that it should not be played, signifying his disapproval with a heavy downpour of rain. This rain also had the effect of changing the rest of the programme for the afternoon. As it was felt that the roads might not be good, the proposed motor ride was cancelled and the party took the afternoon train to La Gabelle.

An opportunity for a very thorough inspection was afforded, and the members had ample time to look into all the details. While the party was there one of the huge Stoney sluice gates was lowered into place. It was a revelation to all who were watching to see the ease with which these gates were handled and to note how tight a joint they made on their sills.

During the afternoon it grew very hot and all the party were exceedingly glad when the train, pulling the two special cars, rolled into the station. At Three Rivers the cars were picked up by the train from Quebec and an attack, in force, was immediately made on the dinner. After dinner the party returned to their cars to while away the time till the arrival of the train at Mile End.

The following members of the Montreal Branch and their friends made the trip:—J. L. Busfield, M.E.I.C., P. S. Gregory, M.E.I.C., H. S. Grove, A.M.E.I.C., H. G. Thompson, Jr.E.I.C., J. S. Martin, E. S. Kelsey, S.E.I.C., W. A. B. Hicks, M.E.I.C., R. M. Hannaford, M.E.I.C., Fred Newell, M.E.I.C., A. McMillan, J. F. F. Mackenzie,

Members of Montreal Branch Visit Shawinigan Falls and LaGabelle

Jr.E.I.C., S. S. Shector, A.M.E.I.C., G. R. Halliger, A. W. Hunter, Douglas E. Watts, H. B. Simons, W. P. Roper, R. A. Witherspoon, R. F. Howard, M.E.I.C., E. E. Weibel, A.M.E.I.C., Alexander Peden, A.M.E.I.C., G. de Cardaillac, Stanley A. Neilson, A.M.E.I.C., C. S. Saunders, A.M.E.I.C., T. S. Morrisey, A.M.E.I.C., Norman E. D. Sheppard, A.M.E.I.C., J. A. Burnett, M.E.I.C., W. C. Adams, M.E.I.C., L. H. Mahaffy, S.E.I.C., L. E. M. Henderson, E. Brown, M.E.I.C., J. P. Watson, A.M.E.I.C., F. J. McHugh, R. M. Hueston, S.E.I.C., F. S. Fisher, S. Svenningson, M.E.I.C., R. H. Findlay, A.M.E.I.C., A. T. Perrin, A.M.E.I.C., R. M. Walker, A.M.E.I.C., A. R. Meldrum, N. Cageorge, A.M.E.I.C., B. W. Seton, Jr.E.I.C., J. W. Anderson, A.M.E.I.C. F. L. Ducharme, H. B. Pope, A.M.E.I.C., Fraser S. Keith, M.E.I.C., J. S. Whyte, M.E.I.C., V. E. North, S.E.I.C., A. S. Wall, A.M.E.I.C., R. D. O'Neill, de Gaspe Beaubien, M.E.I.C., W. H. Abbott, A.M.E.I.C., G. E. Templeman, A.M.E.I.C., Louis O'Sullivan, S.E.I.C., Norman Holland, H. Milliken, H. Freeman, C. K. McLeod, A.M.E.I.C.

To Mr. R. A. Witherspoon and his fellow officials of the Shawinigan Company great credit is due for the very complete arrangements which they made and for their many courtesies during the day.

Niagara Peninsula Branch

R. W. Downie, A.M.E.I.C., Secretary-Treasurer.
C. G. Moon, A.M.E.I.C., Branch News Editor.

About fifty members attended the annual meeting of the branch held at Welland on May 19th.

The scrutineers reported a very close ballot for the vice-presidency and executives. The nomination of H. L. Bucke, M.E.I.C., for president was unopposed; Alex. Milne, A.M.E.I.C., won the vice-presidency, and the two new executive committeemen were E. G. Cameron, A.M.E.I.C., and J. C. Street, M.E.I.C. E. P. Murphy, A.M.E.I.C., and M. B. McLean were then appointed auditors by the meeting.

Charles Coutlee, M.E.I.C., of Ottawa, was to have been the principal speaker of the evening, but unexpected business caused him to cancel his visit. Professor Peter Gillespie, M.E.I.C., of Toronto, however, was happily available to fill the breach, and gave a most interesting paper on the life and works of the late Sir Sanford Fleming. This was illustrated by lantern slides of various scenes and personages who were confreres of that great engineer.

Professor Gillespie is chairman of a committee on biographies of prominent Canadian engineers and in due course his biography of Sir Sanford Fleming will be published in *The Engineering Journal*, but this branch feels that it has been privileged in hearing the whole story at first hand.

Alex. J. Grant, M.E.I.C., in moving a vote of thanks expressed great pleasure in listening to the exploits of engineers, many of whom were known to him personally.

The meeting adjourned after a brief address by Mr. Blake-Duff, the original editor of the Welland *Tribune*, who laid stress upon a few of the legal aspects of riparian ownership in highly cultivated and fertilized farming districts.

Peterborough Branch

P. Manning, A.M.E.I.C., Secretary.
W. E. Ross, A.M.E.I.C., Branch News Editor.

Radio Frequency Amplification

A general meeting was held in the Chamber of Commerce, on the evening of April 23rd, at which the speaker was W. B. Cartmel, M.A., M.E.I.C., radio engineer of Northern Electric Company, who gave a paper entitled "Radio Frequency Amplification". This meeting was very well attended, the hall being filled almost to capacity, with members and friends, the radio fans, of course, predominating.

Before commencing his paper, Mr. Cartmel entertained those present with music and speeches received on a Northern Electric super-hetrodyne set; despite the unfavourable receiving conditions, which the scribe, not being a radio fan, was assured were bad.

The speaker then proceeded with his address, illustrating his remarks with a series of lantern slide diagrams, which covered the general field of radio receiving apparatus, commencing with the simplest receiving circuit and gradually enlarging and elaborating, feature by feature, describing the regenerative sets and various types of tuned radio frequency, such as superdyne, neutrodyne, reflex, and a set combining all of these features and known as the Van Roberts.

Mr. Cartmel then described the set which he had been demonstrating which was a Northern Electric six-tube super-hetrodyne, comparing it with the various types already discussed.

An interesting feature of the demonstration was a 350-volt power amplifier, for use for public assembly or concert purposes, and which obtains its entire supply of A, B and C current from a lamp socket.

Mr. Cartmel also used one of the new paper cone type of loud speaker, constructed on the well known Pathe principle. This was very effective, bringing out the natural baritone talking tones much better than a horn, but appeared to accentuate the static noises somewhat.

After the address, there was a heavy bombardment of questions, and when these had been satisfactorily disposed of, Mr. Cartmel treated the assembly to a further demonstration of the set. The meeting was presided over by P. L. Allison, M.E.I.C., who introduced the speaker, and, before adjourning the meeting, tendered him the thanks of the branch on a motion by A. B. Gates, A.M.E.I.C., and heartily approved by those present.

Field Control of Concrete

On May 14th, after the annual general meeting, the last regular meeting of the season was held, at which Col. H. C. Boyden, C.E., of the Portland Cement Association, gave a paper on "Field Control of Concrete".

In the absence of the Chairman, E. R. Shirley, M.E.I.C., who was unfortunately out of the city on a business trip, R. L. Dobbin, M.E.I.C., occupied the chair and introduced the speaker, who was, he stated, an old acquaintance of this branch.

Col. Boyden then described the various methods and tests used for the control of concrete, including both laboratory and field tests and pointed out that the best all round test for the field is the "slump" test.

Discussing the actual faults in concrete construction, the speaker said in part that five main troubles are encountered which are responsible for the existence of concrete not up to the standard which should be obtained. These faults are:—(1) Incorrect control or lack of control of water cement ratio; (2) Incorrect fineness modulus of aggregate, i.e. not enough care taken to procure uniformity batch by batch, or incorrect storage. For medium size jobs the speaker recommended stock piling in beds not more than 18 to 20 inches deep. (3) Not sufficient time for mixing; Col. Boyden stated that in his opinion, one batch per minute cannot be done and good concrete result therefrom. (4) Consistency or slump. The speaker stated that 99 per cent of the concrete (reinforced) poured does not require more than 4-inch slump, and that nowhere is a slump of more than 7 inches necessary. He stated that there had been much contention regarding shooting systems, but in his opinion a shooting system is O.K., provided that the correct slump is maintained. (5) Curing; twenty-one days under water. The Colonel mentioned other methods of curing, but stated that they were not yet approved methods and was emphatic regarding the advantages of water curing, in so far as increase in compressive strength, resistance to abrasion, and elastic limit.

In conclusion, Col. Boyden stated that there are four rules which, if rigidly adhered to will improve concrete. The rules are: (1) slump test; (2) use dry rodded sand, not wet or damp sand; (3) proportion by weight and not by volume; (4) use inundating process, where possible, i.e., immerse sand in water instead of vice versa.

After the address, the speaker showed some interesting slides, relating to his remarks. Numerous questions were asked by the members at the conclusion of the paper, after which A. L. Killaly, A.M.E.I.C., thanked Col. Boyden on behalf of the branch and the meeting adjourned.

Sault Ste. Marie Branch

A. H. Russell, Junior E.I.C., Secretary-Treasurer.

The regular monthly meeting of the Sault Ste. Marie Branch was held on Friday May 29th, 1925, following a dinner of members and guests at the Y.W.C.A. Queen Street E., with Wm. Seymour, M.E.I.C., chairman, presiding.

After the adoption of the minutes of the last meeting, the Sault Ste. Marie Permanent Safety System movement was discussed and on motion of J. H. Jenkinson, A.M.E.I.C., and C. H. E. Rounthwaite, A.M.E.I.C., it was decided that our branch would become a member of the system and pay the necessary fees. The first meeting of the Permanent Safety System Committee will be held on June 2nd, at which our representative, C. H. Speer, M.E.I.C., will attend.

A lively discussion of summer trips for the members of the branch ended in the secretary being asked to send out a questionnaire to the members and get their opinions on the suggested inspection and pleasure trips.

Equipment of Modern Blast Furnace

The chairman then introduced the speaker, F. Smallwood, M.E.I.C., chief engineer of the Algoma Steel Corporation, who gave his second paper on "Equipment of Modern Blast Furnace". In this section, he dealt with the utilization of the gases and the disposal of the iron and slag. He clearly showed by lantern slides, the details of the construction of the furnace and the charging machinery also the iron and slag ladles and the gas engines. For a 500-ton blast furnace it took approximately 40,000 cubic feet of air per minute for operation and this air had to go through mechanical washers that made it cleaner than the average air breathed daily. He clearly showed the way in which the molten iron was handled from the furnace to the ladle cars and then to the cast house to be cast into "pigs" of approximately 100 pounds weight. The method of handling the slag has been improved greatly in the last few years due to using cast iron slag pots and the newer designs have two pots instead of one to each truck as illustrated by Mr. Smallwood. Details of the pipe line system for the gases to the gas engines were given and the various uses of the gas engines were fully explained and their early history was given showing that Belgium and Germany had been the first countries to develop the gas engine in Europe.

A hearty vote of thanks was tendered to Mr. Smallwood for his splendid paper.

A special meeting of the Sault Ste. Marie Branch was held on Wednesday June 17th, 1925, following a dinner at the Y.W.C.A.

Lieut.-Col. Lamb, M.E.I.C., chairman of sub-committee in Organization of the Association of Professional Engineers of Ontario was the guest of honour.

The chairman, Wm. Seymour, M.E.I.C., after calling the meeting to order, introduced Col. H. J. Lamb, who gave a splendid talk on the "Organization of the Association of Professional Engineers of Ontario". He commenced at its early days and clearly outlined the different steps that have been taken to get their present legislation through the government. At present the association has 1,160 members and is growing stronger every day, thus necessitating stronger committees to carry on. Col. Lamb pointed out that the Organization Committee was the most important at the present time, it has been divided into sub-committees handling certain districts and these in turn appointed regional leaders to handle each electoral district and these leaders were supplied by the district chairman with all information and help necessary to carry on the work.

At the present time there are twenty Ontario Government Acts containing the word "engineer", and as Col. Lamb expressed it, almost every person was some kind of an engineer, but what the Association wanted and were working for was a clear definition of the word engineer, in its true sense as a profession. The speaker made a strong appeal to all members of *The Engineering Institute of Canada* to get more in touch with the public in order that the people would realize that the engineer was a professional man and that they should be recognized as a professional body.

On motion of C. H. Speer, M.E.I.C. and C. H. E. Rounthwaite, A.M.E.I.C., the following resolution was passed: "That this branch express its approval of the appointment of L. R. Brown, A.M.E.I.C., as regional leader for the Sault Ste. Marie district, and that the Sault Ste. Marie Branch will give all assistance possible to Mr. Brown."

W. S. Wilson, A.M.E.I.C., on behalf of the Professional Engineers of the Sault expressed his appreciation of the work done by the provincial executive up to the present time. Col. Lamb, expressed his appreciation of the co-operation of the Sault Branch and he felt that the appointment of Mr. Brown would be a real asset to his committee. An open discussion in general topics finished up the evening.

Victoria Branch

E. P. Girdwood, M.E.I.C., Secretary-Treasurer.

Dominion Dry Dock—Esquimalt

His Honour, the Lieutenant Governor, Walter C. Nichol, and party of engineers, visited the Dominion Dry Dock, Esquimalt. Amongst those present were his Honour's private secretary, H. J. Muskett, J. P. Forde, M.E.I.C., district engineer, G. B. Mitchell, M.E.I.C., D. F. de Bretigny, and others.

His Honour congratulated the engineers in charge of the large project, upon the great progress of construction, and stated he was deeply impressed with his inspection of the tunnels, pump house and pumping system for emptying the docks, and the sanitary system.

All present felt that Victoria has added another great project which does credit to the engineers in charge, and the Dominion government.

British Columbia will benefit by the opening of the new Dry Dock next year, which will give an impetus to the expansion of trade and commerce between Canada and Trans-Pacific ports. Water was admitted to the dry dock on June 10th, 1925.

At Victoria College, Victoria, B.C., a paper was read on April 8th, by W. A. Gourlay, resident engineer, on the "Dominion Dry Dock" Esquimalt, B.C., illustrated with lantern slides. The paper was prepared by J. P. Forde, M.E.I.C., district engineer, Dominion Public Works, Victoria, B.C. Mr. Forde was called to Alaska on business on the date the paper was read, so that Mr. Gourlay consented to read it.

The construction was described and the system of operation of this dock, which is the second largest in the world. Mr. Gourlay did great credit to this paper, and sixty-five members and friends found this lecture and subject very interesting.

Mr. Forde's paper was read before the Victoria Branch recently and the Vancouver members present were so impressed with the merits of Mr. Forde's paper that they lost no time in urging the executive of Vancouver Branch to arrange with Mr. Forde to read his paper in Vancouver. Mr. Forde's address was sincerely appreciated by everyone. N. A. Yarrow, A.M.E.I.C., proposed a hearty vote of thanks which was followed by great applause.

CORRESPONDENCE

Engineering Education

Box 253, Miami, Arizona.
May 20th, 1925.

The Editor,
The Engineering Journal,
Dear Sir:—

Many interesting ideas on the subject of Engineering Education appeared in your March issue. I note that you extended an invitation to the members of *The Institute* to express their views.

So many eminent educators have discussed the subject that I hesitate to give my views. It may be useful, however, for those engaged in academic life to hear from others who are endeavouring to apply to industrial problems those truths that they have absorbed in the class room. Speaking from the standpoint of "one who is going through the mill" I incline towards conservatism in engineering curricula. There is a tendency toward overloading. Looking back over my own college course, I recall that I was greatly helped in my studies by reading a small book on logic. This little book taught me to separate the elements of a problem that had been worked out into its hypothesis, the deductive reasoning used in its solution and finally recognize the degree of certainty of the solution. In applying, consciously at least, the methods of logic to the work of the lecture room I believe too much of my time was consumed in home study. Apart from that the principles taught in the class certainly stuck in my head. I would make exception of the subject of thermodynamics, which subject I obtained a good standing in on examination, but in looking back I believe my success in that particular subject was due rather to a facility with the calculus than to any very clear understanding of basic principles. In this respect a little home study in physical chemistry has aided me in getting a rather slender hold on the subject of thermodynamics.

The difficulty of obtaining suitable employment on graduation was a grave one for me. After getting into the right kind of work another difficulty presented itself. I lacked practical knowledge to such an extent that I could not think of industrial apparatus in such a way as to see the application of the principles taught in the class room to the working of a particular piece of apparatus in a plant. This is an embarrassing condition of mind that I have just recently overcome. However, nothing in my comparatively unimportant experience has transpired to shake my belief in the desirability of a thorough grasp of the fundamental scientific principles. Possessing these, together with the natural desire of the scientist to get behind details of any given process, the technologist cannot fail to make himself felt in his own particular field. However, because of this he will not necessarily be popular with his superiors but in time of difficulty for his employers they may be compelled to recognize his ability. The late Prof. Joseph W. Richards, formerly professor of metallurgy in Lehigh University, says in his preface to volume No. 1, Metallurgical Calculations, — "If ever rule-of-thumb is to be replaced in metallurgical process by scientific operation, the change must be based on experiments, classification of results, and calculations therefrom. The principles involved are physical, chemical and mechanical; the scientific metallurgist must master these, use them as tools, and overcome brute nature by their skilful employment".

Some writers have mentioned the subjects of economics, English, modern languages and the classics. With the exception of economics these belong in the curricula of the high schools. Economics, so far as it applies to engineering, might be usefully taught. However, if by economics is meant political economy, I for one do not believe it has a place in any engineering course. I was struck with statements made by Garet Garrett in an article in a recent issue of the *Saturday Evening Post* entitled "Signs in England". He remarks of the theory of wages held by John Stuart Mill: — "That amazing fallacy of a fixed wage fund, not increasable by human means, was nothing new in its time. It was merely the formula by which the feudal notion of wages was carried into an industrial age and there justified. The feudal notion was that wages were a dead burden upon wealth." This theory of Mill's has been exploded by Henry George in that masterpiece of his, "Progress and Poverty", published over thirty years ago. Political economy is a subject about which its exponents differ, even on fundamental principles.

To sum up, I believe the courses in engineering should be limited to a few fundamental subjects and that thoroughness should be the goal. The humanities should be left to the high schools or to the graduate himself to round out his training after graduation by private study.

Very truly yours,

W. K. THOMPSON, A.M.E.I.C.

Quantities of Materials for Concrete

A second edition of Bulletin 9 of the Structural Materials Research Laboratory, Lewis Institute, Chicago. "Quantities of Materials for Concrete," by Duff A. Abrams and Stanton Walker, has been issued.

The principal subject-matter of the bulletin is a series of tables of proportions and quantities for portland cement concrete for compressive strengths of 2,000, 2,500, 3,000, 3,500, and 4,000 pounds per square inch at 28 days, using fine and coarse aggregates of different sizes, and concrete of a wide range of workability as measured by the slump test.

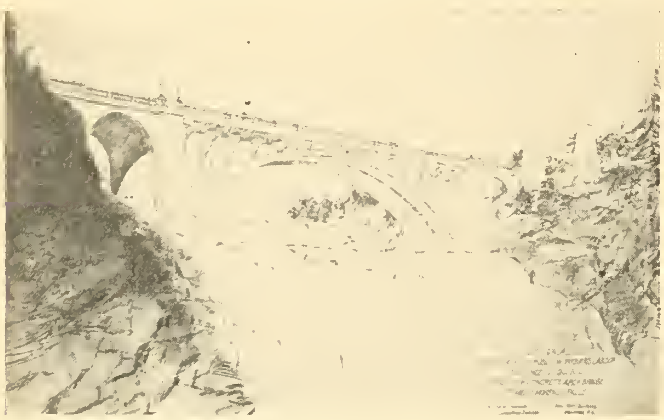
The tables are based on the water-ratio method of proportioning concrete developed in this laboratory as a result of many thousands of tests. They differ principally from tables by other authors in that the proportions have been selected with definite strengths in view, and take into account the quantity of mixing water as well as the size and grading of the fine and coarse aggregates.

This bulletin was first published in 1921, but had been out of print for several months. In the second edition, the text has been rewritten to constitute a more complete discussion of the subject. A method of taking into account the differences in volumes of materials when measured in the laboratory and when measured under field conditions is described. The descriptions of field and laboratory test methods have been enlarged and include recent changes in the standards of the American Society for Testing Materials.

Montmorency Falls Bridge

According to a recent statement the Department of Public Works and Labour of the Province of Quebec, has announced the final decision regarding the award of the prizes in connection with the competition for the design of the bridge over the Montmorency river at Montmorency Falls, Quebec. The first prize was awarded to Messrs. Arthur Surveyer and Company, Montreal, and the second prize to Mr. W. Chase Thomson, M.E.I.C. The details of the design submitted by Messrs. Arthur Surveyer and Company were published in the April, 1925 issue of *The Engineering Journal.* The design submitted by Mr. W. Chase Thomson, M.E.I.C., is illustrated herewith.

The over-all length of the bridge according to Mr. Thomson's plans is 350-feet with a 22-foot roadway between curbs, and two 5-foot sidewalks. The approach arches are 34-feet in the clear and the main arch has a span of 214-feet with a rise of 36-feet (both measurements being on arch axis). The design does not make any attempt at ornamentation, every effort being made to produce an economic structure. The estimated cost is $87,000. It is of interest that in this design provision has been made in accordance with the instructions received from the Department, to afford no interference with the existing power development works. For this purpose the west pier was located so as to clear the discharge pipe, and the penstock. The towers at the righthand side of the illustration are relics of the old suspension bridge.



Montmorency Falls Bridge Design.
W. Chase Thomson, M.E.I.C. Awarded Second Prize.

Design for Montmorency Falls Bridge submitted by
Lesslie R. Thomson, M.E.I.C.

Design shows main span of two ribs, floor supported by stringers and floor beams concealed by spandrel wall; two flanking spans — earth fills over arches — the westerly one of which masks out the headgates. These flanking spans are of increasing width and connect the structure with two large areas at each end. The cut stone portions of the old suspension bridge towers are re-erected as corner monuments in order to preserve these historic old landmarks.

Recent Additions to the Library

Transactions, Proceedings, etc.

Presented by the Societies:

Proceedings of the Royal Society of Edinburgh, 1924-25.

Proceedings of the American Concrete Institute, 1925.

Anuario, 1925 of the Universidad Nacional de la Plata.

Year Book 1924-25 of the Franklin Institute of the State of Pennsylvania.

Constitution and By-Laws, 1925, Engineers and Architects Club of Louisville, Kentucky.

Year Book, 1925, of the Association of Professional Engineers of the Province of British Columbia.

Reports, Etc.

Presented by the Canadian Board of Civil Commissioners:
16th Annual Report of the Civil Commission of Canada, 1924.

Presented by the Ontario Department of Mines:
33rd Annual Report, 1924, part three.

Presented by the Department of Colonization, Mines and Fisheries of the Province of Quebec.
Report on Mining Operations in the Province of Quebec during 1924.

Presented by the Geological Survey of Ohio:
Geology of Columbian County. W. Stout and R. E. Lamborn, (Bulletin 28).

Presented by the Department of Trade and Commerce, Canada:
The Canada Year Book, 1924.

Miscellaneous

Presented by the Koninklijk Instituut van Ingenieurs, Amsterdam:
Decimal Index to the Books contained in the library of the Koninklijk Instituut. (In German)

Recent and Early Information about Ancient and Medieval Ships by Captain E. Snow.

Transactions of the First World Power Conference — 4 vols.

Preliminary Notice

of Applications for Admission and for Transfer

June 19th, 1925

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in July 1925.

R. J. DURLEY, Secretary.

*The professional requirements are as follows:—

A Member shall be at least thirty-five years of age, and shall have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office, or a term of instruction in a schoolof engineering recognized by the council. The term of twelve years may, at the discretion of the council, be reduced to ten years in the case of a candidate for election who has graduated from a school of engineering recognized by the council. In every case the candidate shall have held a position in which he had responsible charge for at least five years as an engineer qualified to design, direct or report on engineering projects. The occupancy of a chair as a professor in a faculty of applied science or engineering, after the candidate has attained the age of thirty years, shall be considered as responsible charge.

An Associate Member shall be at least twenty-seven years of age, and shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years. The occupancy of a chair as an assistant professor or associate professor in a faculty of applied science of engineering, after the candidate has attained the age of twenty-seven years, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council, shall be required to pass an examination before a board of examiners appointed by the council. The candidate shall be examined on the theory and practice of engineering with special reference to the branch of engineering in which he has been engaged. This examination may be waived at the discretion of the council if the candidate has held a position of professional responsibility for five or more years.

A Junior shall be at least twenty-one years of age, and shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the council, if the candidate for election has graduated from a school of engineering recognized by the council. He shall not remain in the class of Junior after he has attained the age of thirty-three years.

Every candidate who has not graduated from a school of engineering recognized by the council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects: geography, history, (that of Canada in particular), arithmetic, geometry, euclid (books I, IV and VI), trigonometry, algebra up to and including quadratic equations.

A Student shall be at least seventeen years of age, and shall present a certificate of having passed successfully an examination equivalent to the final examination of a high school or the matriculation of an arts or science course. He shall either be pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall not remain in the class of student for more than two years after graduation; or he shall be receiving a practical training in the profession, i which case he shall pass an examination equal to that prescribed for admission to the grade of Junior in the foregoing section and he shall not remain in the class of Student after he has attained the age of twenty-seven years.

An Affiliate shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience, qualify him to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

ARMSTRONG—WILLIAM DUN, of Exshaw, Alta. Born at Owen Sound, Ont., Nov. 2nd, 1890; Educ., Two years, School of Science, Univ. of Tor. One year, Prov. Inst. of Technology, Calgary; 1906-07, Sun Portland Cement Co., Owen Sound, Ont.; 1910-11, Canadian Inspection and Testing Laboratories; 1912-14, mech. dept., Can. Pac. Rly., Toronto; 1914-19, overseas. Can. Engrs. and R.A.F.; 1919-20, Canada Cement Co., Montreal and Winnipeg. Asst. supt. at Winnipeg; 1921-23, engr., Canada Cement Co., Exshaw, and from 1923 to date, plant supt. at Exshaw for Canada Cement Co.

References: R. S. Trowsdale, R. M. Dingwall, J. H. Ross, A. C. Tagge, F. B. Kilbourn, B. L. Thorne, A. F. Ford, A. S. Dawson.

BATES—NEVILLE, of Bridgeburg, Ont. Born at Manchester, England, May 28th, 1893; Educ., Manchester Technical School, 1910-12; 1912-14, asst. on Ontario Land survey work with Speight & Van Nostrand, Toronto; 1914-19, overseas; 1919-20, rodman and leveller on radial rly. and location surveys, H.E.P.C. of Ontario; 1920-24, asst. engr., Ontario Dept. of Highways; 1924 (Feb.-Aug.), location and constrn. of elect'l. power lines, also dftsman., H.E.P.C. of Ontario; Aug. 1924 to date, with James, Proctor & Redfern, of Toronto, as their res. engr. at Bridgeburg, Ont.

References: F. E. Sterns, W. B. Redfern, I. F. Willsie, E. D. Wilkes, G. F. Hanning.

BEAVER—WILLIAM GEORGE, of 541 Aberdeen Avenue, Hamilton, Ont. Born at North Shields, England, Dec. 15th, 1890; Educ., First Class B.O.T. Cert. First Class Ontario Cert. Four years Tynemouth Tech.; 1906-11, ap'ticeship with The Wallsend Slipway Engrg. Co., Wallsend-on-Tyne, England; 1911-17, from junior engr. to second engr. on steamers of The Anglo Saxon Petroleum Co., and Eagle Oil Transport Co.; 1916-17, instructor in oil fuel burning for the Eagle Oil Transport Co.; 1917-18, engr. in charge destroyer refits at H.M. Dockyard, Invergordon, Scotland; 1918-19, testing and erecting, steam turbine test house, for Charles A. Parson Co., Newcastle, England; 1919-20, chief engr., Can. Govt. Merchant Marine, Montreal: 1920-22, sales engr., Goldie & McCulloch Co., Galt, Ont.; Apr. 1923 to Oct. 1924 chief engr., Penmans Ltd., Paris, Ont.; Organizer, proprietor, and owner of copyright (applied for), The School of Stationary Engineering, Hamilton, Ont.; At present chief engr., Canadian Westinghouse Company, west end plant, in charge of steam, mech'l. and elect'l. mtce., Hamilton, Ont.

References: I. J. Tait, W. J. Turnbull, J. O. Twinberrow, H. U. Hart, J. A. Brown.

BURNS—ROBERT HENRY, of 87 East Street, Sault Ste. Marie, Ont. Born at Watertown, N.Y., May 1st, 1895; Educ., 1916-18, first two years, C.E. course Clarkson College of Technology. 1919-20, third year science, Queen's Univ.; 1918-19, engrg. divn. U.S. Navy; 1915 (summer), New York State Highway Dept., Watertown, N.Y.; 1919 (Feb.-Oct.), levelman, M. and W. Dept. New York Central R.R., Watertown, N.Y.; 1920 (spring), transitman, Black River Regulating Board; 1920-21, constrn. inspr. and engrg. dftsman., Spanish River Pulp & Paper Mills, Espanola, Ont.; 1922-23, transitman, hydraulic dept., for same company at Sault Ste. Marie, Ont.; 1922, in charge of reconnaissance survey of Spanish River & Upper Sturgeon River watershed; 1923 to date, engineering dftsman., Lake Superior Paper Co. Ltd. Sault Ste. Marie, Ont.

References: H. A. Morey, G. H. Kohl, J. L. Lang, J. W. LeB. Ross, K. G. Ross.

FERGUSON—JAMES GORDON, of 282 Desaulnier Blvd., St. Lambert, Que. Born at Dungannon, Ont., April 1st, 1900; Educ., B.Sc., Queen's Univ. 1923; May 1923 to date, telephone Engr., Northern Electric Company, Ltd., Montreal.

References: D. M. Jemmett, L. T. Rutledge, L. M. Arkley, W. C. Adams, J. D. Peart.

GORDON—CHARLES HOWARD, of 1018 Queen Mary's Road, Montreal, Que. Born at Montreal, Sept. 8th, 1902; Educ., B.Sc., McGill Univ. 1924. Grad. R.M.C. 1922; Aug. 1924 to Apr. 1925, with Sir W. G. Armstrong-Whitworth & Co., London, Eng., concrete design for power house, at Arapuni, New Zealand; At present with the Atlas Construction Company, Montreal, concrete cribs for Montreal Harbour.

References: A. S. Dawes, E. W. Wall, J. L. Busfield, F. B. Brown, C. M. Morssen.

GRIFFIN—AUGUSTUS, of Brooks, Alta. Born at Visalia, Calif., U.S.A., June 8th, 1883; Educ., B.S. Univ. of California, 1906; 1904 (summer), rodman, power ditch survey, Calif.; 1905-06 (summers), field agent, U.S. Dept. Agriculture, in charge of field experiments in irrigation and drainage in Calif.; 1906-12, engr. and supt. of Modesto Irrigation District, Modesto, Calif.; 1912-13, irrigation investigations snd studies; 1913-14, supt. of irrigation on the Truckee-Carson (now Newlands) Reclamation Project, at Fallon, Nevada; 1913-15, inclusive, consltg. engr. for the New Waterford Irrigation District, Waterford, Calif.; 1914-18, chief engr., South San Joaquin Irrigation District, Manteca, Calif.; Jan. 1918 to date, supt. of operation and mtce. of the eastern section irrigation system, C.P.R. Brooks, Alta., in charge of operation and mtce. and misc. design and constrn.

References: G. W. Craig, A. S. Dawson, R. S. Stockton, B. L. Thorne, L. C. Charlesworth, S. G. Porter, W. Pearce.

JORON—RODOLPHE EMILE, of Chicoutimi, Que. Born at Valleyfield, Que., Oct. 29th, 1888; Educ., B.A.Sc. Laval Univ., 1909. Mining Engr., 1911. Prov. L.S., 1914; 1909-10, assayer and surveyor, Nova Scotia Mine, Cobalt, Ont.; 1910, Hollinger Mine, Porcupine; 1911, engr. on municipal development, West Crescent Heights, Westmount; 1912-14, engr. dept., Chicoutimi Pulp Co. and associated companies; 1914-15, in charge of constrn. of water and sewer system, roads, etc., Chandler, Que.; 1915-16, mgr. of the interests of the St. Lawrence Pulp & Paper Co. in Chandler; 1916, surveys re location of contour 115 reservoir, Kenogami; 1917-21, in charge of engrg. and in charge of different companies controlled by Mr. J. E. A. Dubuc; 1922 to date, private practice as civil engr. and prov. land surveyor, Chicoutimi, Que.

References: E. Lavoie, J. L. Delisle, G. E. LaMothe, J. E. A. McConville, J. A. Claveau, M. Doye.

KINGAN—GORDON HERRON, of Temiskaming, Que. Born at Montreal, Que., Oct. 1st, 1901; Educ., B.Sc. (C.E.), McGill Univ. 1925; 1920 (summer), dfting. with Northern Electric Co., Montreal; 1921 (summer), dfting. engrg. dept., Ross & MacDonald, Montreal; Dec. 1922 to Sept. 1924, instr'man. and dftsman., Riordon Pulp Corpn., Temiskaming, Que.; June 1925, re-engaged as junior constrn. engr. with same company.

References: H. M. MacKay, E. Brown, R. DeL. French, W. L. Ketchen, L. S. Dixon.

MACKEAN—JAMES LEWIS, of St. Petersburg, Florida. Born at Manchester England, Feb. 25th, 1888. Educ., Manchester Technical School, 1907; 1910-13 rodman and transitman, Can. Nor. Rly.; 1914-18, overseas, Can. Engrs. 1919-20, in charge of field parties on location of hydro radials and land surveys 1920-23, field engr. and asst. roadmaster for Toronto Transportation Commission designing and laying out of special track work and install'n. of same; 1924, res. engr of constrn. for Canadian National Electric Rlys. at Niagara Falls, Ont., designing of work, special work and engr.; At present, private practice, surveying, sub-division landscaping and development contractor.

References: G. P. MacLaren, G. F. Hanning, H. W. Tate, T. U. Fairlie, E. Boswell, A. T. Spencer, E. T. Agate, H. L. Vercoe, E. Duncan.

STEIN—CHARLES RAMSAY STIRLING, of Winnipeg, Man. Born a Vancouver, B.C., Jan. 5th, 1897; Educ., R.M.C. Received Commission Dec. 1915. Sch. of Mil. Engrg., Chatham, England, 1921-22; Continued service in Royal Can. Engrs., from Dec. 1915. 1920, Brevet Capt., 1921, Capt. At present, dist. engr. officer, Mil. Dist. No. 10, Winnipeg, Man.

References: A. C. Caldwell, J. L. H. Bogart, H. F. H. Hertzberg, R. Caryle R. A. Kirkpatrick.

FOR TRANSFER FROM CLASS OF ASSOCIATE MEMBER TO THAT OF MEMBER

CHADWICK—KENNETH MURRAY, of 1827 Chestnut Avenue, Victoria, B.C. Born at Leeds, England, August 11th, 1878; Educ., Private Tuition. Passed exam. for Ass. Mem. Inst. C.E., 1903. 1895-99, served articles of apprenticeship with city engr., Leeds, England; Res. engr. as follows: 1899-1900, bacteriological sewage filter-contact beds, trickling filters, open and closed septic tanks, cost £15,000; 1901-02, constrn. of 30" diam. cast iron pipe (water) 11½ miles long, cost £87,000; 1903-05, designed and constructed 5 miles of sewers up to seven feet diam.; 1906, asst. engr. of design of a sewage disposal scheme for city of Leeds to cost over a million pounds, and particularly design of an intercepting sewer 7 miles long; 1908, constructed and designed 60 room apartment house in Toronto; 1911-12, designing and constructing houses in Penticton; 1916-17, inspecting 18-lb. shells for the Imperial Munitions Board, Victoria, B.C.; 1918-25, engr. of constrn. for the Victoria Gas Company, Victoria, B.C.

References: E. E. Brydone-Jack, W. M. Everall, E. P. Girdwood, F. C. Green, G. M. Tripp.

HEARN—RICHARD LANKASTER, of Spokane, Wash. Born at Toronto, Ont., May 18th, 1890; Educ., B.A.Sc. Univ. of Toronto, 1913, 1911 (May-Oct.), rodman, roadway section, 1912 (May-Nov.), instr'man., sewer section, Dept. of Works, Toronto; 1913 (May-Nov.), dftsman., Dom. Bridge Co., Lachine; 1913-22, with H.E.P.C. of Ontario as follows: 1913-14, designer on Wasdells Falls power development; 1914-15, shop inspr., for steel penstock and surge tank, Eugenia Falls development; 1915-18, asst. engr. on design of various power developments; 1918-20, asst. engr. in charge of designing and dfting. dept., 1920-21, asst. engr. supervising constrn., 1921-22, personal asst. to chief hydraulic engr. on constrn., Queenston-Chippawa Development; July 1922 to date, asst. chief engr., Washington Water Power Company, Spokane, Washington, D.C.

References: H. G. Acres, T. H. Hogg, N. R. Gibson, R. S. Lea, W. S. Lea, A. C. D. Blanchard, H. E. T. Haultain, M. V. Sauer, H. L. Bucke, J. B. Goodwin, H. P. Rust.

WALKER—ANDREW, of 2359 Mance Street, Montreal, Que. Born at South Durham, Que., May 7th, 1881; Educ., Private tuition, I.C.S. elect'l. engrg.; 1904-07, dftsman. with Fred Thomson & Co. Ltd., and from 1907 to date, with same firm in charge of design of induction motors, transformers, D.C. motors and generators, control apparatus, special apparatus, switchboards, etc.

References: F. Thomson, C. Thomson, J. H. Hunter, J. J. York, P. S. Gregory, I. R. Tait.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

THOMPSON—HAROLD MORFIN, of 152 Belmont Avenue, Hamilton, Ont. Born at Ordsall, Nr. Retford, England, Dec. 4th, 1892; Educ., 1907-14 (nights), Gainsboro Tech. Sch. Cert. 2nd Class, M.C.U.E.I., in heat engines in 1911. 2nd Class British Board of Education in machine constrn. and drawing. Diploma in industrial management efficiency, Lasalle Extension Univ., Chicago, 1922; 1907-13, indentured, mech. engr's. ap'tice, with Marshall Sons & Co., Gainsboro, England; Junior dftsman. with same company until Aug. 1914; 1914-19, R.F.C. Served in France and Belgium, Oct. 1918 recommended for Commn. in field. 1919, in charge of drawing office No. 5, Aircraft Repair Depot, R.A.F. England. Demob. as Hon. 2nd Lieut.; 1919-20, asst. chief dftsman., mill engine dept., Marshall Sons & Co., Gainsboro; Sept. 1920, engaged by Sawyer-Massey Co. Hamilton, as mech. engr., designing dftsman., estimator and charge of special engrg. jobs other than standard, and from Sept. 1923 to date, chief engr. with same company.

References: W. F. McLaren, G. R. Marston, A. M. Jackson, H. A. Lumsden, E. H. Darling, L. S. MacDonald, H. B. Stuart.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

BRADSHAW—FREDERICK WYKEHAM, of Riverbend, St. Joseph d'Alma, Que. Born at Hackbridge, Surrey, England, Nov. 25th, 1900; Educ., B.Sc. (Chem. Eng. with honors), McGill Univ. 1925; 1919 (six mos.), machinist, Metropolitan Vickers Mfg. Co., Manchester, England; 1921 (summer), asst. in tech. dept. Price Bros. (also summer 1922); 1923 (April-Sept.), on 156" news machine, and 1924 (April-Sept.), dfting. and design work at Kenogami, Price Bros. and Co. Ltd.; at present asst. to engr. in charge of installation of equipment at Price Bros.' Riverbend mill.

References: G. F. Layne, A. A. MacDiarmid, C. N. Shanly, H. V. Bignell, N. F. McCaghey.

FETTER—ROY EUGENE, of 923-9th Street South, Lethbridge, Alta. Born at Galeon, Ohio, Dec. 1st, 1902; Educ., B.A. Univ. of Alta., 1922. (Completed course in civil engrg. except six mos. in last year). 1919-20 (summers), rodman and leveller, C.P.R., D.N.R., Lethbridge; 1921-22 (summers), instr'man. and timber inspr., Lethbridge Nor. Irrigation Dist.; Jan. 1923 to Oct. 1924, transitman on the Santa Fe Rly., coast lines, location 9 mos., mtce., 9 mos.

References: R. W. Boyle, R. S. L. Wilson, G. S. Brown, G. P. F. Boese, C. S. Clendening.

PHILLIPS—RICHARD DARRELL, of Toronto, Ont. Born at Fredericton, N.B. Mar. 19th, 1902. Educ., B.Sc. (E.E.), Univ. of N.B., 1923; 1923-24 (15 mos.), test dept., Can. Gen. Elec. Co., Peterborough, and from Sept. 1924 to date, at head office of same company in Toronto, at present one of three illuminating engrs. handling problems of lighting referred to head office.

References: W. M. Cruthers, A. F. Baird, E. O. Turner, A. B. Gates, D. L. McLaren.

ROCHESTER—LLOYD BAILLIE, of 145 St. James Street, Ottawa, Ont. Born at Ottawa, June 22nd, 1893; Educ., B.Sc., (Mining), McGill Univ. 1921; 1910-11, rodman, C.N.R.; 1913-14, recorder, Govt. precise levelling party, Nova Scotia; 1915-19, overseas. C.F.A., Can. For. Corps., R.F.C.; 1920-22, Ontario Timber Investigation, i/c of surveying and asst. timber estimator; 1923-24, i/c of field party, surveying and cruising Blanche & Nation (Edwards limits), Singer Mfg. Co.; 1924-25, i/c of field party, prelim. exploration work on mining claims in Nor. Ontario and Quebec. At present engaged on mining exploration work and timber limit surveys.

References: J. B. Porter, M. B. Atkinson, J. L. Rannie, H. M. MacKay, N. E. D. Sheppard.

Engineering Index

This Index is prepared by the American Society of Mechanical Engineers.

In this department will be published from month to month the titles of current engineering papers with the authors and source and a brief extract of the more important. It is designed to give the members of The Institute a survey of all important articles relating to every branch of engineering profession.

PHOTOSTATIC PRINTS

Photostatic copies of the articles listed in this section, or others on engineering subjects, may be obtained from the Engineering Societies Library.

Price of each print (up to 11 by 14 in. size) 25 cents, plus postage. Where possible, two pages, up to 7 by 9 in. size, will be photographed on one print. Larger magazines require a print per page. Bills will be mailed with the prints.

The Library is also prepared to translate articles, to compile lists of references on engineering subjects and render assistance in similar ways Charges are made, sufficient to cover the cost of this work. Correspondence is invited. Information concerning the charge for any specific service will be given those interested. In asking for information please be definite, so that the investigator may understand clearly what is desired.

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A

ABRASIVES

Production Statistics. The Mineral Industry of the British Empire and Foreign Countries. Imperial Mineral Resources Bur., 1925, 26 pp. Statistics, 1920-1922, on abrasives.

ABRASIVE WHEELS

Standardization. Grinding Wheel Manufacturers Simplify Products. Automotive Industries, vol. 52, no. 18, Apr. 30, 1925, pp. 790-791, 3 figs.; also Am. Mach., vol. 62, no. 18, Apr. 30, 1925, pp. 689-693, 7 figs. Review of booklet issued by Grinding Manufacturers Assn. of United States and Canada on standardization and simplification of grinding wheels; general types of wheels reduced from 29 to 14 and number of sizes of each type limited to minimum which will meet needs of grinding industry.

Grinding Wheels Standardized. Abrasive Industry, vol. 6, no. 5, May 1925, pp. 134-140, 8 figs. Practical standards prepared after five years of effort; unnecessary sizes are eliminated; gives complete specifications.

AERODYNAMICS

Research. Some Recent Work of the Aerodynamics Department, National Physical Laboratory, R. V. Southwell. Roy. Aeronautical Soc.—Jl., vol. 29, no. 172, Apr. 1925, pp. 146-164 and (discussion) 164-167, 17 figs. Work on stability and control; performance; airscrews; airships; economic flight; fundamentals of fluid motion; eddy motion; hydro-dynamic stability; elastic vibrations.

AIRCRAFT CONSTRUCTION MATERIALS

Fabrics. Aircraft Fabrics, J. E. Ramsbottom. Faraday Soc.—Trans., vol. 20, part 2, no. 59, Dec. 1924, pp. 295-302, 2 figs. Deals with properties of fabrics used for structural covering of aircraft, such as tautness, strength, deterioration on weathering, protection from deteriorating action of weather.

AIRPLANE PROPELLERS

Vibration in Blades and Shaft. An Experimental Study of the Vibrations in the Blades and Shaft of an Airscrew, A. Fage. Roy. Soc.—Proc., vol. 107, no. A743, Mar. 2, 1925, pp. 451-469, 10 figs. Investigation deals with natural frequencies of flexural vibration of blades and shaft of rotating airscrew, and includes comparison of theoretical results with those determined experimentally from analysis of sounds emitted.

AIRPLANES

Airfoils. The Effects of Shielding the Tips of Airfoils, E. G. Reid. Nat. Advisory Committee for Aeronautics—Report, no. 201, 1925, 9 pp., 12 figs. Results of tests made at Langley Memorial Aeronautical Laboratory to ascertain whether aerodynamic characteristics of airfoil might be substantially improved by imposing certain limitations upon air flow about its tips.

Interchangeable Manufacture. Interchangeable Manufacture As Applied to Airplane Construction, Wm. B. Stout. Am. Mach., vol. 62, no. 20, May 14, 1925, pp. 767-770, 12 figs. Details of construction of ship now being flown by Ford Motor Co. between Detroit and Chicago; jigs used throughout; reasons for using method described.

Mail. The Curtiss "Carrier Pigeon". Flight, vol. 17, no. 16, Apr. 16, 1925, pp. 228-229, 2 figs. Describes machine built by Curtiss Aeroplane & Motor Co., of Garden City, N. Y., specially for overnight air mail service; intended for operation between New York and Chicago; carries half a ton of mail (about 40,000 letters) or parcels; 400-hp. Liberty engine; speed range 50 to 120 m.p.h.

Seaplanes. *See Seaplanes.*

Slotted Wings. The Slotted Wing in Practice (Der Spaltflügel in der Praxis), G. Lachmann. Zeit. für Flugtechnik u. Motorluftschiffahrt, vol. 16, no. 1, Jan. 14, 1925, pp. 6-8, 2 figs. Author gives sketch of successful monoplane equipped with slotted wings; narrow auxiliary wing of duralumin, when not used, fits front edge of main wing exactly and causes practically no added weight or added flying resistance, but it reduces landing velocity from 112 to 80 km. per hr.; slotted wings are being tried by Handley-Page in England and by works of Udet and E. Heinkel in Germany, where satisfactory results have been obtained.

AIRSHIPS

Schütte-Lanz Structural Methods. Structural Methods Employed by the Schütte-Lanz Airship Company, Gentzke. Nat. Advisory Committee for Aeronautics—Tech. Memorandums, no. 313, May 1925, 71 pp., 73 figs. on supp. plates. Notes based on experience of Schütte-Lanz Airship Co. in light construction, with object to stimulate employment of these methods in other fields of industry. Translated from Zeit. für Flugtechnik u. Motorluftschiffahrt.

ALLOY STEELS

Austenitic. Austenite and Austenitic Steels, H. A. Mathews. Am. Inst. Min. & Met. Engrs.—Trans., no. 1450-C, Apr. 1925, 29 pp., 20 figs. Discusses physical characteristics of austenitic steels; observations of austenite and experimental results.

ALLOYS

Aluminum. *See Aluminum Alloys.*

Copper. *See Copper Alloys.*

Internal Structure. The Inner Structure of Alloys, Rosenhain. Metal Industry (Lond.), vol. 26, no. 15, Apr. 10, 1925, pp. 361-364, 10 figs. Article based on series of three Cantor Lectures given before Roy. Soc. Arts, discussing nature of principal typical alloy systems and crystal structures; and showing how different physical properties of various alloys, such as hardness, melting range, plasticity and brittleness, effect of heat treatment, internal stresses, electrical conductivity, elastic hysteresis, magnetic properties, and color depend primarily on atomic arrangement of metals forming alloy.

Iron. *See Iron Alloys.*

ALUMINUM

Thermal Expansion. Thermal Expansion of Aluminum and Various Important Aluminum Alloys P. Hidnert. U. S. Bur. Standards, Scientific Papers, No. 497, Jan. 9, 1925, pp. 697-731, 21 figs. Data on linear thermal expansion of four samples of aluminum and 51 samples of important aluminum alloys; preparation chemical composition, heat treatment, etc., are included; description of apparatus used; etc.

ALUMINUM ALLOYS

Mechanical Properties. Aluminum and Its Light Alloys, Rob. L. Streeter and P. V. Faragher. Mech. Eng., vol. 47, no. 5, May (section 2) 1925, pp. 433-349, 11 figs. Data on mechanical properties of alloys for sand, permanent-mold, and die castings, wrought aluminum, high-strength alloys and forgings therefrom, etc.

AMMONIA

Vapor, Specific Volume of. The Specific Volume of Superheated Ammonia Vapor, C. H. Meyers and R. S. Jessup Refrig. Eng., vol. 11, no. 10, Apr. 1925, pp. 345-350 and 354 (including brief discussion), 4 figs. Method and apparatus used in determining specific volume; experimental details; results of measurements.

APPRENTICES, TRAINING OF

Management Principles. Management Principles of Apprenticeship, H. A. Frommelt. Indus. Mgmt. (N. Y.), vol. 69, nos. 2, 4 and 5, Feb., Apr. and May, 1925, pp. 76-78, 206-207 and 306-308. Feb.: Principles of tradition. Apr.: Principle of solidarity. May: Principles of education.

ATMOSPHERE

Health, Relation to. The Atmosphere and Its Relations to Human Health and Comfort, C.-E. A. Winslow. Am. Soc. Siv. Engrs.—Proc., vol. 51, no. 5, May 1925, pp. 794-810. Composition and characteristics of atmosphere; physiological effects of atmospheric pressure; chemical and thermal problems of ventilation; physiological effects of sunlight; bacteria in air; problems of atmospheric dust; industrial poisons; odors and health; role of engineer in promoting purity of atmosphere.

AUTOGENOUS WELDING

Fuel Oils, Welding With. Welding and Cutting with Fuel Oils (Schweissen und Schneiden mit Brennölen), Achenbach. Warme, vol. 48, no. 9, Feb. 27, 1925, p. 118. Points out that liquid fuels can be used to advantage in autogenous welding and cutting of metals; acetylene becomes explosive under pressure exceeding 2 atmos., but benzol and its derivatives are more stable and combine advantages of being in liquid form at normal pressure and of being easily vaporized; commercial 90-per cent benzol is recommended for welding and cutting, and heavy grades of gasoline.

AUTOMOBILE ENGINES

Crankcase-Oil Dilution. Oil Dilution and Contamination. Soc. Automotive Engrs.—Jl., vol. 16, no. 5, May 1925, pp. 498-500, 1 fig. Causes and practical remedies as seen in light of recent experiments; conflicting opinions of detriment versus value of dilution; crankcase-oil, contamination and its relation to dilution; means for preventing contamination.

AUTOMOBILES

Bodies, Finishing of. Baking the Finish on Auto Fenders, Hoods and Bodies, L. A. Blackburn. Fuels & Furnaces, vol. 3, no. 3, Mar. 1925, pp. 253-256 and 287, 5 figs. Practice of Olds Motor Works, Division of General Motors Corp., at Lansing, Mich.; temperature regulation and air flow through ovens receive careful attention.

Brakes. Mechanical and Hydraulic Forces Combined in New Brake. Automotive Industries, vol. 52, no. 18, Apr. 30, 1925, pp. 779-781, 3 figs. Madden "compensating system" utilizes mechanical linkage for application and hydraulic pressure for equalization; claimed to prevent skidding; easy to adjust.

Fuel-Consumption Meters. Fuel-Consumption Measurement (Zur Frage der Brennstoffmessung), K. R. H. Praetorius. Motorwagen, vol. 28, no. 9, Mar. 31, 1925, pp. 187-189, 2 figs. Describes Schiske system of fuel-consumption meter for engine testing and for trial runs; design is based on principle of communicating tubes.

Mercedes. The 12-40 Mercédès. Auto-Motor Jl., vol. 30, no. 15, Apr. 9, 1925, pp. 301-304, 13 figs. Description of new model; supercharging a feature; a finely-designed overhead valve-gear and an interesting suspension and power transmission.

PARIS SHOWS. The Two Automobile Shows in 1924 (Les deux Salons de l'Automobile en 1924, M. Keraval.) Industrie des Voies Ferrées et des Transports Automobiles, vol. 19, no. 218, Feb. 1925, pp. 78-84, 10 figs. Reviews heavy-weight vehicles, engines, speed gears and transmissions, suspensions, breaking, bodies, trucks, etc.

AVIATION

AERIAL TRANSPORTATION. Aerial Transportation, C. T. Durgin. Ry. Club of Pittsburgh—Official Proc., vol. 24, no. 5, Mar. 26, 1925, pp. 90-101 and (discussion) 101-114. Discusses commercial value of airplane when used as aerial transport; technical and economic factors; analysis of cost of air route between Pittsburgh and Philadelphia.

B

BALLS

HOLLOW SEAMLESS. Manufacturing Hollow Seamless One-Piece Balls, T. Dantzig. Can. Machy., vol. 23, no. 17, Apr. 23, 1925, pp. 16-18, 6 figs. Describes processes of manufacturing light, strong balls for valve and bearing industries. Metal worked in cold state throughout.

BEARINGS

OIL-RING DESIGN. Oil-ring Design, H. A. Freeman. Machy. (N. Y.), vol. 31, no. 9, May 1925, pp. 687-690, 7 figs. Data on design of oil rings that have given good service.

BEAMS

CONTINUOUS. Contiuuous Beams with Irregular Loads, Wm. R. Bryans. Jl. Eng. Education, vol. 15, no. 7, Mar. 1925, pp. 548-553, 6 figs. Discusses generalized from of three-moment equation, derived in certain English textbooks on mechanics, which can be simply applied, analytically for most cases and graphically for all cases of loading.

REINFORCED-CONCRETE. Notes on the Design of T Beams in Reinforced Concrete, W. A. Fitz G. Kerrich. Royal Engrs. Jl., vol. 39, no. 1, Mar. 1925, pp. 51-54. Shows that even when neutral axis falls outside slab, rectangular beam formulas may be used so long as "equal strength ratio" is not exceeded.

BEARINGS, BALL

INSTALLATION AND MAINTENANCE. Installation and Maintenance of Ball Bearings, H. N. Parsons. Am. Mach., vol. 62, no. 19, May 7, 1925, pp. 731-732. Care in handling; instructions covering application; removing and cleaning bearings; lubricants, kinds to use and kinds to be avoided and reasons therefor.

MANUFACTURE. Ball Bearings in the Making. Am. Mach., vol. 62, nos. 20 and 21, May 14 and 21, 1925, pp. 757-761 and 799-802, 23 figs. May 14: Selecting and testing stock; rings made by forging and on automatics; annealing; special machines for grinding rings. May 21: Forging of balls on Bradley hammers; grounding with abrasive wheels; heat treating in continuous furnaces; lapping and polishing in special machines.

BELTING

CREEP. A Discussion of Belt Creep, R. F. Jones. Textile Wld., vol. 67, no. 19, May 9, 1925, pp. 69, 71, 73 and 85, 3 figs. Effect that it has on application of fundamental belting formula.

BLAST FURNACES

FUEL OIL FOR. Oil Fuel For Blast Furnace Work. Fuels & Furnaces, vol. 3, no. 4, Apr. 1925, pp. 367-368, 1 fig. Results of experiments being made by Roumanian government in use of mazut (residue of crude petroleum) for blast-furnace work, with view of ascertaining metallurgical possibilities of country's rich fuel oil resources. From Revue de Métallurgie.

BOILER FEEDWATER

HIGH-PRESSURE BOILERS. Feedwater Requirements for High-Pressure Boilers (Das Speisewasser für Hoch-und Höchstdruckkessel), R. Klein. Wärme, vol. 48, no. 12, Mar. 20, 1925, pp. 147-151, 16 figs. From point of view of concentration alone, apart from higher temperatures and pressures concerned, feedwater purification is of increased importance in high and extra high-pressure boilers; compares results obtained with feedwater consisting of 90 per cent condensate and 10 per cent make-up, latter being softened in one case by lime-soda process and in other by thermochemical process; author asserts that either oxygen or CO_2 in feed-water causes corrosion, but it becomes more rapid if both gases are present.

BOILER FURNACES

AIR PREHEATING. Evolution of Air Preheating in Boiler Firing (Bewertung der Luftvorwärmung bei Dampfkesselfeuerungen), D. J. Hudler. Archiv für Wärmewirtschaft, vol. 6, no. 1, Jan. 1925, pp. 16-17. From results of tests with irregular evaporation conditions on uniform evaporation are calculated.

ECONOMY IN DESIGN. Making Your Furnace Suit Your Fuel, F. Juraschek. Indus. Mgmt. (N. Y.), vol. 69, no. 5, May 1925, pp. 284-290, 9 figs. Points out that every local fuel can be burned to good advantage, and economically, with proper type of furnace equipment, and that capital investment required can almost invariably be amortized in short time by means of savings effected; how combustion conditions can be met efficiently; problems of excess-air infiltration and heat losses by radiation.

GRATES. Firing Low-Grade Fuel on Traveling Grates (Die Verheizung minderwertiger Brennstoffe auf Vorschubrosten), Pradel. Wärme- u. Kälte-Technik, vol. 27, no. 4, Feb. 15, 1925, pp. 27-31, 5 figs. Discusses plane, traveling, inclined, cascade and other types of grates and gives results of tests with them.

HAND FIRING. Hand Firing for Boilers, F. Johnstone Taylor. Indus. Mgmt. (Lond.), vol. 12, no. 4, Apr. 1925, pp. 270 and 272. How proper methods will increase efficiency of steam generation.

Hand Firing of Boilers. Colliery Eng., vol. 2, no. 14, Apr. 1925, pp. 158-160, 2 figs. Discusses combustion processes and indicates how higher efficiency may be secured by intelligent manipulation.

BOILER OPERATION

RULES FOR. Suggested Rules for the Care of Power Boilers. Mech. Eng., vol. 47, no. 5, May (section 1) 1925, pp. 371-378. A. S. M. E. boiler construction code; rules for routine operation, for operating and maintaining boiler appliances, for inspection, and for prevention of direct causes of boiler failures.

BOILER PLANTS

INCREASING CAPACITY IN SAME FLOOR SPACE. Increasing Boiler Capacity and Efficiency in Same Floor Space, Chas. J. Herbeck. Power, vol. 61, no. 17, Apr. 28, 1925, pp. 646-647, 3 figs. How additional capacity was supplied in boiler plant of Iowa Railway & Light Co., Cedar Rapids; with new arrangement furnace volume has been doubled.

LIGNITE-BURNING. Boiler Houses with Lignite Firing (Das Braumkohlenkesselhaus), A. Barth. Wärme, vol. 48, nos. 9 and 10, Feb. 27 and Mar. 6, 1925, pp. 110-114 and 127-131, 22 figs. Discussion of boiler plants for Central-German lignite with suggestions for proper construction and requisite equipment.

INSTRUMENTS. Power-Plant Instruments, R. S. Reed. Power, vol. 61, no. 20, May 19, 1925, pp. 769-774, 4 figs. Typical arrangement of indicating, integrating and recording instruments for steam end of power plant with suggestions for their selection and installation.

BOILER TUBES

CORROSION. A Few Remarks on Corrosion and Pitting, E. O. Wright. Boiler Maker, vol. 24, no. 3, Mar. 1925, p. 78. One man's experience in field of boiler-tube deterioration and his theory as to cause.

REPAIRING. Repairing and Maintaining Boiler Tubes Economically, B. Schapira. Boiler Maker, vol. 24, no. 4, Apr. 1925, pp. 91-95, 9 figs. Describes Peoborsky system of handling locomotive boiler tubes and flues, which has been followed in Austria for some years.

BOILERS

COAL VS. OIL AS FUEL. Coal Vs. Oil as Fuel for Steam Boilers, H. A. Woodworth. Nat. Engr., vol. 29, no. 5, May 1925, pp. 218-219. Discussion on advantages of the two fuels and their future possibilities.

LOCOMOTIVE. *See Locomotive Boilers.*

BOILERS, WATER-TUBE

BRICKWORK. Brickwork of Furnaces of Oil-Fired Water-Tube Boilers. Mar. Engr. & Motorship Bldr., vol. 48, no. 571, Apr. 1925, pp. 140-141, 1 fig. Discusses points in connection with care and maintenance of furnace lining of water-tube boilers.

BRASS

MANUFACTURE, DEVELOPMENT IN. Brass Manufacturing Progress, W. R. Clark. Metal Industry (N. Y.), vol. 23, no. 4, Apr. 1925, pp. 137-139, 5 figs. Improvements in mechanical working of brass over period of quarter century; improvements in casting shop, rolling-mill practice, electric annealing, extrusion, cold-rolling mill, tube mill, etc.; points out that outstanding developments have been due to utilization of electricity, especially electric-furnace method of melting.

BRIDGES, HIGHWAY

DESIGN AND APPEARANCE, IMPROVEMENTS IN. Improvement in Design and Appearance of Highway Bridges, C. J. Desbaillets. Eng. Jl., vol. 8, no. 5, May 1925, pp. 201-204, 8 figs. Plea for greater architectural consideration in design of bridges.

FIRE SAFEGUARDS. Safeguarding Long Highway Bridge from Fire and Other Damage. Eng. News-Rec., vol. 94, no. 18, Apr. 30, 1925, pp. 722-723, 3 figs. Fire stops placed in approaches minimize danger from chimney effect; other features; means of toll collection.

INDIANA STATE HIGHWAY. Bridge Building on an Indiana State Highway. Eng. News-Rec., vol. 94, no. 20, May 14, 1925, pp. 804-806, 5 figs. Contracts for series of bridges let to one firm for all concrete substructures and spans, and to another firm for steel spans; design and construction features.

STEEL ARCH. New Bridge over the Niagara. Engineer, vol. 139, no. 3618, May 1, 1925, p. 492, 2 figs. on p. 490. New double-track steel arch bridge built across gorge of Niagara River for Michigan Central R. R. Co.; it is of spandrel-braced two-hinged class, very rigid; and bottom chord is parabolic curve. See also Eng. Tl., vol. 8, nos. 4 and 5, Apr. and May 1925, pp. 159-162 and 205-210, 3 figs.

STRENGTHENING AND RE-DECKING. Strengthening and Re-Decking Old Bridge for Heavy Traffic, L. E. Moore. Eng. News-Rec., vol. 94, no. 17, Apr. 23, 1925, pp. 692-695, 5 figs. Saving due to reconstructing instead of replacing Harvard bridge in Boston will pay for work in seven years; new deck of heavy plank with granite-block surfacing and high reinforced-concrete curb.

STRENGTHENING CAST-IRON. Strengthening a Cast-Iron Railway Bridge with Reinforced Concrete, M. de Boulongue. Concrete & Constr. Eng., vol. 20, no. 4, Apr. 1925, pp. 206-212, 8 figs. Account of repairs and strengthening of bridge across Rhone River, comprising 5 cast-iron arches, total length being 1075 ft., including masonry abutments.

BRIDGES, STEEL

SHIFTING. Shifting a Bridge in Vienna. Engineer. vol. 139, no. 3616, Apr. 17, 1925, pp. 428-429, 4 figs. Describes shifting Brigitta Bridge over Danube Canal 20 m. upstream; iron girder bridge was built in 1871 and has length of 67 m. and breadth of 18.10 m.

BUILDINGS

INDUSTRIAL, DESIGN AND LAYOUT. Reinforced-Concrete Wood-Pulp Paper Mill in Oregon, E. L. Williams. Eng. News-Rec., vol. 94, no. 20, May 14, 1925, pp. 808-811, 6 figs. Burned mill is rebuilt in few months; steel columns in first story save floor space; wood roof and sash on account of humidity in paper-machine room.

BUILDING MATERIALS

BUILDING STONE. Canada's Resources in Building Stone, W. A. Parks. Can. Inst. Min. & Metallurgy—Bul., no. 156, Apr. 1925, pp. 367-386, 3 figs. Factors involved in selection of stone for a proposed structure; table giving Canadian production in 1922; imports and exports for 1922; limestone, sandstone, and granite resources.

BUSHINGS

JIG. Jig Bushings (Einsteckhohrbuchsen), K. Hoere. Werkstattstechnik, vol. 19, no. 5, Mar. 1, 1925, pp. 157-161, 3 figs. Discusses standardization of interchangeable bushings, lining and loose bushings, tolerances, etc., and gives tables of data for proposed standards.

C

CABLES, ELECTRIC

IMPREGNATED, PAPER, DETERIORATION OF. Deterioration of Impregnated Cable Paper Subjected to Temperature Only. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 5, May 1925, pp. 508-510, 7 figs. Abstract of report made on investigation of mechanical deterioration of impregnated cable paper when subject to various temperature tests which have been conducted at Mass. Inst. Technology.

SINGLE-CORE ARMOURED. The Use of Single-Core Armoured Cables for Alternating Currents, G. M. Harvey and A. H. W. Busby. Instn. Elec. Engrs.—Jl., vol. 63, no. 340, Apr. 1925, pp. 368-378, 7 figs. Deals with losses involved in distribution of alternating currents in sheathed cables in which sheath is of magnetic material; investigation of single-core rubber-insulated cables, each enclosed in separate iron tube, and also single-core cables armored with one or two layers of galvanized iron or steel wires, giving experimental data showing measured losses in each case.

CABLEWAYS

COAL-MINE, STEEP. Steep Ropeways in South Wales. Engineer, vol. 139, no. 3619, May 8, 1925, pp. 514-516, 18 figs. partly on p. 518 and supp. plate. Describes three ropeways constructed at coal mines in South Wales for transportation of refuse brought out of mines, conveyed from pits at bottoms of valleys to mountain tops.

CAMS

DESIGN. Cam Design, J. Park. Automobile Engr., vol. 15, no. 201, Apr. 1925, pp. 110-113, 11 figs. Method of calculating camshaft torque and tappet side thrust.

CARS, REFRIGERATOR

INSULATION, BALSAM-WOOL. Balsam-Wool Insulation Tests. Ry. Age, vol. 78, no. 21, Apr. 25, 1925, pp. 1041-1042, 2 figs. New insulator developed by Wood Conversion Co., Cloquet, Minn., designed primarily for use in refrigerator car; it is made from fibers of coniferous Northern woods, chemically treated to withstand refrigerator-car service.

CASE-HARDENING

DEVELOPMENTS. Recent Developments in Case Hardening, A. R. Page. Metal Industry (Lond.), vol. 26, nos. 12, 13 and 14, Mar 20, 27 and Apr. 3, 1925, pp. 297-299, 321-323 and 345-347, 8 figs. After dealing briefly with early development and principles of process, author discusses modern theory and methods, covering such points as: types of pots, steels for case-hardening and influence of main constituents, selection of carburizing materials, carburizing temperatures, its mechanism, heat treatment, selective case-hardening, causes and avoidance of soft spots and exfoliation.

CAST IRON

ALLOY ADDITIONS. The Improvement of Cast Iron by Alloy Additions. E. Piwowarsky. Foundry Trade Jl., vol. 31, nos. 452 and 453, Apr. 16 and 23, 1925, pp. 331-334 and 345-346, 3 figs. Results of tests giving effect of aluminum, titanium, nickel, chromium, vanadium, tungsten; critical examination of results-Translated from Stahl u. Eisen.

GRAPHITE EUTECTIC. The Graphite Eutectic in Cast Iron, J. E. Hurst. Foundry Trade Jl., vol. 31, no. 453, Apr. 23, 1925, pp. 353-354, 5 figs. Refers to results of investigations by E. Schuz (Stahl u. Eisen, Jan. 29, 1925) on occurrence of solid-solution graphite eutectic in certain cast irons, and concludes that there is no doubt that weight of evidence is in favor of non-existence of austenite-graphite eutectic in iron-carbon series of alloys.

GRAPHITIZATION. The Formation of Graphite in Cast Iron, J. E. Hurst. Foundry Trade Jl., vol. 31, no. 452, Apr. 16, 1925, pp. 326-330 (including brief discussion), 5 figs. Formation of graphite; condition of carbon in solution in liquid alloys; temperature at which graphite commences to form; formation of graphite from primarily formed carbide.

TRANSVERSE TEST. The Transverse Test of Cast Iron, H. C. Dews. Foundry Trade Jl., vol. 31, no. 453, Apr 23, pp. 350-352, 2 figs. Traces development of certain tests from their early conception to modern practice; conversion from square to circular bars.

CASTING

CENTRIFUGAL. Centrifugal Casting Calculations, Rob. F. Wood. Metal Industry (N. Y.), vol. 23, no. 5, May 1925, pp. 186-189, 5 figs. Discussion of principles set forth in article by N. Lilienberg printed in Blast Furnace & Steel Plant, July 1922; simple and practical method of applying these principles to actual production of centrifugal castings of brass, bronze or other metals.

CONTINUOUS, IN PERMANENT MOLDS. Making Castings Continuously in Permanent Molds. Iron Trade Rev., vol. 76, no. 21, May 21, 1925, pp. 1325-1328, 4 figs. Method of impregnating cast iron molds with zinc; process is applied to various types of ferrous and non-ferrous castings.

CASTINGS

BURNING-ON. Burning-on, J. H. List. Eng. Production, vol. 8, no. 152, May 1925, p. 130, 1 fig. Principles underlying successful method; consists in pouring molten metal over parts to be repaired until they have fused together; factors to be observed for successful work.

CEMENT

ALUMINATE. The Properties of Aluminate Cement and Methods of Utilization, R. L. Morrison. Pit & Quarry, vol. 9, no. 11, Mar. 1, 1925, pp. 71-75. Is made from limestone and bauxite; outstanding properties are very high strength which it develops in 24 hours and its power to resist chemical action of sea water and certain underground waters encountered in tunnels; chemical analysis; results of tests.

CENTRAL STATIONS

AFRICA. The New Pretoria Power Station, G. M. Clark. S. Wales Inst. Engrs.—Proc., vol. 41, no. 1, Mar. 17, 1925, pp. 45-74, 15 figs. Discusses water and coal facilities, design, operation of cooling pond, dam, power-house building, cables and distribution, erection of oilers, turbo-foundations, main buildings, pump room, piping, switchgear, converter station, etc.

FUEL ECONOMY IN SMALL. Economy of Fuel in Small Generating Stations. Power Engr., vol. 20, no. 230, May 1925, pp. 171-172. Analyzes operating conditions in typical small public or private power plant.

HUDSON AVENUE, BROOKLYN. The Hudson Avenue Generating Station of the Brooklyn Edison Company. Elec. Jl., vol. 22, no. 4, Apr. 1925. Contains following articles: Fundamental Plan in the Electrical Design, H. R. Woodrow, pp. 153-155, 3 figs.; Construction and Mechanical Features, J. N. Landis, pp. 155-166, 19 figs.; Electrical Circuits and Switching Equipment, E. A. Hester, pp. 166-180, 21 figs.

CHAINS

SLING, STRESSES IN. Stresses in Sling Chains, J. P. Doolan. Eng. News-Rec., vol. 94, no. 18, Apr. 30, 1925, p. 739, 1 fig. Presents chart intended to give "pull" in chain when working at various angles.

CHIMNEYS

REINFORCED-CONCRETE. Design and Construction of the Reinforced Concrete Chimney at the Briquetting Works, Yallourn, Vic. Commonwealth Engr., vol. 12, no. 6, Jan. 1, 1925, pp. 203-209, 9 figs. Design of chimney, A. L. Galbraith; Construction of chimney, Chas. H. Kernot.

STREAMLINE. The Stream-Line Stack. Power, vol. 61, no. 20, May 19, 1925, pp. 788-792, 9 figs. Cheminée évasée, Prat, venturi, or convergent-divergent stack, as it is variously known, is widely used in Europe, but not well known to American engineers; gives its genesis, corrects popular misapprehensions as to its principles and shows some of forms through which it has passed in process of development.

CHROMIUM

PLATING. Chromium Plating and Its Applications, Liebreich. Metal Industry (Lond.), vol. 26, no. 18, May 1, 1925, p. 432. Report of paper and discussion at meeting of German Society for Metallurgy; applications of chromium plating; structure of deposit; corrosion-resisting properties compared with nickel plate; costs of chromium and nickel plating. Translated from Zeit. für Metallkunde.

CHUCKS

OVAL TURNING. An Elliptical Turning Chuck. Machy. (Lond.), vol. 26, no. 657, Apr. 30, 1925, pp. 142-143, 3 figs. Details of new oval turning chuck made by Nickolls Tool & Mfg. Co., Birmingham, Eng.; it is essentially a rotary compound slide operated by eccentric ring termed former ring, which is attached to headstock of lathe.

CIRCUIT BREAKERS

HIGH-VOLTAGE, TESTS. High-Voltage Circuit Breaker Tests, P. Sporn and H. P. St. Clair. Elec. World, vol. 85, no. 19, May 9, 1925, pp. 970-973, 10 figs. Tests made at 132 kv. at Canton, O., show that capacities of 725,000 kva. can be interrupted successfully; breaker stands seven shots at 1-min. intervals; details of connections and results observed.

CITIES

ENGINEERING IN SMALL. Engineering in the Small City. Eng. News-Rec., vol. 94, no. 20, May 14, 1925, pp. 800-803, 3 figs. Paving Details, sanitary and other services, and financing in Jamestown, N.Y. Real Value of Keeping Assessment Maps Accurate and Up-to-Date. B. K. Finch. Part-Circle Culverts Extensively Used in California Cities. New Gravity Water Supply for Staunton, Va., L. H. Williamson.

CLUTCHES

RIM FRICTION. Rim Friction Clutch. Machy. (Lond.) vol. 26, no. 656, Apr. 23, 1925, pp. 121-122, 3 figs. Special feature of clutch is ready means provided for removing slippers when necessary without disturbing either rim, body, or sliding box.

COAL

BRIQUETTING. Mastrocoal Briquetting Plant. Engineering, vol. 119, no. 2096, May 1, 1925, pp. 536-539, 7 figs. Describes process which has for its object production of briquettes free from described defects as well as reduction of proportion of binding material used to minimum.

CANADIAN RESOURCES. The Coal Resources of Canada, M. J. Patton. Can. Min. Jl., vol. 46, no. 15, Apr. 10, 1925, pp. 371-378, 3 figs. A study of fuel situation. Reprinted from Queen's Quarterly, Mar. 1925.

CHEMISTRY. Modern Views of the Chemistry of Coals of Different Ranks as Conglomerates, A. C. Fieldner and J. D. Davis. Am. Inst. Min. & Met. Engrs.—Trans., no. 1453-F, May 1925, 16 pp., 2 figs. Classification of coal by ranks; banded constituents of bituminous coal; separation of coal conglomerate by organic solvents; action of chemical reagents on coal; action of oxygen under pressure; action of reducing agents on coal; destructive distillation of coal.

CLEAT IN. Why Coal Has Cleat and the Way in Which It Runs. Coal Age, vol. 27, no. 16, Apr. 16, 1925, pp. 576-578, 3 figs. Cleats vary in direction but face fractures are always at right angles to butt cleavages: Professor Kendall of Leeds, Eng., ascribes cleat to tide strains but mountain forming movements are probable cause.

COKING POWER. A Contribution to the Classification of Coals, S. Qvarfort. Fuel, vol. 4, no. 4, Apr 1925, pp. 154-160, 14 figs. With special reference to their coking power.

MOISTURE-CONTENT DETERMINATION. How to Determine Moisture Content of Coal with Simple Device. Coal Age, vol. 27, no. 16, Apr. 16, 1925, p. 573, 1 fig. Simple method and device for determining volume of water in fuel.

PRODUCTS, DISTILLATION OF. Distillation Products of Coal, W. E. Gray. Combustion, vol. 12, no. 5, May 1925, pp. 338-339. Discussion of the various processes for distillation of coal, and of conditions that will hasten their commercial adoption.

COAL DEPOSITS

ALBERTA, CANADA. A Chemical Survey of Alberta Coals, E. Stanfield. Can. Inst. Min. and Metallurgy—Bul., no. 156, Apr. 1925, pp. 406-420, 5 figs. Deals with proximate analyses and calorific values.

Geology of Alberta Coal, J. A. Allan. Can. Inst. Min. and Metallurgy—Bul., no. 156, Apr. 1925, pp. 387-405, 10 figs. Results of recent study in field and laboratory. Estimates of coal reserves, based on development to date.

COAL HANDLING

LOCOMOTIVE COALING STATION. New Coaling Station Has Car Loading Facilities. Ry. Age, vol. 78, no. 22, May 2, 1925, pp. 1097-1098, 2 figs. Features of new coaling station and sanding plant, built by Illinois Central at Dubuque, Ia., include provision for grading coal and ground storage arrangement which permits of reloading into cars for shipment as well as into bins for immediate delivery to locomotives.

PLANTS. Modern Coal Handling. Electrician, vol. 94, no. 2449, Apr. 24, 1925, p. 483, 1 fig. Some details of plant at East Greenwich power station, England; fully automatic arrangements lead to economy.

COAL WASHING

FLOTATION AND RHEOLAVEUR PROCESSES. Studies of Froth Flotation and Rheolaveur Coal Cleaning Systems in Great Britain, C. H. S. Tupholme. Coal Age, vol. 27, no. 19, May 7, 1925, pp. 682-684. Larger impurities removed by hand picking; both froth and rheolaveur give excellent separation; drum filters used for dewatering cleaned product.

COILS

SOLENOIDAL, A. C. RESISTANCE OF. On the Alternating Current Resistance of Solenoidal Coils, S. Butterworth. Roy. Soc.—Proc., vol. 107, no. A744, Apr. 1, 1925, pp. 693-715. In earlier paper by author formula was given for computing a.c. resistance of single-layer coils in which spacing of wires is not too close; comparison was made by C. N. Hickman between measured and computed values of resistance of solenoidal coils, using above formula; owing to misconception in regard to scope of formula, he came to conclusion that formula could be in error by 300 per cent, whereas when legitimately applied discrepancy is reduced to 30 per cent; in order to account for outstanding difference extension of theory was made so as to include closely wound coils, with result that difference is reduced to average of 7 per cent.

COKE OVENS

WASTE-HEAT UTILIZATION. The Utilization of Waste Heat from Coke Ovens, A. Parker, Gas Wld., vol. 82, no. 2124, Apr. 4, 1925, pp. 12-16 (Coking Sec.), Discusses Investigations by research committee of Univ. of Leeds and Instn. Gas Engrs.; dry cooling of coke and steam production; steam raising by surplus gas; surplus gas and gas engines; water gases and steam raising; methods of waste heat recovery.

COMPASSES

AERONAUTICAL. Modern Procedure in Aerial Navigation (Les procédés modernes de navigation aérienne), F. Collin. Génie Civil, vol. 86, no. 13, Mar. 28, 1925, pp. 309-312, 9 figs. Describes Morel compasses, adopted by French Navy, compass card floating in a container filled with alcohol-water; method of compensation; aerial navigation by radio-compass.

New Compass Makes Flying Safer. Automotive Industries, vol. 52, no. 19, May 7, 1925, p. 829, 1 fig. Earth inductor developed by M. M. Titerington is improvement over previous models; direction can be maintained easily under all conditions; apparatus consists of three units.

CONCRETE

CALCIUM CHLORIDE IN, EFFECT OF. Effect of Calcium Chloride in Concrete. Contract Rec., vol. 39, no. 16, Apr. 22, 1925, pp. 396-397. A summary of results of tests made on 7,500 specimens; within certain limits calcium chloride increases strength; time of set is shortened by its addition.

MOISTURE EFFECT ON. The Effect of Moisture on Concrete, W. K. Hatt. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 5, May 1925, pp. 757-793, 23 figs. Reports investigations conducted by Engineering Experiment Station of Purdue University in co-operation with U. S. Bureau of Public Roads, and reviews literature on measurement of volume changes in Portland cements and concretes; primary purpose of investigations was to measure maximum warping and surface deformations produced in concrete road slab as result of non-uniform distribution of moisture, to give basis for estimating possible initial stresses.

SCIENTIFIC CONTROL OF MIXING. Scientific Control of Concrete Shows Economy. E. E. Seelye. Eng. News-Rec., vol. 94, no. 20, May 14, 1925, pp. 811-812, 1 fig. Application of fineness-modulus theory on building gives uniform concrete and saves considerable money.

CONCRETE, REINFORCED

DESIGN. Reinforced Concrete Design, D. Peabody. Tech. Eng. News. vol. 5, no. 8, Mar. 1925, pp. 286-287, 302 and 304, 5 figs. Principal changes embodied in 1924 report of Joint Committee on Reinforced Concrete.

RUSTING OF STEEL IN. Experiments on Rusting of Reinforcing Steel in Concrete, E. C. Schuman. Wis. Engr., vol. 29, no. 6, Mar. 1925, pp. 99-100 and 112, 3 figs. Account of tests carried out in Laboratory for Testing Materials at Univ. of Wisconsin; results of tests in tabular form.

CONDENSERS, ELECTRIC

STATIC. Application of Static Condensers to Power-Factor Correction, R. E. Marbury. Power, vol. 61, no. 17, Apr. 28, 1925, pp. 648-650, 8 figs. What power factor is; conditions on circuit that cause low power factors; effects of low power factor; construction of static condensers; condenser units available for power-factor correction.

CONDENSERS, STEAM

SURFACE. Testing Surface Condensers Equipped With Steam Jet Air Pumps, J. H. Bell. Power, vol. 61, no. 17, Apr. 28, 1925, pp. 669-672, 3 figs. Summarizes, combines and explains procedure, principles, formulas and calculations necessary in making comprehensive test on steam-jet air-pump equipped surface condensers.

CONNECTING RODS

MACHINING. Machining the Cleveland-Six Connecting Rod, M. R. Wells. Am. Mach., vol. 62, no. 20, May 14, 1925, pp. 770-772, 1 fig. Details of operations and descriptions of tools used; rough and finish boring; milling, and cutting off caps; tinning and babbitting; finishing babbitted holes.

CONSTRUCTION WORK

COSTS KEEPING. Keeping Costs on Construction Work, A. L. Hartridge. Contract rec., vol. 39, no. 15, Apr. 15, 1925, pp. 361-365, 1 fig. System by which dependable costs can be obtained; five main items: labor, materials, quantities, costs, and reports; how cost data can be used profitably.

CONVERTERS

ROTARY. New Rotary Converters in Liverpool Sub-stations. Engineer, vol. 139, no. 3614, Apr. 3, 1925, p. 390, 2 figs. Details of Mather & Platt converters, equipped with patent starting and self-synchronizing gear.

The Starting of Rotary Converters, F. Emmerich. Brown Boveri Rev., vol. 12, no. 3, Mar. 1925, pp. 51-59, 11 figs. Describes various methods usually employed for this purpose together with their advantages and disadvantages.

COPPER ALLOYS

COPPER-CALCIUM. The Production of Copper-Calcium Alloys, F. Otto. Metal Industry (N.Y.), vol. 23, no. 4, Apr. 1925, p. 143. Method used for producing copper-titanium alloys in electrochemical way by employing molten bath of fluorspar as electrolyte, points out path to be followed in making copper-calcium alloys; most favorable process, economically is represented by cuprous chloride and calcium chloride in electrolyte consisting of fluorspar and calcium chloride. Translated from Metall u. Erz.

COPPER DEPOSITS

SUPERFICIAL. Superficial Copper Deposits, W. H. Weed. Eng. and Min. Jl.—Press, vol. 119, no. 15, Apr. 11, 1925, p. 605. How they are formed and what they teach.

CORE BOXES

CYLINDRICAL, MAKING. Diverse Ways of Making Cylindrical Coreboxes, J. Drinkwater. Can. Foundryman, vol. 16, no. 4, Apr. 1925, pp. 11-13, 4 figs. Possibilities of circular saw, band saw and other machines must be realized in order to perform work in most expeditious manner; reviews various methods employed for making small- and large-diameter boxes, and also shallow and deep boxes.

CORES

BAKING. The Baking of Cores, C. C. Hermann. Brass World, vol. 21, no. 3, Mar. 1925, pp. 87-88. Venting of core; portable ovens for baking cores; describes gas-fired core-drying oven in which city gas is used as fuel at 1-lb. pressure.

OIL-SAND. Oil-Sand Cores, G. Edginton. Foundry Trade Jl., vol. 31, no. 451, Apr. 9, 1925, pp. 315-316. It has been author's experience that attempts to introduce oil-sand cores into foundries has been either unqualified success of dismal failure; type of sand used; preparation of sand; core oils; preparation of boxes; making and baking of cores. See also (discussion) in no. 452, Apr. 16, 1925, pp. 335-336.

The Oil-Sand Core, F. C. Edwards. Metal Industry (Lond.), vol. 26, no. 16, Apr. 17, 1925, pp. 391-393, 2 figs. Discusses many advantages, such as simplicity of production, venting unnecessary, sprigs and irons may in most cases be dispensed with, less wear and tear of core bore, immunity from moisture, takes much shorter time to prepare and dry than green sand cores, saving by eliminating necessity for grids, blacking generally unnecessary, etc.; chief point of care in oil sand core is its delicacy in green state.

COST ACCOUNTING

JOB-COST FINDING. Getting Job Costs Without Guesswork, W. N. Polakov. Indus. Mgmt. (N. Y.), vol. 69, no. 5, May 1925, pp. 269-272, 6 figs. Describes means and methods whereby executive can know just which products are most profitable, what discounts are justified on quantities, and establishes basis for accurate price quotation without fear of unreliable estimate.

CUTTING TOOLS

LUBRICATING AND COOLING. Lubricating and Cooling the Cutting Tool, A. F. Brewer. Indus. Mgmt. (N. Y.), vol. 69, no. 4, Apr. 1925, pp. 197-205, 7 figs. Cutting-tool lubricants and coolants, and their selection; reason for generation of heat; reconditioning of cutting oils; advantages of reconditioning cutting oils, etc.; prevention of infection.

THERMOELECTRIC MEASUREMENT OF TEMPERATURES. Thermoelectric Measurement of Cutting Tool Temperatures, H. Shore. Wash. Acad. Sciences—Jl., vol. 15, no. 5, Mar. 4, 1925, pp. 85-88. Method adopted in present experiments consists in utilizing contact point between tool and work as hot junction of thermoelectric circuit; final results show at first rapid increase of temperature with increasing rates of cutting metal, but dropping to more gradual rise at faster cutting rates.

D

DAMS

ARCH. Proposed Experimental Arch Dam on Stevenson Creek. Eng. News-Rec., vol. 94, no. 20, May 14, 1925 pp. 816-817, 2 figs. Design worked out to show how cantilever and arch elements act; cantilever should fail at first filling.

DIE CASTING

CONDENSERS. Production of Adjustable Condensers by Die Casting (Herstellung von Drehkondensatoren aus Spiritzguss), W. Wiedemann. Maschinenbau, vol. 4, no. 4, Feb. 26, 1925, pp. 178-179, 3 figs. Discusses advantages of die casting and describes its application to condensers with alloy of 80 per cent pure Bauer tin, 14 per cent antimony and 6 per cent electrolytic copper.

DIELECTRIC

GASEOUS. High-voltage Dielectric Characteristics of Gaseous Insulators, F. M. Clark. Gen. Elec. Rev., vol. 28, no. 3, Mar. 1925, pp. 158-170, 6 figs. Outlines progress which has already been made in investigation of properties and laws of gaseous dielectrics, together with a discussion of the various explanatory theories that have been suggested.

DIES

PRECISION HARDENING. Press-die Hardening: The Latest Precision Methods of Operation, J. W. Urquhart. Mech. World, vol. 77, nos. 1994 and 1996, Mar. 20 and Apr. 3, 1925, pp. 182-183 and 213-214. Mar. 20: Press-die making materials; dies from castings; steel castings for dies; high-carbon carburized die; ensuring heavy casing. Apr. 3: Depth of steel face; jet quenching of dies; effective hardening temperature; acid quenching for hollow faces.

DIESEL ENGINES

CASTINGS FOR. Castings for Diesel Engines. Foundry Trade Jl., vol. 31, nos. 452 and 453, Apr. 16 and 23, 1925, pp. 321-325 and 347-349, 15 figs. Review of conference between Scottish sections of Inst. Brit. Foundrymen and Instn. Mech. Engrs. on problems connected with production of castings for Diesel engines, discussing following subjects: Inefficiency of short-period heating tests; chromium and growth; advantage of low phosphorus content; European continental conditions; suggested elimination of cast iron; making of Still engine, including foundry planning; question of costs and quality; metallurgical considerations; commercial aspect; weight for horsepower limits; fundamental desiderata; low phosphorus deemed undesirable; small engines as bases for experiments.

DOUBLING-ACTING. The First Harland & Wolff Double-Acting Diesel Engine. Shipbldg. and Shipg. Rec., vol. 25, no. 15, Apr. 9, 1925, pp. 423-424, 2 figs. Details of 8-cylinder, 10,000-b. hp. unit for one of Royal Main Steam Packet Co.'s 22,000-ton motorships.

OPERATION. Operation of Diesel Engines, R. Hildebrand. Power, vol. 61, nos. 17 and 19, Apr. 28 and May 12, 1925, pp. 651-652 and 735-736, 4 figs. Apr. 28: Inlet and exhaust valves. May 12: Air-starting valves and their care.

POWER PLANTS, USE IN. Oil Engines in Plants Requiring Steam, L. H. Morrison. Power, vol. 61, no. 16, Apr. 21, 1925, pp. 613-615, 2 figs. Discusses influence of installation of Diesel engines alongside of steam units on cost of power. See supp. plate containing illustration of typical Diesel-engine power plant.

SOLID-INJECTION. Airless Injection in Marine Diesel Engines. Mar. Engr. & Motorship Bldr., vol. 48, no. 571, Apr. 1925, pp. 146-149, 6 figs. Characteristics, advantages, and disadvantages.

STANDARDIZED MANUFACTURE. Standardized Diesel Engine Manufacture. Oil Engine Power, vol. 3, no. 4, Apr. 1925, pp. 245-250, 15 figs. In Fairbanks, Morse Co.'s plant at Beloit, Wis., specialized manufacture improves product and reduces cost.

DRAWINGS

DRAFTING-ROOM PRACTICE. Some Elements of Drafting-Room Practice That May Be Standardized, F. W. Ming. Mech. Eng., vol. 47, no. 5, May (section 1) 1925, pp. 346-348, 21 figs. The fact that there are now several methods of representing same thing indicates vital need for standardization of machine drafting; replies to questionnaire sent to manufacturing firms regarding method they preferred in representing machine elements specified and opinions as to need of standardizing machine drafting; wide diversity of methods are employed to represent like machine parts; most outstanding need for standardization is in drawing sheet sizes.

DRILLS

TWIST. Making High-Speed Twist Drills, A. E. Granville. Can. Machy., vol. 33, no. 15, Apr. 16, 1925, pp. 13-15, 8 figs. Describes the various steps in production.

DROP FORGING

LAPS AND THEIR PREVENTION. Laps—Their Production and Prevention, L. Aitchison. Forging— Stamping—Heat Treating, vol. 11, nos. 3 and 4, Mar. and Apr. 1925, pp. 78-80 and 114-117, 16 figs. Discusses defects experienced in drop-forging practice, such as laps, folds, galls and cold shuts.

E

EDUCATION, ENGINEERING

ELECTRICAL. Electrical Education in 1924. Elec. World, vol. 85, no. 20, May 16, 1925, pp. 1019-1020, Increase of enrollments and appropriations; broader training includes many utility courses; more graduate scholarships needed; analysis of trends.

GREAT BRITAIN. Notes on Engineering Education in Great Britain W.E. Wickenden. Jl. Eng. Education, vol. 15, no. 8, Apr. 1925, pp. 580-585. Contrast between British and French engineering education; outstanding features of former appear to be flexibility, fair equalization of recognition for degree and non-degree courses, intimacy of contact between teacher and student, simplicity and solidity of curricula, thoroughness in teaching of fundamentals, rapid development of research, etc.

INVESTIGATION OF. The Present State of the Society's Investigation of Engineering Education, H. P. Hammond. Jl. Eng. Education, vol. 15, no. 7, Mar. 1925, pp. 493-497. Summary of state of work in various projects which are being carried out in investigation of Society for Promotion of Engineering Education.

ELECTRIC DISCHARGE

HIGH-VOLTAGE, PHOTOGRAPHIC STUDY OF. A Photographic Study of High Voltage Discharges, R. H. George, K. B. McEachren and K. A. Oplinger. Purdue Univ.—Bul., Eng. Experiment Station Bul. No. 19, Sept. 1924, 114 pp., 99 figs. Study of behavior of high-voltage electrical discharges in gases. Results of several methods of attach used to determine mechanism and characteristics of corona discharge.

ELECTRIC DISTRIBUTION SYSTEMS

THREE-WIRE D. C. Three-Wire Direct-Current Distribution Networks: Some Comparisons in Costs and Operation, H. W. Taylor. Instn. Elec. Engrs. —Jl., vol. 63, no. 340, Apr. 1925, pp. 337-348 and (discussion) 348-367, 11 figs. Discusses application of different types of cables and methods of laying to various parts of 3-wire d.c. network; types of cables are single-core, 3-core, and triple-concentric; methods of laying are conduit, direct, and solid; describes looped-neutral service, object of which is to facilitate location of faults on smaller sizes of triple-concentric vulcanized-bitumen distributors, and to improve continuity of supply under fault conditions.

ELECTRIC GENERATORS

PROTECTION. Protection of Electric Generators, C. R. Chace. Power, vol. 61, no. 20, May 19, 1925, pp. 780-781, 2 figs. Limiting damage in case of failure in machine's windings; d.c. generators in parallel; differential relay and reverse-power relays on a.c. generators; uses of reactors and lightning arresters.

VARIABLE-SPEED THIRD-BRUSH TYPE. Variable-Speed Dynamos of the Third-Brush Type, C. Coppock. Elec. Rev., vol. 96, no. 2472, Apr. 10, 1925, pp. 567-569, 5 figs. Notes on self-regulating dynamos, for train lighting, etc.

ELECTRIC GENERATORS, A. C.

Parallel Running. Parallel Running of Alternators, G. Windred. Electrician, vol. 94, no. 2446, Apr. 3, 1925, pp. 399-400. Discussion of article by J. Frith and F. Buckingham in Feb. 27 and Mar. 6, 1925, numbers of Electrician. Cooperation of electrical and mechanical theorists essential.

Self-Synchronizing. A Self-Synchronizing Alternator. Engineer, vol. 139, no. 3619, May 8, 1925, pp. 526-527, 4 figs. New machine devised by L. J. Hunt to run in parallel under most adverse conditions and even when gas engines with very light flywheels are used; alternator may be connected to busbars without synchronizing, and will continue to run satisfactorily even if old gas engines are used.

ELECTRIC LOCOMOTIVES

Developments. Latest Developments in Electric Locomotive Design and Their Relation to Transportation, W. B. Potter, New York, R. R. Club—Official Proc., vol. 35, no. 5, Mar. 20, 1925, pp. 7603-7620, 23 figs. Types of electric locomotives and their performances.

ELECTRIC METERS

Selection, Use and Care. Selection, Use and Care of Recording Electrical Meters, J. E. Housley. Power, vol. 61, no. 18, May 5, 1925, pp. 690-692, 6 figs. Reading accuracy of meters; recording voltmeter in power house; recording meter prevented overloading motors; recording conductivity meter.

ELECTRIC MOTORS

Controllers. The Mill-type Magnetic-time Control System, J. D. Wright, Gen. Elec. Rev., vol. 28, no. 4, Apr. 1925, pp. 243-247, 10 figs. Describes equipment developed primarily to meet demands of steel-mill electrical engineers for a simple, rugged, and reliable magnetic controller which will provide definite time control of motor acceleration.

ELECTRIC MOTORS, A.C.

Adjustable-Speed. The Adjustable-speed Alternating-current Motor with Shunt Characteristics, H. C. Uhl. Gen. Elec. Rev., vol. 28, no. 4, Apr. 1925, pp. 248-257, 12 figs. Describes alternating-current adjustable-speed brush-shifting motor having shunt characteristics, i.e., its change of speed is only moderate as compared to change in load; it is sometimes known as Schrage motor from K. H. Schrage of Sweden, its inventor, but as developed by Gen. Elec. Co. it is known as type BTA motor. Its different applications to various industries.

Single-Phase Induction. The Single-Phase Induction Motor, L. M. Perkins. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 5, May 1925, pp. 499-508, 23 figs. Operation of single-phase induction motor is presented according to crossfield theory as distinguished from theory of oppositely rotating fields; mathematics used requires only knowledge of algebra and trigonometry and no factors, such as crossfield iron loss and crossfield magnetizing current, are neglected; in addition to derivation of vector diagram, its transformation into accurate circle diagram, which requires no assumption except sine-wave voltage and primary field distribution, is shown. (Abridgment.)

Synchronous. Synchronous Motor Applications, Jas. F. Burke. Iron & Steel Engr., vol. 2, no. 4, Apr. 1925, pp. 159-173 and (discussion) 173-175, 31 figs. Deals, with synchronous and other forms of motors; developments of synchronous-induction motors.

ELECTRIC MOTORS, D. C.

Locomotive. Factors Affecting the Design of D. C. Motors for Locomotives, R. E. Ferris, Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 5, May 1925, pp. 481-489, 25 figs. Gives comparison between different types of motor mounting as regards amount of power which may be developed in available space with d. c. motors; comparisons are largely qualitative but withing reasonable limits are also qualitative; voltage applied to motor commutator, voltage-to-ground, number of poles, peripheral speed and track gage, as well as type of motor mounting are considered in comparison.

ELECTRIC POWER

Cost. Electric Energy From Large Power Plants, H. E. M. Kensit. Can. Engr., vol. 48, no. 15, Apr. 14, 1925, pp. 396-398. Condensed analysis covering cost of electric energy from large, new power plants; comparisons of cost of steam and hydro-electric power; cost of electric transmission; long-distance transmission.

Measurement. Revised Tables of Phase Angle Correction Factors for Use in Power Measurements, C. T. Weller. Gen. Elec. Rev., vol. 28, no. 3, Mar. 1925, pp. 202-206. An error occurs in measuring power in a.c. circuits due to phase displacements in instrument transformers and in wattmeter; if phase displacements or phase angles are known, error may be corrected and true watts obtained by multiplying preliminary result in apparent watts by proper correction factor taken from revised tables given. Directions for using tables, formulas and other data useful in correcting results of power measurements.

ELECTRIC RAILWAYS

Austria. Electric Operation of the Federal Austrian Railways (Der elektrische Betrieb auf den österreichischen Bundesbahnen), H. Luithlen. Elektrische Bahnen, vol. 1, no. 3, Mar. 1925, pp. 65-84, 40 figs. Discusses progress in electrification, available water resources, storage, dams, pressure piping, poles and transmission lines, substations, tracks, locomotives, etc.

ELECTRIC SWITCHES

220-Kv. Disconnecting. New 220-Kv. Switch Stands Tests. Elec. World, vol. 85, no. 17, Apr. 25, 1925, pp. 879-880, 3 figs. Motor-operated disconnecting switch designed to meet severe weather conditions; details of switch and description of tests.

ELECTRIC TRANSMISSION LINES

Calculation. Calculations for Transmission Lines, R. G. Hornberger. Elec. World, vol. 85, no. 19, May 9, 1925, pp. 965-968, 9 figs. Semi-graphic practical method saves time and labor; no textual instruction or handbooks required; example showing application of method; forms used.

Design. Transmission Line Design, Part I—Mechanical Features, G. S. Smith. Univ. Wash.—Bul., Eng. Experiment Station Bul. No. 29, Aug. 1, 1924, 45 pp. 11 figs. Mechanical design of spans with supports at unequal elevation.

ELECTRIC WELDING, RESISTANCE

Experiences. Experience with Resistance Welding, C. A. Hughes. Elec. World, vol. 85, no. 18, May 2, 1925, pp. 913-918, 15 figs. Field of application; spot, seam and butt welding; mechanical strength of welds, success in welding different thickness of metals.

Spot. Electric Spot (Resistance) Welding, J. W. Meadowcroft. Am. Welding Soc.—Jl., vol. 4, No. 4, Apr. 1925, pp. 32-34. Methods.

ELECTRICITY, APPLICATIONS OF

Agriculture. Farm Electrification in New York State, O. D. Young. Gen. Elec. Rev., vol. 28, no. 4, Apr. 1925, pp. 214-218. Abstract of address before a meeting of representatives of farm, university, and electric public utility organizations held under auspices of Empire State Gas & Elec. Assn. at Albany, N. Y.

ELECTROMETERS

Radio-Frequency Measurement. An Electrometer Method for the Measurement of Radio Frequency Resistance, P. O. Pedersen. Inst. Radio Engrs.—Proc., vol. 13, no. 2, Apr. 1925, pp. 215-243, 14 figs. Criticizes existing methods for measurement of radio-frequency resistance and describes new electrometer method, where quadrant electrometer is put across inductance in oscillatory circuit; with this method radio-frequency resistance of even very feebly damped circuit may be determined with error well within one part in a thousand, and determination may be made in few seconds.

EMPLOYMENT MANAGEMENT

Promotion of Good Will. A Method of Increasing Workshop Efficiency, F. J. Sharr. Engineer, vol. 139, no. 3619, May 8, 1925, pp. 513-514. Describes experiment tried out by large engineering works, aim of which was promotion of good will in men; basis of method was exhibition of good will by management; under system described, men are offered a number of "conditions" known to be highly prized by them, in exchange for increased output.

ENGINEERS

Railway Executives. The Engineer as a Railroad Executive, J. Kruttschnitt. Mech. Eng., vol. 47, no. 5, May (section 1), 1925, pp. 313-318. Problems confronting responsible managing officer and extent to which he has thus far solved them; how engineer has risen to new responsibilities and what recognition has been accorded to his fitness to administer railroad properties.

F

FANS

Automatic Motor Control. Automatic Control for Forced-Draft Fans at Wabash River Station, W. C. Plumer. Power, vol. 61, no. 20, May 19, 1925, pp. 782-783, 6 figs. Starting fan motors; automatic control of motors.

Centrifugal. Performance of Centrifugal Fans for Electrical Machinery, C. J. Fechheimer. Mech. Eng., vol. 47, no. 5, May (section 1), 1925, pp. 319-326, 26 figs. Ordinary commercial centrifugal fan is provided with stationary collecting device, generally a volute, which usually improves performance materially; in fans used in cooling electrical machinery, however, such collecting devices cannot be readily applied, and revolving impeller therefore forms sole means for developing pressure needed to drive air through vent ducts; author gives results of extended series of tests made to determine performance of centrifugal fans without collecting devices, and to obtain sufficient data to enable designers to select types of fans intelligently.

FATIGUE

Industrial. Elimination of Unnecessary Fatigue in Industry, Geo. H. Shepard. Mech. Eng., vol. 47, no. 5, May (section 2) 1925, p. 418. Abstract of report of Committee to A.S.M.E. Management Division.

FEEDWATER HEATERS

Locomotive. Locomotive Feedwater Heating (Le Réchauffage de l'Eau d'Alimentation des Chaudières-Locomotives sur le Réseau P.-L.-M.), A. Parmantier. Revue Générale des Chemins de Fer, vol. 44, no. 2, Feb. 1925, pp. 114-126, 5 figs. Theory of heat recovery from waste steam; describes feedwater heater used on Paris-Lyons system and tests carried out showing savings due to C. C. P. and Worthington apparatus.

FILTRATION PLANTS

St. Catharines, Ont., Canada. Ten Million Gallon per Day Filtration Plant for the City of St. Catharines. Contract Rec., vol. 39, no. 15, Apr. 15, 1925, pp. 366-368, 2 figs. Works now under construction will comprise coagulating basins. six pairs of mechanical filters, a five-million-gallon clear water reservoir and necessary appurtenances.

FIRE EXTINGUISHERS

Foam. Gas Liquid Emulsions or Foams and their Use in Fire Fighting. Fuels & Furnaces, vol. 3, no. 4, Apr. 1925, pp. 397-398. Translated from Industrie Chimique.

FLOTATION

Machines. Development and Operation of a 50-Gram Flotation Machine, J. F. Gates and L. K. Jacobsen. Eng. and Min. Jl.—Press, vol. 119, no. 19, May 9, 1925, pp. 771-772, 2 figs. Describes machine suitable for rapid work and where only small quantities of pulp are available; results compare well with those from larger machines.

FLOW OF GASES

Pressure Governors. Pressure Governors for Controlling the Flow of Gases at High Pressures, J. S. G. Thomas. Jl. Sci. Instruments, vol. 2, no. 1, Oct. 1924, pp. 20-22, 2 figs. Describes two forms of governor suitable for maintaining a constant pressure at a point in a gas-flow system under high pressure (up to 100 lb. per sq. in. or so); both forms are of relief valve type; in first a gravitational control is employed, in second control is exercised by an elastic diaphragm closing a chamber in which a constant pressure is maintained.

FLUORSPAR

Industry. The Mineral Industry of the British Empire and Foreign Countries, Statistics 1920-1922-Fluorspar. Imperial Mineral Resources Bur. (Lond.), 1925, 11 pp. Statistics of production, imports and exports.

FLYWHEELS

Power-Press, Design of. The Design of Power Press Flywheels, Wm. J. Smith. Machy. (Lond.), vol. 26, no. 656, Apr. 23, 1925, pp. 105-109, 2 figs. Calculation of section of belt and section of arms; stress on rim section; example.

FOREMEN

Training. Paving the Way for a Trained Leadership, J. K. Novins. Indus. Mgmt. (N. Y.), vol. 69, no. 5, May 1925, pp. 302-305. Present status of foreman training; report of National Industrial Conference Board; government co-operation; activities of employers' association.

FORGING

Dies. Machine Forging Dies, C. C. Hermann. Machy. (N. Y.), vol. 31, no. 6, Feb. 1925, pp. 433-436, 8 figs. Design and use. Forging in field of tool-steel rock drills; methods followed in upsetting bolts and spokes of steel wheels.

FORGINGS

Defects in Heavy. Defects in Large Forgings, J. F. Harper. Mech. Eng., vol. 47, no. 5, May (section 2) 1925, pp. 400-402, 6 figs. Common defects encountered and explanation of their causes; methods used to insure uniform and homogenous material.

FOUNDATIONS

BEARING SOILS. Progress Report of the Special Committee to Codify Present Practice on the Bearing Value of Soils for Foundations, Etc. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 5, May 1925, pp. 884-897, 5 figs. Includes appendices on, Recent Investigations of Soil Colloids, P. L. Gile; The Supporting Value of Soils as Influenced by Bearing Area, A. T. Goldbeck; and Report of Sub-Committee on Piling.

CONCRETE. Can the Formation of Laitance be Prevented?, R. M. Miller. Contract Rec., vol. 39, no. 15, Apr. 15, 1925, pp. 369-372, 2 figs. Suggestions of practical value obtained as result of observations made during pouring of 3900 cu. yds. of seal concrete under water in connection with construction of a coal pier.

GRANULAR, LOADING. Experimental Loading on Granular Material, D. E. Moran. Franklin Inst.—Jl., vol. 199, no. 4, Apr. 1925, pp. 493-501, 2 figs. Study of movements of sand when subjected to vertical pressure, and conclusions therefrom; author emphasizes point that more information on this subject is of vital importance to engineers who have to deal with movements of granular material under varying load, and better knowledge will lead to more intelligent and economical design of footings and clearing understanding of what constitutes safe loading on sands whose general characteristics are known.

POWER HOUSES. The Substructure of New York Edison Co.'s Power House, F. W. Skinner. Eng. & Contracting (Gen. Contracting), vol. 63, no. 4, Apr. 17, 1925, pp. 794-801, 4 figs. Features of design and construction of foundations for a large steam electric power plant in New York City, involving difficult excavation, pile driving by special methods and unusually heavy mass concrete. See also Pub. Wks., vol. 56, no. 3, Mar. 1925, pp. 75-78, 3 figs.

FOUNDRIES

FARM MACHINERY CASTINGS. Use Special Molding Machines for Farm Castings, P. Dwyer. Foundry, vol. 53, no. 9, May 1, 1925, pp. 345-348, 10 figs. Methods and equipment of Massey-Harris Co., Toronto, Can., manufacturers of agricultural machinery; maintain school of instruction; most machines are home-made; describes pattern equipment.

IRON. New Iron foundry at a Sheffield Works. Engineer, vol. 139, no. 3614, Apr. 3, 1925, pp. 374-376, 6 figs. partly on p. 382. New foundry is arranged on most modern lines for production of varied class of work of non-repetition character, comprising castings up to 40 tons weight, or heavier; handling of iron and coke; cupolas and charging platform; casting pits; core department; drying stoves; sand-treatment plant; molding equipment.

LABORATORY. Construction of a Small Foundry Laboratory. Foundry Trade Jl., vol. 31, no. 450, Apr. 2, 1925, p. 280, 1 fig. Points on economical method of providing bench for analysis of iron and steel-works material.

PLANNING FOR ECONOMICAL PRODUCTION. Foundry Planning for Economical Production, E. J. Ross. Foundry Trade Jl., vol. 31, nos. 449 and 450, Mar. 26 and Apr. 2, 1925, pp. 259-263 and 281-286, 27 figs. Why planning is necessary; origin of difficulties; effective economies; describes how planning scheme has been successfully carried out for speedy and economical production of castings used in general engineering; ways of making mold; venting; pattern-shop practice; contraction; coring; manufacture of complete mold; advantages of system.

PULVERIZED COAL FOR MELTING IRON. Pulverizing Coal for the Melting of Grey Iron, A. De Young. Can. Foundryman, vol. 16, no. 4, Apr. 1925, pp. 14-15, 2 figs. Hunt-Spiller Mfg. Corp. report gratifying results in total tons melted per hour and fuel ratio per ton melted; tests for fineness; temperature, 2700 deg. Fahr.

FOUNDRY EQUIPMENT

LABOR-SAVING AUXILIARY. Auxiliary Equipment for Saving Man Power in the Foundry. Better Foundry Practice, no. 7 1925, pp. 3-15, 7 figs. Describes practices in representative foundries located in various industrial centers of the United States, based on study by Metropolitan Life Insurance Co.; deals with material handling; raw-material handling; conveying in foundry; ventilating cleaning room; laboratory control in foundry; auxiliary-equipment purchase.

FREQUENCY

MULTIPLICATION. Frequency Multiplication. N. Lindenblad and W. W. Brown. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 5, May 1925, pp. 469-473, 9 figs. Principles and practical applications of ferromagnetic methods; principles of sinusoidal and shock excitation; advantages of "dip" method, and of short magnetic path; radio and industrial applications.

FUELS

LOW-GRADE, UTILIZATION OF. Developments In The Use Of Low Grade Fuels, H. Southern. Fuels & Furnaces, vol. 3, no. 3, Mar. 1925, pp. 267-268. Fuel situation in England has led to rapid development of unit pulverizers and to an improved low-temperature process by-product recovery gas plant and producer. Pt. 2: English developments in low-temperature carbonization. Pt. 3: Utilization of waste heat.

[*See also Coal; Pulverized Coal.*]

FURNACES, HEAT-TREATING

CONTINUOUS. New Furnaces of Continuous Type Installed to Raise Quality and Production. Brass World, vol. 21, no. 3, Mar. 1925, pp. 79-81, 4 figs. Furnaces installed in heat-treating department of Hupp Motor Co., Detroit; one furnace is used exclusively for normalizing, forgings and annealing cast-iron parts; how furnaces are built; speed of conveyors; unit for heat-treating front-axle I-beams is of entirely different construction; process is continuous, piers extending whole length of furnace.

G

GARBAGE DISPOSAL

ODOR ELIMINATION IN WORKS. Elimination of Odors from Garbage Disposal Works, S. A. Greeley. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 5, May 1925, pp. 832-846, 1 fig. Status of odor elimination; undamental considerations; terms used; comments on odors; sources of odors in garbage works; effect of house treatment, collection and disposal; incineration of garbage; reduction; treatment of drier gases; experience with plant locations.

GAS TURBINES

PROBLEMS AND PROSPECTS. Gas Turbines, M. König. North-East Coast Instn. Engrs. & Shipbldrs.—advance paper for mtg. Apr. 24, 1925, 44 pp., 34 figs. Deals with present-day position and future possibilities; discusses basis cycles employed and merits or other wise of their adoption in gas turbines, as compared with other prime movers; refers to fundamental difficulties of suitable materials and efficient means of compression; author does not share undue optimism of some engineers on future prospects, but he is equally opposed to sceptics who state that gas turbine is impracticable.

GASES

SPECIFIC HEAT. On the Measurement of the Ratio of the Specific Heats using Small Volumes of Gas. J. H. Brinkworth. Roy. Soc.—Proc., vol. 107, no. A743, Mar. 2, 1925, pp. 510-543, 10 figs. Ratios of specific heats of air and of hydrogen at atmospheric pressure and at temperatures between 20 deg. and—183 deg. cent.

GEARS

STEELS, CHARACTERISTICS OF. Some Metallurgical Considerations of Gears. Machy. (Lond.), vol. 26, no. 655, Apr. 16, 1925, pp. 77-81, 6 figs. Characteristics, general properties, and peculiarities of all different metals and alloys commonly employed for manufacture of gears; includes chart giving chief characteristics of gear steels.

GOLD DEPOSITS

IDAHO. Geology and Gold Resources of Boise Basin, Boise County, Idaho, S. M. Ballard. Idaho Bur. Mines & Geol. Bul., no. 9, Dec. 1924, 100 pp., 28 figs. partly on supp. plates. Early history; geography; topography; geology; gold placer mining operations; economic geology; early development of lode deposits; mines and prospects.

QUEBEC, CANADA. Recent Developments in Northern Quebec, H. C. Cooke. Can. Inst. Min. & Metallurgy—Bul., no. 156, Apr. 1925, pp. 343-350. Notes on transportation and geologic work; mining operations.

GRAIN ELEVATORS

MODERN DESIGN. A Modern Granary, K. Wagner. Eng. Progress, vol. 6, no. 3, Mar. 1925, pp. 59-63, 8 figs. Comparison between bucket elevator and pneumatic plant; piping of pneumatic plant; driving mechanism; constructive details of granary; storing and unloading facilities.

GRAPHITE

INDUSTRY. The Mineral Industry of the British Empire and Foreign Countries, Statistics 1920-1922-Graphite. Imperial Mineral Resources Bur. (Lond.), 1925, 23 pp. Statistics of production, imports and exports, and prices.

GRINDING

FORM. Form Grinding, H. Darbyshire. Eng. Production, vol. 8, no. 152, May 1925, pp. 139-140. 1 fig. Practical observations on this and other grinding problems.

WORK-SPEED EFFECT ON. Works-peed Effect on Grinding, C. A. Carlson. Abrasive Industry, vol. 6, no. 5, May 1925, pp. 145 and 154, 2 figs. Variables that must be taken into account when determining workspeeds; results of practical tests.

GRINDING MACHINES

FACE. Heavy Face Grinding Machines with Horizontal Spindle and Segmental Wheel. Brit. Machine Tool. Eng., vol. 3, no. 32, Mar-Apr. 1925, pp. 242-243, 2 figs. Deals with recently developed grinding machine made by Churchill Machine Tool Co., indicating its sphere of utility.

GEAR. Garrison Hydraulic Gear Grinder. Machy. (N. Y.), vol. 31, no. 9, May 1925, pp. 733-734, 2 figs. Machine for grinding gear teeth on production basis, hydraulic system; wheel dresser and wheel drive.

H

HEAT TRANSMISSION

PLATES AND WALLS. Heating and Cooling of Plates and Walls. Fuels & Furnaces, vol. 3, no. 4, Apr. 1925, pp. 381-384, 4 figs. A method of solving, graphically, heat flow through plates or walls of any material, of any thickness, of constant or of variable density, or several layers of materials of various densities and thicknesses.

HEATING, ELECTRIC

INDUSTRIAL. Industrial Electric Heating—Its Possibilities and Promises, F. A. Coffin. N. E. L. A. Bul., vol. 12, no. 3, Mar. 1925, pp. 182-184 and 199. Author makes appeal for more general interest in electric heat and wider, more comprehensive and effective effort in developing industrial electric heating business.

Load Building Possibilities of Industrial Heating, C. L. Ipsen. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 5, May 1925, pp. 458-462, 9 figs. Brief survey of more recent achievements in industrial electric heating; shows increasing tendency of industries to adopt electric heating, particularly for high-grade products; describes specific installation for such processes as steel treating, copper and brass annealing, vitreous enameling, glass annealing, baking japans, cores, bread, etc., on large scale; show that quality of product has been improved by use of electric heating with little if any increase in cost.

HEATING, HOT-AIR

APPARATUS FOR LARGE SPACES. Modern Air Heating Plants for Large Localities. Eng. Progress, vol. 6, no. 3, Mar. 1925, pp. 73-74, 4 figs. Describes individual air-heating apparatus which are distributed in sections to be heated in such manner that each apparatus heats certain portion of locality by blowing out hot air, no distributing pipes being required.

HIGH VOLTAGES

TESTING. 1,000,000 V. Testing, E. T. Norris. Electrician, vol. 94, no. 2448, Apr. 17, 1925, pp. 456-457 and 459, 4 figs. Details of connection and design of transformers used; some test results. See also Elec. News., vol. 34, no. 9, May, 1925, pp. 4-43, 2 figs.

TESTING LABORATORY. A High Voltage Testing Laboratory. Engineer, vol. 139, no. 3618, May 1, 1925, pp. 481-483, 4 figs. Details of equipment of high-voltage testing and research laboratory at Trafford Park of Metropolitan-Vickers Elec. Co.; includes 500,000-volt transformer and also lower-pressure equipment.

HIGHWAYS

TRAFFIC DEVELOPMENTS. Elements Governing the Development of Highway Traffic, A. N. Johnson Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 5, May 1925, pp. 748-756, 4 figs. Discusses amount of future traffic upon American highways and compares this with traffic capacity of lane road.

HYDRO-ELECTRIC DEVELOPMENTS

NEWFOUNDLAND. Putting Through a Great Hydro-Electric Project in Newfoundland, A. A. Paoli and F. A. McLean. Compressed Air Mag., vol. 30, no. 5, May 1925, pp. 1231-1236, 17 figs. Developments in Humber Valley, involving construction of canal 8 miles long, several miles of railway, large concrete and earth dams, large power house and transmission lines, 400-ton paper mill, model town and structures.

NOVA SCOTIA. Harnessing the East River with Special Reference to the Development at Ruth Falls, H. S. Johnston. Eng. Jl., vol. 8, no. 5, May 1925, pp. 220-221. Describes development of power possibilities on East River, Sheet Harbor, on Atlantic coast of Nova Scotia. (Abstract.)

NIAGARA FALLS. Power at Niagara, W. K. Bradbury. Tech. Eng. News, vol. 5, no. 8, Mar. 1925, pp. 282-283, 298 and 300, 7 figs. Installation of three 70,000-hp. hydro-electric units which will do work of 9,000,000 men; construction detail of new waterway in form of tunnel; details of Johnson penstock valve, power-house foundations, wheel case, turbine runner and other parts of project.

ICE TROUBLES. Overcoming Ice Difficulties at the Holtwood Power Plant, H. W. Lowy. Boston Soc. Civ. Engrs.—Jl., vol. 12, no. 3, Mar. 1925, pp. 142-149, 4 figs. Ice troubles encountered are of three sources or origin; river ice, forebay ice, and frazil ice; diagnosing impending frazil ice; handling equipment during frazil ice run; occurrence of frazil ice troubles.

Isle Maligne, Que., Canada. Six Units of 540,000 h.p. Plant n Operation, D. Kennedy. Power House, vol. 18, no. 7, Apr. 5, 1925, pp. 23-26, 7 figs. Some features of power house of hydro-electric power project of Duke-Price Power Co., on Saguenay river at Isle Maligne.

La Gabelle, Canada. Hydro-Electric Plant at La Gabelle, P. Q. Elec. News, vol. 24, no. 7, Apr. 1, 1925, pp. 58-61, 10 figs. Particulars of 120,000-hp. development recently completed on St. Maurice River for Shawinigan Water & Power Co.; four units at present, operating on a 60 ft. head.

Low-Head, Iowa. Low-Head Power Plant Designed for Typical Mid-West River, E. L. Chandler. Eng. News-Rec., vol. 94, no. 19, May 7, 1925, pp. 762-763, 3 figs. Pinhook hydro-electric plant in Iowa has earth and concrete dam, earth dike without corewall, and spillway and power house on piles.

I

ICE MANUFACTURE

Flooded System of Tank Operation. The Flooded System of Operating Ice Tanks, T. Mitchell. Power, vol. 61, no. 18, May 5, 1925, pp. 683-684, 2 figs. Principles involved in flooded system.

Systems, Non-Condensable Gases in. Non-Condensable Gases in Ice Making Systems, B. E. Hill. Power House, vol. 18, no. 6, Mar. 20, 1925, pp. 46-48, 2 figs. Nature and source of their accumulation in refrigerating plants; evolution of methods used for their elimination; economic importance of their removal.

INDUSTRIAL MANAGEMENT

Profit Margin, Determining. Picking the Profitable Products, R. Rosenthal. Mgmt. & Admin., vol. 9, no. 5, May 1925, pp. 429-431, 2 figs. Method used in small plant to determine manufacturing and profit margin.

Psychology in. Industrial Psychology: Its Scope and Effect on Efficiency, C. S. Myers. Paper Trade Jl., vol. 80, no. 19, May 7, 1925, pp. 61-63. Discusses vocational study, movement study, spell study, environment study, and study of incentives. From Cost Accountant.

Sales Planning. Distribution a Governing Influence on Production, G. D. Mercer. Taylor Soc.—Bul., vol. 10, no. 2, Apr. 1925, pp. 111-115. Sales department must sell factory production to maintain stable operating organization and utilize equipment at maximum efficiency.

Standards Department. Organization of a Standards Department (Die Organisation eines Normenbüros), H. Kummer. Maschninebau, vol. 4, no. 6, Mar. 26, 1925, pp. 263-265. Discusses work of standards department in a hardware manufacturing plant in formulating standards, maintenance, interchangeability, etc.

Tool-Room Operation. A Toolroom Operating on a Production Basis, A. A. Merry. Am. Mach., vol. 62, no. 18, Apr. 30, 1925, pp. 698-700, 5 figs. Small-quantity problem; developing all-round toolmakers from specialists; scheduling work and establishing responsibility; functions of control board.

INDUSTRIAL ORGANIZATION

Reorganization Scheme. A Reorganization Scheme with a Definite Objective. Eng. Production, vol. 8, no. 151, Apr. 1925, pp. 116-117. Tackling problem of unproductive time; store location; inspection-department location; sectionalizing store; amalgamation of progress department and assembly store; stock-assembly section.

INDUSTRIAL TRUCKS

Electric. Machine-Shop Transportation with Industrial Electric Trucks, H. J. Payne. Am. Mach., vol. 62, no. 21, May 21, 1925, pp. 803-804, 5 figs. Use of electric trucks for general shop work; signal system for controlling their use; oversized tires; each unit equipped with ampere meter; crane-type truck.

Reduction Saving $48,000 in Materials Handling Costs, F. C. Eibel. Indus. Mgmt. (N. Y.), vol. 69, no. 5, May 1925, pp. 312-315, 4 figs. How electric-truck fleet, on regular schedule, serves large metal working plant.

INSULATORS, ELECTRIC

Disk. Failure of Disk Insulators on High-Tension Transmission Lines, H. D. Panton. Am. Inst. Elec. Engrs.—Jl. vol. 44, no. 5, May 1925, pp. 474-475, 2 figs. Results of insulator tests of 1923 and 1924. Supplement of paper by author printed in vol. 41, Nov. 1922 issue of Journal. (See reference in Eng. Index 1922, p. 357.)

Porcelain, Testing of. Testing Porcelain Insulators, W. Bucksath. Electrician, vol. 94, no. 2449, Apr. 24, 1925, pp. 480-481, 5 figs. Employment of voltage surge in theory and practice; its use in determining internal faults.

INTERNAL-COMBUSTION ENGINES

Light Metals in. Light Metals in Explosion Engines (Les métaux légers dans les moteurs à explosion), M. De Fleury. Société des Ingénieurs Civils de France—Mémoires et Compte Rendu des Travaux, vol. 77, no. 10-12, Oct.-Dec. 1925, pp. 712-733. Essential characteristics of explosion engines and role of light metals in their realization; use of aluminum, alpax. magnesium; reduction of weight, increase of speed, etc. Bibliography.

Railway Traction with. Present State of Railway Traction by Means of Internal Combustion Engines (L'Etat actuel de la traction sur voies ferrées par moteurs à combustion interne). Génie Civil, vol. 86, nos. 14 and 15, Apr. 4 and 11, 1925, pp. 325-332 and 355-358, 50 figs. Discusses use of explosion engines and internal-combustion engines for locomotives; railway motor cars, etc., dealing with different types; types of transmissions; tendency in choice of transmissions.

[*See also Automobile Engines; Diesel Engines; Oil Engines.*]

IRON

Blowholes, Formation of. The Influence of Gases at High Temperatures upon Iron, with Special Reference to the Formation of Blowholes, A. G. Lobley and C. L. Betts. Iron & Steel Inst.—advance paper, no. 10, for mtg. May 1925, 10 pp., 5 figs. It is shown that presence of CO_2, whether by direct introduction or as product of interaction of CO and iron oxide, definitely gives rise to blowholes; in presence of CO metal is very much more sound; general conclusion is reached that McCance's hypothesis is definitely confirmed by these experiments. See also (abstract) in Engineering, vol. 119, no. 3097, May 8, 1925, pp. 591-592, 16 figs.

IRON ALLOYS

Physico-Chemical Properties. Principles of Metallurgy of Ferrous Metals for Mechanical Engineers, L. Cammen. Mech. Eng., vol. 47, no. 5, May (section 1) 1925, pp. 339-345, 12 figs. First of series of articles discussing underlying physical and chemical processes involved in metallurgy of iron and steel, and dealing particularly with physico-chemical properties of iron alloys. Factors affecting structure of iron alloys; allotropic modifications of iron; iron-carbon equilibrium diagram; bibliography.

IRON CASTINGS

Defects, Classification of. The Classification of Foundry Defects, F. H. Hurren. Foundry Trade Jl., vol. 31, no. 450, Apr. 2, 1925, pp. 287-290. Points out that importance of defective castings is overstressed; two main categories of foundry detectives; classification by cause; cause of mis-runs; scabbed and dirty castings; defectives due to bad or unsatisfactory material, bad design, or caused by bad management. Alternative system of classification according to materials.

IRON FOUNDING

Special Pig Iron, Use of. Special Pig Iron and Its Use in the Gray-Iron Foundry (Spezialroheisen und seine Verwendung in der Graugussgiesserei). Zeit. für die gesamte Giessereipraxis, vol. 46, no. 17, Apr. 26, 1925, pp. 209-210. Points out advantages of use of special pig along with ordinary foundry pig in order to improve quality of product.

IRRIGATION

Australia. Irrigation Enterprises in Australia. Engineer, vol. 139, no. 3617, Apr. 24, 1925, p. 465, 9 figs. partly on p. 462. Among most important schemes are Hume storage works; Torrumbarry weir and lock; and Goulburn weir, Victoria.

L

LATHES

Turret. Economic Efficiency of the Full-Automatic Turret Lathe in Comparison with the Semi-Turret Lathe, R. J. Wadd. Mech. Eng., vol. 47, no. 5, May (section 2) 1925, pp. 411-414. Deals with economic results arising from changes in machine-tool equipment as affected by labor employed and efficiency of production; specific comparisons are instituted based on work done by full-automatic and semi-automatic turret lathe as analyzed with aid of recommended formulas developed by Formulas Committee of A.S.M.E. Materials Handling Division.

LIGHTING

Glare and Visibility. Glare and Visibility, M. Luckiesh and L. L. Holladay. Illuminating Eng. Soc.—Trans., vol. 20, no. 3, Mar. 1925, pp. 221-247 and (discussion) 248-252, 13 figs. Resume of results obtained in investigations which have been prosecuted for past two years in Lighting Research Laboratory at Nela Park, Cleveland, O., of visual and lighting conditions involving these factors.

Intensity Distribution of Units. Isocandles and the Asymmetric Lighting Unit, F. Benford. Gen. Elec. Rev., vol. 28, no. 4, Apr. 1925, pp. 271-276, 10 figs. Method of plotting distribution of intensity of unsymmetrical or asymmetric lighting units so as to give a complete engineering description on a single curve sheet.

Ocular Principles. The Ocular Principles in Lighting, C. E. Ferree and G. Rand. Illuminating Eng. Soc.—Trans., vol. 20, no. 3, Mar. 1925, pp. 270-295, 7 figs. Deals with ocular principles involved in lighting, their relation to the various types of concrete lighting situations and their utilization in explaining effects of lighting on eye.

LOCOMOTIVE BOILERS

Manufactute. Boiler Production at the Lima Locomotive Works. Boiler Maker, vol. 24, no. 3, Mar. 1925, pp. 61-66 and 88, 14 figs. Practice at boiler shop of Lima Locomotive Works at Lima, Ohio; an average production of 40 locomotive boilers a month is maintained by a highly organized shop staff.

Pitting. Causes and Prevention of Pitting in Locomotive Boilers, C. H. Koyl. Boiler Maker, vol. 24, no. 5, May 1925, pp. 126-127. Discusses pitting caused by acids and by electric action; elimination of oxygen in feedwater.

LOCOMOTIVES

Boosters. The Locomotive Booster, T. P. Whelan. St. Louis Ry. Club—Official Proc., vol. 29, no. 11, Mar. 13, 1925, pp. 211-214 and (discussion) 214-216; also (abstract) in Ry. Rev., vol. 76, no. 18, May 2, 1925, pp. 817-818. Advantages of booster are clearly set out.

Diesel-Engined. German Experimental Diesel Locomotives. Ry. Gaz., vol. 42, no. 16, Apr. 17, 1925, p. 523, 2 figs. Locomotives built experimentally by Berliner Maschinenbau Co. and exhibited at Seddin Exhibition; one is shunting locomotive with hydraulic transmission, and other has direct drive.

Shopping Policy. Factors Concerning the Economics of Shopping Steam Locomotives, L. K. Sillcox. Mech. Eng., vol. 47, no. 5, May (section 2) 1925, pp. 419-425, 2 figs. Folly of continuing obsolete designs in service; trend of unit costs since 1910; effect of specific shopping policy on cost of repairs; bearing of utilization of power on shopping policy.

Signals. Signal Repetition on Locomotives of the Compagnie de l'Est (Note sur les Appareils de Répétition des Signaux sur les Locomotives Employés par la Compagnie de l'Est), M. Marty and M. Picard. Revue Générale des Chemins de Fer, vol. 44, no. 4, Mar. 1925, pp. 189-198, 22 figs. partly on supp. plates. Discusses apparatus for acoustic repetition of "stop" signals in locomotive cab, recording "stop" and "proceed" signals on indicator diagram, etc., installed on lines of Compagnie de l'Est, France.

Switching. A Geared Shunting Locomotive. Engineer, vol. 139, no. 3616, Apr. 17, 1925, pp. 432-434 and 436, 8 figs. Characteristics feature of steam shunting locomotive is adoption of high-speed enclosed engine connected with driving wheels by chains; results of test.

Three-Cylinder. Three-Cylinder Locomotive for the Missouri Pacific. Ry. Age, vol. 78, no. 23, May 9, 1925, pp. 1165-1166, 1 fig. 2-8-2 type for freight service designed to develop high tractive force and efficiency.

M

MACHINE TOOLS

Built-In Electrical Equipment. Machine Tools with Built-In Electrical Equipment, J. W. Hazper. Am. Mach., vol. 62, no. 20, May 14, 1925, pp. 780-782, 8 figs. Changes of motor drive in machine tools; individual drive replaces group drive; increased use of machines having motors built in; auxiliary motors used on large tools.

Castings for. Castings for Machine Tools, H. Jowett. Foundry Trade Jl., vol. 31, nos. 453 and 454, Apr. 23 and 30, 1925, pp. 341-344 and 369-371, 21 figs. Explains why holding-down plant is essential, and describes one installed by author at his works; details of lathe bed mold; foundation plate for heavy lathe; slotting machine cross slide; loco-frame-plate slotter bed; check for milling machine; plano-milling machine.

Lubrication. Lubrication of Machine Tools. Lubrication, vol. 11, no. 3, Mar. 1925, pp. 25-36, 23 figs. Deals with lubrication of lathes; planers, shapers and slotters; milling machines; boring mills and drilling machines, and other machine-shop equipment.

Replacement Policy. Getting the Most Out of Your Machine Tool Dollar, L. C. Morrow. Am. Mach., vol. 62, no. 21, May 21, 1925, pp. 793-794. Expression of equipment policies of International Harvester Co., as obtained by interviews with J. G. Wood, general works manager, and R. R. Keith, chief engineer, motor trucks and buses.

MACHINING METHODS

AUTOMOBILE BRAKE PARTS. Manufacturing Hydraulic Four-Wheel Brake Parts, J. Younger. Am. Mach., vol. 62, no. 21, 1925, pp. 796-798, 10 figs. Design and operation of hydraulic brakes; operations on master cylinder and wheel cylinders; inspection; running-in on a special "road-testing" machine.

MALLEABLE CASTINGS

BLACKHEART, MANUFACTURE. The Manufacture of American Blackheart Castings. Metal Industry (Lond.), vol. 26, no. 17, Apr. 24, 1925, pp. 413-415 and 443-445, 8 figs. Discusses chief production and metallurgical problems in manufacture of blackheart malleable iron castings, dealing particularly with those relating to annealing temperatures.

MATERIALS HANDLING

ELECTRIC TELPHER LINES. Electric Telpher Lines. P. Stephan. Eng. Progress, vol. 6, no. 3, Mar. 1925, pp. 53-57, 12 figs. Electrical equipment of trucks; mechanical design; to-and-fro service; closed rail track; electric grab lines; trucks with attendant; store yard and loading bridges; loading bridges with grab cranes; inclined telpher lines.

LABOR-SAVING EQUIPMENT, CALCULATING ECONOMY OF. An Application of the Formulas for Computing Economies of Labor-Saving Equipment, Geo. Langford. Mech. Eng., vol. 47, no. 5, May (section 2) 1925, pp. 408-410, 1 fig. A.S.-M.E. Materials Handling Division's formulas for computing economies of labor-saving equipment are applied to purchase and operation of electric industrial truck in place of hand lift trucks; describes type of work done by electric truck and gives analysis of saving effected by its adoption; explanation of practical features involved in evaluation of various factors used by formulas.

Formulas for Computing the Economies of Labor-Saving Equipment, Jas. A. Shepard and Geo. E. Hagemann. Mech., Eng., vol. 47, no. 5, May (section 2) 1925, pp. 403-408. Develops five simple equations, showing maximum investment which will earn simple interest; yearly cost to maintain mechanical equipment ready for operation; yearly profit from operation of equipment, in excess of simple interest, and in per cent on investment; and years required for complete amortization of investment out of earnings; method of applying these formulas, and evaluation of their various factors.

OVERHEAD RAIL VS. AUTOMATIC TRUCK. Runways and Telphers v. Automatic Trucks, W. H. Atherton. Indus. Mgmt. (Lond.), vol. 12, no. 3, Mar. 1925, pp. 197-198. Compares relative advantages of overhead rail traffic in engineering shops and factories with accumulator trucks.

MEASURING INSTRUMENTS

END MEASURING MACHINE. End Measuring Machine at the National Physical Laboratory, Machy. (Lond.), vol. 26, no. 656, Apr. 23, 1925, pp. 113-114, 2 figs. Special micrometer headstock and indicating tailstock form essential parts of machine. Measurement of short gages and of thermal expansion of short gages by interference methods.

METALLOGRAPHY

SOLID SOLUTIONS. Metallography for Engineers, W. Rosenhain. Metallurgist (supp. to Engineer, vol. 139, nos. 3613 and 3617), Mar. 27 and Apr. 24, 1925, pp. 40-42 and 50-53, 9 figs. Solid solutions; micro-structure of alloys; super-saturated condition of solid solutions.

METALS

HEAT EVOLVED DURING PLASTIC EXTENSION. The Heat Developed during Plastic Extension of Metals, W. S. Farren and G. I. Taylor. Roy. Soc.—Proc., vol. 107, no. A743, Mar. 2, 1925, pp. 422-451, 17 figs. Methods of measurement for which self-recording testing machine was made which automatically produced stress-strain curve as specimen was being stretched; to measure heat evolved during stretching, rise in temperature which occurs during rapid plastic extension of bar was measured with thermocouple; results and discussion thereof; stress-strain records.

MILLING CUTTERS

FACE, GRINDING OF. Grinding Face Milling Cutters. Machy. (N. Y.), vol. 31, no. 9, May 1925, pp. 700-701, 6 figs. How periphery, corners, and face of milling cutters of inserted-blade type are sharpened.

MILLING MACHINES

PLANO-MILLING OPERATIONS. Plano Milling. Brit. Machine Tool Eng., vol. 3, no. 32, Mar-Apr. 1925, pp. 237-239, 3 figs. Shows how multiple cutter plano mill may be arranged to perform with ease work which by any other method could be carried out only under difficulties and compared with method illustrated, most inefficiently.

MINERAL DEPOSITS

CANADA. Recent Mining Developments in Ontario, A. G. Burrows. Can. Inst. Min. and Metallurgy-Bul., no. 156, Apr. 1925, pp. 351-366, 1 fig. Particulars regarding gold, silver, nickel-copper, and lead.

MINERAL RESOURCES

ALASKA. Mineral Resources of Alaska, 1922, A. H. Brooks and others. U. S. Geol. Surv., Bul. 755, 1924, 220 pp., 14 figs. partly on supp. plates. Results achieved in investigation of mineral resources of Alaska and treating of mining industry of the territory, especially of statistics of mineral production.

CANADA. Some Mineral Resources West of Ottawa. Can. Min. Jl., vol. 46, no. 16, Apr. 17, 1925, pp. 401-402, 1 fig. Description of known mineral deposits along Waltham Branch of Can. Pacific Ry.

MINES

SURVEYING. The Development of Mine Surveying Methods, H. Briggs. Colliery Guardian, vol. 129, nos. 3346, 3347 and 3348, Feb. 13, 20 and 27, 1925, pp. 391-393, 465-466 and 510-511, 25 figs. Describes development of methods from early times to 1850. Paper read before Inst. Mine Surveyors.

MOLDS

PRESSURE OF MOLTEN IRON. The Pressure of Iron and Loading of Molds (Der Eisendruck und die Belastung der Formen), O. Schnidt. Zeit. für die gesamte Giessereipraxis, vol. 46, no. 13, Mar. 29, 1925, pp. 165-167, 8 figs. By pressure of iron is meant pressure of molten iron against walls of container or mold; discusses injurious effects and methods of calculating iron pressure.

STRIPPING. Note on a Small Stripping Machine (Note sur une petite machine à demouler). Fonderie Moderne, vol. 19, Jan. 1925, pp. 6-7, 3 figs. Describes a machine suitable for medium plants, and its operation.

MOTION STUDY

MECHANICAL AIDS. Mechanical Aids to Motion Study, K. H. Condit. Am. Mach., vol. 62, no. 18, Apr. 30, 1925, pp. 685-688, 7 figs. Photographic apparatus for motion-study records; microchronometer for recording time; cyclegraphs of various types; motion models, magster and simultaneous motion-cycle charts.

MOTOR BUSES

ELECTRIC. Storage-Battery Traction (La traction électrique par accumulateurs), M. Andries. Industrie des Voies Ferrées et des Transports Automobiles, vol. 19, no. 219, Mar. 1925, pp. 145-151, 6 figs. Report of battery-driven buses and trucks organized by Union des Syndicats de l'Electricité.

MOTOR TRUCKS

AXLES. An Original Back Axle Design. Motor Transport (Lond.), vol. 40, no. 1049, Apr. 6, 1925, pp. 411-412, 5 figs. Particulars of Huch back axle, built by Sheldon Axle & Spring Co., of Wilkes-Barre, Pa., which combines a number of important advantages and eliminates many defects of other types.

BERLIET. A Low-Loading Berliet. Motor Transport (Lond.), vol. 40, no. 1049, Apr. 6, 1925, pp. 413-414, 5 figs. Particulars of a new pneumatic-tired 30-cwt. high-speed model suitable for passenger and goods transport.

FIAT. The 15-cwt. Fiat. Motor Transport (Lond.), vol. 40, no. 1041, Apr. 20, 1925, pp. 471-472, 5 figs. A new light van chassis of simple design for fast delivery work; horsepower, 10 R.A.C. rating; four cylinders forming a single casting, and bore and stroke of 65 and 110 mm. respectively.

SIX-WHEEL. A Karrier Rigid Six-Wheeler. Motor Transport (Lond.), vol. 40, no. 1042, Apr. 27, 1925, pp. 489-491, 7 figs. Details of air-braked two-tonner intended principally for service in undeveloped countries.

STEAM. A Well-tried Steamer. Motor Transport (Lond.), vol. 40, no. 1050, Apr. 13, 1925, pp. 439-441, 4 figs. Details of latest Leyland steam vehicles; thimble tube boiler standardised; roller-bearing poppet-valve engine and two-speed gear unit.

O

OIL ENGINES

HEAVY-OIL. A New Type of Heavy-Oil Engine. Gas and Oil Power, vol. 20, no. 235, Apr. 2, 1925, pp. 147-148, 2 figs. Blackstone system of spring injection.

Heavy-Oil Engines, H. R. Sankey. Engineer, vol. 139, no. 3619, May 8, 1925, pp. 508-509. Outstanding questions relating to large engines of self-ignition type, such as fuel injection, temperature stresses, super-charging, scavenging, detonation, materials used, weight, lubrication, utilization of waste heat.

ORE DRESSING

HARDINGE BALL MILL. The Development of the Hardinge Mill, J. C. Farrant. Chem. Age (Lond.), vol. 1 , no. 302, Mar. 28, 1925, pp. 300-301, 3 figs. Notes on developments and improvements in design of Hardinge Mill, with particulars of operating data.

P

PATTERNS

FOUNDRY, STORAGE OF. Better Foundry Pattern Storage Advocated. Iron & Steel of Canada, vol. 8, no. 4, Apr. 1925, pp. 79-81, 1 fig. Protection from fire and from loss essential; centralized control for keeping continuous record of location of every pattern.

PIERS

CONCRETE. New Concrete Pier at Bremerton Navy Yard, J. B. Walker. Sci. Am., vol. 132, no. 4, Apr. 1925, pp. 233-234, 7 figs. Economy of combined precast and poured concrete.

PIPE, WOOD-STAVE

CONSTRUCTION. Wood Stave Pipe. Engineer, vol. 139, no. 3614, Apr. 10, 1925, pp. 400-401, 2 figs. Notes on material, construction and durability.

PISTON RINGS

CAST-IRON POTS. Interim British Standard Specification for Cast Iron Piston Ring Pots (Sand Cast and Chill Cast) for Automobiles. Brit. Eng. Standards Assn., No. 5004, Sept. 1924, 7 pp., 1 fig. Specification covering chemical composition, tensil test, elasticity test, preparation of test rings, and number of tensile and elasticity tests.

PLATES

RECTANGULAR, STRESSES IN. Stresses in Rectangular Plates Clamped at Their Edges and Loaded with a Uniformly Distributed Pressure, C. E. Inglis. Instn. Nav. Architects—advance paper, no. 7, for mtg. Apr. 1925, 13 pp., 10 figs. partly on supp. plate. Investigation to discover how far Grashof's formulas are in agreement with calculations based exactly upon laws of elasticity. Paper is decidedly mathematical in character.

POLES, STEEL

FOOTING CORROSION, REMEDIES FOR. Remedies for Tower-Footing Corrosion, E. H. Steele. Elec. World, vol. 85, no. 17, Apr. 25, 1925, pp. 880-881. General practice of foundation work for transmission purposes is in two distinct classes: (1) metal footing, all galvanized, placed in natural soils, relying entirely upon earth for foundation purposes, and with no other protection for metal surface than galvanizing; (2) metal footing incased in concrete material below ground line, this footing being ungalvanized except on exposed areas above ground line.

POLISHING MACHINES

STANDARDS FOR. Proposed Standards for Interchangeable Cones, Chucks and Extension Pieces for Polishing and Grinding Machines (Normblattentwürfe für Polierspitzen, etc). Werkstattstechnik, vol. 29, no. 2, Jan. 15, 1925, pp. 80-82, 3 figs.

PRESSWORK

SHEET-METAL ARTICLES. Press Tool Work, F. P. Turner. Eng. Production, vol. 8, no. 152, May 1925, pp. 131-137, 14 figs. Describes presses and tools used in fabrication of sheet-metal articles; types of presses; combined roll and dial feed; flat edge trimmer; blanking, compound, combination and double-action dies; the sub-press.

PRINTING MACHINERY

PRESSES. Modern Methods of Building Printing Presses, F. H. Colvin. Am. Mach., vol. 62, no. 17, Apr. 23, 1925, pp. 639-641, 10 figs. Tools and fixtures used in new plant where Kelly press is built; milling and drilling fixtures; finishing cuts in cams and knurls.

PULLEY BLOCKS

ELECTRIC. One-Ton Electric Pulley Block. Engineering, vol. 119, no. 3093, Apr. 10, 1925, pp. 447-449, 9 figs. Block will lift load at speed of 20 ft. per min.; load is held automatically in all positions; if control levers are released barrel of controller is always brought to rest in neutral position, and can never overshoot this and reverse motor.

PULVERIZED COAL

BURNING. Pulverized Coal Burning. Eng. & Boiler House Rev., vol. 38, nos. 9 and 10, Mar. and Apr. 1925, pp. 367-369, and 438 and 443-445, 13 figs. Details relating to equipment necessary for successfully burning pulverized coal, and description of Fuller system.

GRAY-IRON MELTING. Melting Grey Iron With Powdered Coal. Fuels & Furnaces, vol. 3, no. 3, Mar. 1925, pp. 227-230, 4 figs. Particulars of pulverized coal installation of Hunter Spiller Mfg. Corp., South Boston, Mass.; uniform results obtained capacity increased 25 per cent by recent installation.

Industrial Plants, Application to. The Application of Pulverized Fuel to the Industrial Plant. Power, vol. 61, no. 20, May 19, 1925, pp. 784-787, 4 figs. Outlines certain of basic considerations surrounding art of burning pulverized fuel, together with correct procedure in making installation proposal, that will supply impartial basis for judgment of its merits.

Lopulco System. Some Notes on the "Lopuleo" Pulverized Fuel System. Eng. & Boiler House Rev., vol. 38, no. 10, Apr. 1925, pp. 446, 449-450 and 452, 4 figs. Development; outline of general arrangement of standard plant, with details of the different units used.

Microscopic Study. A Microscopic Study of Pulverized Coal, L. V. Andrews. Mech. Eng., vol. 47, no. 5, May (section 2) 1925, pp. 429-432, 18 figs. Results showing that screen tests for fineness may be misleading in making comparisons of pulverizing mills.

PUMPS

Water-Works, Automatic Control of. Complete Automatic Control of Pumps in Waterworks Plant, H. S. Lane. Elec. World, vol. 85, no. 19, May 9, 1925, pp. 978-979, 2 figs. Describes scheme of automatic control and manner in which equipment functions.

PYROMETERS

Optical. The Measurement of High Temperatures. Metal Industry (Lond.), vol. 26, no. 18, May 1, 1925, pp. 433-436, 11 figs. Optical pyrometers are advocated for high-temperature measurement; negligible time lag and freedom from injury by heat are chief, advantages claimed in this respect over ordinary direct thermocouple type of pyrometer; but optical pyrometers are at disadvantage where "blackbody" conditions are not present; describes two main classes of optical pyrometers, the glowing-filament and total-radiation type; their respective advantages and typical applications.

PYROMETRY

Steel-Hardening Operations. Pyrometry in Hardening Operations, G. Neumann. Eng. Progress, vol. 6, no. 3, Mar. 1925, pp. 65-69, 9 figs. Optical-radiation total-radiation, and mercurial thermometers; protective covering; fitting elements; electric connections; measuring instruments.

RADIO COMMUNICATION

New Fields. New Fields for Radio Signalling, E. F. W. Alexanderson. Gen. Elec. Rev., vol. 28, no. 4, Apr. 1925, pp. 266-270, 5 figs. New York has now a well developed new system of communication reaching all parts of world by radio; notes on growth of this world system. Explanation of scrambling and unscrambling of waves.

Wireless Longitude. Wireless Longitude, G. D. Cowie and E. A. Eckhardt. U. S. Coast & Geodetic Survey, Special Publication No. 109, Serial No. 281, 1924, 52 pp., 28 figs. Describes instruments and equipment used by field parties of U. S. Coast & Geodetic Survey in wireless determination of longitude; method of setting up equipment, its operation; methods of observing, recording. and computing; precautions for avoiding difficulties.

RAILS

Joint Welding. Welding of Rail Joints. Am. Welding Soc.—Jl., vol. 4, no. 4, Apr. 1925, pp. 11-30, 3 figs. Symposium containing following articles: Carbon Arc Welding Methods of the Chicago Surface Lines, J. Wolfe; Welding of Rail Joints, J. C. Lincoln; Rail Joint Welding, H. M. Steward; Rail Joint Welding, H. F. A. Kleinschmidt; Rail Joint Welding, R. H. Dalgleish; Track Rail Joint Welding, F. B. Walker.

Wear. Wear of Rails (Usure et défauts dés rails), C. Frémont. Bul. Technique de la Suisse Romande, vol. 51, no. 5, Feb. 28, 1925, pp. 49-53, 8 figs. General impression is that harder the steel the less the wear; author shows that this is not always so, and that softer and apparently weaker rail may give better results; recommends method of measuring strength of materials as applied to rails; consideration of causes that produce wear on rails; results of tests; concludes that normal wear of rail is result of inertia phenomenon, and as method of decreasing this wear, suggests that much softer metal be used than is done to-day. Abstracted from author's Etudes expérimentales de technologie industrielle.

RAILWAY OPERATION

Electric vs. Steam. Comparative Costs of Steam and Electric Operation of the C. M. & St. P. Railway. Jl. of Elec., vol. 54, no. 6, Mar. 15, 1925, pp. 207-209, 2 figs. Since electrification of 650 miles of main line of this railway remarkable economies have been recorded. Analyzes president's report on cost of electric and steam operation of system.

Electrification Economies on the Chicago, Milwaukee & St. Paul Railway, W. D. Bearce. Gen. Elec. Rev., vol. 28, no. 4, Apr. 1925, pp. 218-228, 7 figs. Abstract of report made by this railway, comparing steam and electric operation on mountain divisions of its main line. See also analysis of this data by A. H. Armstrong, pp. 229-236, 4 figs.

Steam and Electric Trains Jointly. Joint Operation of Steam and Electric Trains Over the Dallas-Denton Division, Texas, B. F. Cooke. Gen. Elec. Rev., vol. 28, no. 4, Apr. 1925, pp. 237-242, 8 figs. On May 15, 1922, Missouri-Kansas-Texas Railroad Co. and Texas Interurban Ry. entered into a contract for term of 50 years under which Missouri-Kansas-Texas R. R. would be electrified between Dallas and Denton, Texas, and used jointly by Railroad Company's steam trains and Interurban Company's electric cars. Explains physical characteristics of trackage, method of electric power supply and control, and features of despatching.

RAILWAY SIGNALING

Colored-Light Signals. Color-Light Signals on C. & N. W., R. M. Phinney. Ry. Signaling, vol. 18, no. 5, May 1925, pp. 174-179, 17 figs. Installation of horizontal type on three-track line and traffic-locking features.

Interlocking. Automatic Interlocking of a Double Track Junction on M. M. T. Lines, A. A. Roberts. Ry. Signaling, vol. 18, no. 5, May 1925, pp. 177-188, 3 figs. Plant consists of five-lever electropneumatic interlocking machine with two-position semaphore signals; auxiliary buttons and releases for unusual moves.

Single-Track. Train Orders Eliminated by Signals on Busy Single Track, E. B. DeMeritt. Ry. Age, vol. 78, no. 21, Apr. 25, 1925, pp. 1021-1022, 2 figs.; also Ry. Signaling, vol. 18, no. 5, May 1925, pp. 190-191, 1 fig. Central of Georgia provides special indicator for switching moves that reduces delays; operator controls trains in section formerly divided into three automatic blocks. Paper presented before Signal Section Am. Ry. Assn.

Substitute for Train Orders. Signaling at the Age of Maturity, S. N. Wight. Ry. Rev., vol. 76, no. 18, May 2, 1925, pp. 818-821, 5 figs. Suggests several schemes whereby signals can be used as complete substitute for train orders, except to work trains and similar special movements or in case of emergency, and at same time increase both safety and facility. Paper presented before signal section, Am. Ry. Assn.

RAILWAY TIES

Preservative Treatment. The Preservative Treatment of Ties on the Boston & Maine Railroad, F. C. Shepherd. Boston Soc. Civ. Engrs.—Jl., vol. 12, no. 3, Mar. 1925, pp. 101-127, 10 figs. New treating plant at Nashua, N.H.; layout; seasoning of ties; adzing and boring; treating-plant building and equipment; operation of treating process; increase in use of treated ties; kinds of wood available in New England; test sections of track; annual tie renewals per mile of track; description of processes used for preservative treatment of timber.

RAILWAY TRACK

Subgrades. Rising of Clay Through Ballast (Etude Expérimentale de l'Ascension de l'Argile à travers le Ballast), M. Sabouret. Revue Générale des Chemins de Fer, vol. 44, no. 4, Apr. 1925, pp. 158-163, 9 figs. Shows by laboratory experiments in which pneumatic hammer was used in place of impact of trains, that clayey subgrade will rise through ballast unless a layer of sand or cinders is intercalated.

RAILWAY YARDS

Car Retarders in Hump Yard. Car Retarders in Hump Yard Effective in Winter. Ry. Age, vol. 78, no. 23, May 9, 1925, pp. 1143-1145, 3 figs. Total of $12,623 saved in one month by use of automatic equipment instead of riders at Gibson, Ind.

REDUCTION GEARS

Interchangeable Worm-and-Gear Reductions. Interchangeable Worm-and-Gear Speed Reduction, Geo. L. Hedges. Machy. (N. Y.), vol. 31, no. 9, May 1925, pp. 682-684, 5 tables. Simple method of determining best worm-and-gear reductions with same center distances, that is, reductions that are mechanically interchangeable but that have different speed ratios corresponding to speeds of different standard commercial motors.

REFRIGERATION

Test Code. Test Code for Refrigerating Systems. Mech. Eng., vol. 47, no. 5, May (section 1) 1925, pp. 365-370. Tentative draft of code in series of nineteen being formulated by A.S.M.E. Committee on power test codes; present code was developed by joint committee of Am. Soc. Refrig. Engrs. and Am. Mech. Engrs. See also Refrig. Eng., vol. 11, no. 10, Apr. 1925, pp. 365-371.

RETAINING WALLS

Safety Against Sliding. Safety of Retaining Walls against Sliding, M. Reiner. Concrete & Constr. Eng., vol. 20, no. 4, Apr. 1925, pp. 183-191, 8 figs. Method of calculating safety.

RIVETED JOINTS

Stresses in. Method of Determining Secondary Stresses Due to Deformation in Systems with Rigid Joints (Méthode de détermination des efforts secondaires dus à la déformation dans les systèmes à joints rigides), P. Center. Revue Universelle des Mines, vol. 6, no. 1, Apr. 1, 1925, pp. 6-30, 10 figs. Study for purpose of applying general principle developed by P. Thomas to triangulated systems and to deduce therefrom conditions for application of riveted joints.

ROAD CONSTRUCTION

Cost Accounting. Cost Keeping on Federal Aid Road Projects, F. M. Garnett. Eng. Wld., vol. 26, no. 3, Mar. 1925, pp. 183-186, 3 figs. Simple system, devised by Ga. State Highway Dept. of keeping cost data, with object in view of avoiding excessive detail work both in field and in office, relying largely upon proportioning labour and motor operation costs incurred in field.

Crushed-Stone Tests. Crushed-Stone Tests and Their Relation to the Service of the Finished Pavement, A. T. Goldbeck. Pub. Roads, vol. 5, no. 12, Feb. 1925, pp. 15-18. Physical tests for rock; test limits for various types of construction; use of screenings as fine aggregate; uniformity of concrete; size requirements.

Efficiency and Costs. Factors Affecting Construction Efficiency and Influence of Specification Interpretation on Costs, T. J. Wasser. Mun. & County Eng., vol. 68, no. 3, Mar. 1925, pp. 154-160. Author's opinion as to what are factors affecting efficiency in construction organization and influence of specification interpretation on unit cost of highway construction. Paper read before Assn. Highway Officials of North Atlantic States.

ROAD MACHINERY

Pavers. Labor-Saving Equipment in Road Construction, E. H. Lichtenberg and Jas. A. Shepard. Mech. Eng., vol. 47, no. 5, May (section 2) 1925, pp. 414-415, 3 figs. Description and economic analysis of new paver, employing A. S. M. E. Materials Handling Division's formulas for computing economies of labour-saving equipment.

ROADS

Subgrade Foundations. Construction of Sub-Grade Foundation, C. D. Pollock. Can. Engr., vol. 48, no. 16, Apr. 21, 1925, pp. 427-428. Experiments being conducted in order to improve sub-grade for pavements; thickness of concrete can be reduced by proper treatment of sub-soil. Paper read before Am. Soc. Mun. Improvements.

Surfaces. New Form of Pavement Surface, H. W. D. Armstrong. Can. Engr., vol. 48, no. 15, Apr. 14, 1925, p. 395, 2 figs. Suggested design for cross-section of pavement to make steering easier for automobiles and reduce wear on vehicles and surface.

Testing. Work of the Testing Bureau of the Illinois Highway Department, H. F. Clemmer. Mun. & County Eng., vol. 68, no. 3, Mar. 1925, pp. 135-138, 1 fig. Discusses plant inspection, cost of inspection, Bates road experiments, fatigue of concrete, curing concrete, core drill testing, concrete mixtures, elastic properties of concrete, etc. Paper read before Ill. Soc. Engrs.

Transportation Structures. The Bottle Neck of Highway Transportation, C. C. Williams. Eng. & Contracting (Roads & Streets), vol. 63, no. 4, Apr. 1, 1925, pp. 686-691. Effect of city streets and their approaches in constricting traffic. Paper read before Highway Short Course at Univ. of Ill.

ROADS, ASPHALT

Amiesite. The Canadian "Amiesite" Asphalt Pavement, C. A. Mullen. Good Roads, vol. 68, no. 3, Mar. 1925, pp. 79-82 and 85, 4 figs. Amiesite is a method, and paving material and pavement resulting from use of that method. The method is one by which an asphalt paving mixture is laid cold instead of hot, asphalt cement thereof being kept sufficiently plastic long enough for purpose by means of a solvent called "liquefier" instead of by means of heat.

Mixtures. Research Looking to Improvement in Asphalt Mixtures, P. Hubbard. Eng. Wld., vol. 6, no. 3, Mar. 1925, pp. 154-158, 8 figs. Results of research. Description of a simple stability test for asphalt paving mixtures; diagrams.

Mixtures, Mineral Fillers for. A Simple Method for Studying the Relative Value of Mineral Fillers for Asphalt Paving Mixtures, P. Hubbard and F. C. Field. Good Roads, vol. 68, no. 3, Mar. 1925, pp. 89-92, 8 figs. Discusses tests made to study effect of variations in mineral aggregate, using limestone, Portland cement and hydrated lime passing 10 to 350 mesh.

Sheet Asphalt Mixture. Sheet Asphalt Mixture Research, H. W. Skidmore. Eng. & Contracting (Roads & Streets), vol. 63, no. 4, Apr. 1, 1925, pp. 693-700, 6 figs. Important points brought out by recent investigations. Paper read before Wis. Eng. Soc.

ROADS, CONCRETE

Construction. Important Features of Concrete Pavement Construction, H. C. Boyden. Mun. & County Eng., vol. 68, no. 3, Mar. 1925, pp. 139-145. Discusses quality of concrete, design of section, and construction methods. Paper read before Sixth Annual Road Instn.

Form Setting. Relation of Form Setting to Riding Qualities of Concrete Pavements, C. N. Conner. Mun. & County Eng., vol. 68, no. 3, Mar. 1925, pp. 111-116. Road forms an important factor; specifications; dimensions, and joints; number of forms required; abuse of forms. Paper read before Am. Rd. Bldrs.' Assn.

ROADS, GRAVEL

GRAVELS. What Should Road Gravel be Like? H. Gauthier. Contract Rec., vol. 39, no. 16, Apr. 22, 1925, pp. 393-396. Results of investigations to determine requirements for good gravel for use in construction of roads; specifications for material and methods of testing.

ROLLING MILLS

BLOOMING MILLS. Replaces Forge Plant with Charcoal Bloomary, E. C. Kreutzberg. Iron Trade Rev., vol. 76, no. 21, May 21, 1925, pp. 1319-1321, 5 figs. Describes new bloomary for producing skelp for charcoal-iron boiler tubes at plant of Reading Iron Co.; new mill is expected to produce 100 tons in 24 hours, and makes possible considerable economy in production; furnaces are entirely hand-fired; tilting tables provided.

BRITISH. Progress in British Rolling-Mill Practice, T. W. Hand. Iron & Stee Inst.—advance paper, no. 7, for mtg. May 1925, 49 pp., 24 figs. partly on supp. plates. Blooming or cogging mills; billet and sheet-bar, three-high plate, and universal mills; large finishing mills; plate mills; merchant, strip, rod, skelp, and combination strip and skelp mills.

ROD MILLS. Remodeled and Electrified Rod Mill, S. N. Roberts. Iron & Steel Engr., vol. 2, no. 4, Apr. 1925, pp. 153-159, 13 figs. Describes what has been done in one plant to increase production and lower cost of production, and results obtained.

S

SAND

FILTER. Filter Sand for Municipal Water Supply, W. M. Weigel. Eng. Wld., vol. 26, no. 3, Mar. 1925, pp. 164-166. General requirements, method of determining effective size and uniformity, sources of supply, methods of mining, and preparation.

MEASUREMENT, INUNDATION METHOD. Making Uniform Concrete by Inundating Sand, R. L. Bertin. Eng. News-Rec., vol. 94, no. 19, May 7, 1925, pp. 775-776, 3 figs. Practical device now available to insure same amount of water regardless of moisture in sand.

SAND, MOLDING

ANALYSES. The Chemical Composition of the Bonding Substance in Natural Molding Sands. Brass World, vol. 21, no. 4, Apr. 1925, p. 120. Analyses of New York, New Jersey, Ohio, Illinois, Wisconsin and Pennsylvania molding sands.

SCREW THREADS

TOLERANCES. Thread Tolerances (Die Gewindetoleranzen), N. Breuer. Werkstattstechnik, vol. 19, no. 4, Feb. 15, 1925, pp. 132-133. Discusses practical construction and testing of bolt and nut threads in view of fact that it is impossible to produce them theoretically accurate; jigs required; etc.

SEAPLANES

SINGLE-FLOAT. Characteristics of a Single-Float Seaplane during Take-Off, J. W. Crowley, Jr., and K. M. Ronan. Nat. Advisory Committee—Report no. 209, 1925, 11 pp., 24 figs. Investigation conducted on N-9H; results show that single-float seaplane trims aft in taking off; until planing conditions is reached angle of attack is about 15 deg. and is only slightly affected by controls.

SEMI-STEEL

MANUFACTURE. Basic Principles Underlying the Manufacture of Semi-Steel. Foundry Trade Jl., vol. 31, no. 451, Apr. 9, 1925, pp. 306-308, 1 fig. Cupola-melted semi-steel; amount of carbon absorbed by steel melted in cupola; effect of steel additions; mechanical properties of semi-steels; practical hints.

Semi-Steel, H. Field. Foundry Trade Jl., vol. 31, no. 451, Apr. 9, 1925, pp. 309-314, 7 figs. Importance of choice of materials in making semi-steel; character of steel additions; cupola experiments with all steel; physical properties of semi-steel casting temperature; remelting semi-steel.

SEWAGE DISPOSAL

CHEMICAL AND BIOLOGICAL RESEARCH. New Jersey Sewage Disposal Studies. Pub. Wks., vol. 56, no. 3, Mar. 1925, pp. 101-105, 2 figs. Results of a year's investigation, made jointly by Agricultural Experiment Stations and State Dept. Health of N.J., of chemical and bacteriological conditions in Imhoff tanks, fauna of tanks and sprinkling beds, fungi and algae in filter beds, film removal and other phenomena.

DEFINITIONS OF TERMS. Definitions for Sewerage and Sewage Disposal Practice. Am. Jl. Pub. Health, vol. 15, no. 4, Apr. 1925, pp. 327-334. Definitions of terms used in sewage and sewage disposal practice, given in dictionary form. Report of committee of Am. Pub. Health Assn. presented at joint session with Sanitary Eng. Div. of Am. Soc. Civ. Engrs.

FLY-EXTERMINATION TREATMENT. Lime Hypochlorite Lowers Psychoda Flies at Sewage-Works, M. M. Cohn. Eng. News-Rec., vol. 94, no. 17, Apr. 23, 1925, pp. 684-685, 1 fig. Studies made at Schenectady indicate that 200 p.p.m. will reduce flies 70 per cent and not upset biological action.

ODOR CONTROL IN TREATMENT PLANTS. Control of Odors from Sewage Treatment Plants, J. F. Skinner. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 5, May 1925, pp. 847-853. Study of character of odors, source, control of production, control of escape of odors; conclusions.

TREATMENT PLANTS, OPERATORS FOR. Licensing Operators of Sewage Treatment Plants in New Jersey, H. P. Croft. Pub. Wks., vol. 56, no. 4, Apr. 1925, pp. 129-131. Provisions of State law and regulations adopted by Health Department. Proposed amendment to prevent discharge for political reasons. Paper read before N.J. Sewage Wks. Assn.

SEWERS

DESIGN. Problems of Sewer Design in Canada, A. G. Dalzell. Can. Engr., vol. 48, no. 16, Apr. 21, 1925, pp. 419-420. Problems can be simplified by concerted action of entire profession; thorough knowledge of topography of land essential; bench marks should be more conspicuous; study of rainfall intensity important; more stations needed.

SHAFTS

WHIRLING OF. Internal Friction as a Cause of Shaft Whirling, A. L. Kimball, Jr. Lond., Edinburgh & Dublin Philosophical Mag. & Jl. Sci., vol. 49, no. 292, Apr. 1925, pp. 724-727, 2 figs. It is shown that under right conditions internal friction will sustain a whirl rather than damp it out.

SHOVELS

ELECTRIC. The Electric Shovel, D. J. Shelton. Eng. & Min. Jl.-Press, vol. 119, no. 15, Apr. 11, 1925, pp. 601-605, 7 figs. Its development; problems and features of design; advantages of its use.

STANDARDIZATION

SOCIETY OF AUTOMOTIVE ENGINEERS. Standardization Activities. Soc. Automotive Engrs.—Jl., vol. 16, no. 5, May 1925, pp. 493-497. Work of divisions and subdivisions of S.A.E. Standards Committee and other standards activities are reviewed. 20-hr. battery rating recommended; completion of aeronautical safety code; Engine Division recommendations; action on parts and fittings; need for clutch-bearings standard; balloon-tire pressures recommended.

STANDARDS

GERMAN N. D. I. REPORTS. Report of German Industrial Standards Committee (Mitteilungen des Normenausschusses der Deutschen Industrie). Bauingenieur, vol. 6, no. 1, Jan. 10, 1925, pp. 1-4 (Baunormung), 4 figs. Proposed standards for manholes, gratings, frames and fittings for street water traps.

Report of the German Industrial Standards Committee (Mitteilungen des Normenausschusses der Deutschen Industrie). Bauingenieur, vol. 6, no. 3, Feb. 10, 1925, pp. 5-12 (Baunormung), 7 figs. Proposed standards for earthenware drain pipes, bends and branches, manholes, gratings, frames for street water traps.

Report of the German Industrial Standards Committee (Normenausschuss der Deutschen Industrie), Maschinenbau, vol. 4, no. 4, Feb. 26, 1925, pp. 193-199, 6 figs. Proposed standards for screw taps, round head rivets, countersunk rivets, oval head rivets, and milling cutter for nut wrenches.

Report of the German Industrial Standards Committee (Mitteilungen des Normenausschusses der Deutschen Industrie). Bauingenieur, vol. 6, no. 5, Mar. 10, 1925, pp. 13-20 (Baunormung), 8 figs. Proposed standards for elevators with and without guides, their cage sizes and loads, shaft dimensions and machinery arrangement, counterweights, etc.

Report of the German Industrial Standards Committee (Normenausschuss der Deutschen Industrie). Maschinenbau, vol. 4, no. 5, Mar. 12, 1925, pp. 244-249, 5 figs. Proposed standards for countersinks for heads and shafts of screws with Whitworth threads and metric threads.

Report of the German Industrial Standards Committee (Normenausschuss der deutschen Industrie), Maschinenbau, vol. 4, no. 6, Mar. 26, 1925, pp. 297-301, 3 figs. Proposed standards for bevel edge steel, screw-thread gages for Whitworth and metric bolt and nut threads.

SWAGING. Standardizing Die Holders for Drop Hammers (Normung der Gesenkbefestigung für Fallhämmer), F. Meyenber. Maschinenbau, vol. 4, no. 1, Jan. 15, 1925, pp. 42-44, 6 figs. Design of standards used by Deutsche Werke to enable same forgings to be finished at any of their works.

STEAM ACCUMULATORS

RUTHS. Ruths Accumulator at Stöbnitz Sugar Factory (Der Ruths-Speicher in der Zuckerfabrik Stöbnitz), K. Halle. Siemens Zeit., vol. 5, no. 2, Feb. 1925, pp. 77-84, 6 figs. Discusses fluctuation in steam consumption at sugar factory, installation of Ruths accumulator and increased production due to its satisfactory working.

STEAM ENGINES

PACKING. Steam Engine Packing. Power Engr., vol. 20, no. 230, May 1925, pp. 175-177, 3 figs. Review of requirements of good packing and of methods adopted to fulfill these in practice.

UNIFLOW. Test of a Uniflow Engine, Geo. H. Barrus. Mech. Eng., vol. 47, no. 5, May (section 2) 1925, pp. 440-441, 4 figs. Results obtained with loads ranging from one-quarter to full load (400 kw.), with two different steam pressures, two different back pressures, two different percentages of clearance, and with saturated and superheated steam.

STEAM PIPES

THERMODYNAMIC CALCULATION. Nomogram for Calculating Steam Piping from the Thermodynamic Point of View (Le calcul des conduites de vapeur au point de vue thermodynamique au moyen d'un abaque), A. C. Raes. Revue Universelle des Mines, vol. 6, no. 1, Apr. 1, 1925, pp. 31-36, 3 figs. partly on supp. plate. Presents nomogram, devised by author and expressed in metric units, by means of which many of problems required in thermodynamic calculation of water pipes can be easily solved; method of employing nomogram.

STEAM POWER PLANTS

CINCINNATI, OHIO. American Can Company Power Plant at Cincinnati, Ohio, C. Mottern. Nat. Engr., vol. 29, no. 5, May 1925, pp. 203-206, 3 figs. Description of a typical modern, high-efficiency power and heating plant for industrial plant service; operating records and comparison of production costs during two years' operation.

COST ACCOUNTING. Cost Accounting for the Power Plant, C. Dick. Nat. Engr., vol. 29, no. 5, May 1925, pp. 220-223, 3 figs. Outlines accounting methods for industrial power plants.

OIL-BURNING. The Benjamin Franklin Operates Oil-Burning Power Plant. Power Plant Eng., vol. 29, no. 9, May 1, 1925, pp. 468-473, 9 figs. Details of power plant of new Philadelphia hotel; engine-driven units furnish current; centrifugal pumps handle house water; ice and refrigeration service.

OIL FIRING. Is Oil Firing Profitable? W. Viessman. Power, vol. 61, no. 17, Apr. 28, 1925, pp. 654-655, 2 figs. Study of power plant shows coal is cheaper fuel; investment of oil equipment high.

PAPER-MILL. Brown Kraft Paper Mill Plant. South. Engr., vol. 43, no. 3, May 1925, pp. 35-38, 8 figs. Particulars of modern paper mill plant at Monroe, La., that is electrically driven by energy produced by its own power plant; turbo-generator of 3750 kw. capacity and four 855-hp. water-tube boilers.

POWER AND PROCESS STEAM. New Plant of Pittsburgh Plate Glass Co. at Milwaukee. Power, vol. 61, no. 20, May 19, 1925, pp. 760-764, 7 figs. Non-condensing stoker-fired turbine plant for paint and varnish division gives economical results in supplying power and process steam.

STEAM TURBINES

BLADE MANUFACTURE. Turbine Blade Manufacture. Blast Furnace & Steel Plant, vol. 13, no. 5, May 1925, pp. 208-213, 5 figs. Methods employed in Westinghouse Turbine Works, So. Philadelphia.

CONSTANT STAGE EFFICIENCY, PRINCIPLE OF. High Efficiency in 1,000-Kw. to 6,000-Kw. Steam Turbines, S. A. Moss. Power, vol. 61, no. 20, May 19, 1925, pp. 775-777, 6 figs. Discusses principle of constant-stage efficiency and turbines based on this principle.

LUBRICATION. Steam Turbine Lubrication. Lubrication, vol. 11, no. 2, Feb. 1925, pp. 13-24, 22 figs. Discusses matter from all-important viewpoint of operating conditions which turbine oil must usually meet.

STEEL

ALLOY. *See Alloy Steels.*

DRILL. Standardization of Drill Steel, F. Aver. Min. Congress Jl., vol. 11, no. 4, Apr. 1925, pp. 163-164 and 181, 8 figs. Some of the conclusions reached by special committee which has been studying subject of standardizing drill steel.

FATIGUE STRENGTH. The Effect of Grain upon the Fatigue Strength of Steels, L. Aitchison. Iron & Steel Inst.—advance paper, no. 1, for mtg. May 1925, 26 pp., 30 figs. on supp. plates. Deals with mechanical properties, particularly fatigue strength, of steels when tested upon specimens taken parallel to, and at right angles to, direction of elongation during forging; it is confirmed that direction of grain has marked influence upon ductility recorded in tensile test and upon toughness as recorded by impact test; maximum stress of material when stressed in two directions is not appreciably different. See also (abstract) in Engineering, vol. 119, no. 3097, May 8, 1925, p. 585.

STRAIN DETECTION. Strain Detection in Mild Steel by Special Etching, J. D. Jevons. Iron & Steel Inst.—advance paper, no. 13, for mtg. May 1925, 14 pp., 28 figs. on supp. plates. Investigation of etching process; results of investigation of factors which influence etching processes. Strain figures produced in mild steels. See also (abstract) in Engineering, vol. 119, no. 3097, May 8, 1925, pp. 585-587, 28 figs. partly on supp. plate.

The Detection of Strain in Mild Steels, T. H. Turner and J. D. Jevons. Iron & Steel Inst.—advance paper, no. 12, for mtg. May 1925, 21 pp., 15 figs. on supp. plates. Methods of strain investigation examined by authors; observations upon strain distortion of steel; it was found that distortion wedges are characteristic of strain in normal carbon steels, but they are difficult to observe; combined tempering and etching process is most informative process, but has only been applied successfully to mild steels. Bibliography. See also (abstract) in Engineering, vol. 119, no. 3097, May 8, 1925, pp. 588-590, 15 figs.

STRUCTURAL. *See Structural Steel.*

STEEL CASTINGS

X-Ray Examination of Steel Castings, I. E Moultrop and E. W. Norris. Mech. Eng. vol. 47, no. 5, May (section 2) 1925, pp. 393-399, 23 figs. Results of examination of some 30 castings for high-pressure steam installation at Weymouth; only five proved seriously defective; through use of X-ray examinations it was possible to eliminate castings which would have been unequal to service owing to flaws that were invisible from surfaces, and to demonstrate soundness and strength of castings accepted.

STEEL, HEAT TREATMENT OF

ANNEALING AND HARDENING. The Hardening of Carbon Tool Steel, S. N. Brayshaw. Eng. Production, vol. 8, no. 151, Apr. 1925, pp. 99-104, 7 figs. Calls attention to importance of heat treatment prior to hardening; heating in salt bath; temperature measurement; standard hardening treatment; comprehensive scheme for research on annealing; description of experimental work and survey of results.

CARBURIZING. Carburization of Iron and Steel, H. S. Cooper. West. Machy. Wld., vol. 16, no. 3, Mar. 1925, pp. 107-109, 9 figs. Discusses method of carburizing, time, temperature and depth, etc.

WARPING AND CRACKING OF STEEL. Some Causes of the Warping and Cracking of Heat Treated Steel, S. A. Richardson. Fuels and Furnaces, vol. 3, no. 4, Apr. 1925, pp. 359-362, 1 fig. Steel may warp or crack because of structural defects or improper quenching. Uneven heating and tempering are important factors.

STOKERS

GAS PRODUCERS. Mechanical Stokers and Ash-Removal Devices for Gas Producers (Mechanische Roste und Ascheaustragvorrichtungen für Gaserzeuger), Gwosdz. Feuerungstechnik, vol. 13, nos. 10 and 13, Feb. 15 and Apr. 1, 1925, pp. 108-111 and 157-160, 13 figs. Discusses different types of stokers, ash conveyors and fire-cleaning devices.

STORAGE BATTERIES

AUTOMOTIVES. The Automotive Storage Battery, Its Operation and Care, T. R. Cook. Soc. Automotive Industries—Jl., vol. 16, ne. 5, May 1925, pp. 503-504 and (discussion) 504-509. Discusses subjects of current input and battery troubles followed by statement of four specific suggestions relating to proper storage-battery maintenance, inspection and advice to car owners; gives, in addition, five general cautions.

STREET RAILWAYS

PROBLEMS. Some Street Railway Transportation Problems, Thos. Fitzgerald. Ry. Club of Pittsburgh—Official Proc., vol. 24, no. 3, Jan. 22, 1925, pp. 44-53 and (discussion) 53-63. Points out that most important problem is that of public relations; methods of regulation and control of public utilities which apply to street-railway companies; economies in operation.

STRUCTURAL STEEL

OXYACETYLENE CUTTING. Tests Structural Steel Cut by Torch, E. E. Thum. Iron Trade Rev., vol. 76, no. 20, May 14, 1925, p. 1262, 1 fig. Information brought to light by investigation of steel surfaces severed by oxyacetylene flame, by shearing, by hack saw and by friction saw.

SUBSTATIONS

AUTOMATIC. Automatic Stations, E. K. Huntington. Elec. Light & Power, vol. 3, no. 4, Apr. 1925, pp. 15-18 and 34, 10 figs. Description of three automatic substations built and put in service by Rochester Gas & Electric Corp. during past year, now operating and giving excellent satisfaction.

AUTOMATIC. Automatic Substations of the Long Island Lighting Company, L. Wintner. Gen. Elec. Rev., vol. 28, no. 3, Mar. 1925, pp. 171-175, 9 figs. Particulars regarding substations now installed and under construction in territory of Long Island Lighting Co.

SUPERPOWER

DEFINITION. Suggests Definition of "Superpower", R. F. Schuchardt. Elec. World, vol. 85, no. 17, Apr. 24, 1925, p. 877. Offers following definition; modern electricity supply systems in which electricity is economically generated in steam or water-power stations, or both, and is distributed for benefit of population over wide areas.

T

TELEVISION

BAIRD SYSTEM. Television, or Seeing by Wireless, J. L. Baird. Discoverey, vol. 6, no. 64, Apr. 1925, pp. 142-143, 2 figs. Notes on system developed by author which does not involve use of prepared photographs but allows observer at receiving end to see what instrument at transmitting end is "looking at".

TEMPERATURE MEASUREMENT

INDICATORS, TESTER FOR. A Temperature Indicator Tester, D. Lewis. Jl. Sci. Instruments, vol. 2, Nov. 1924, pp. 45-50, 6 figs. Describes instrument which provides a simple and rapid method of checking accuracy of temperature indicators or recorders in use with thermocouples. Shows that instrument is electrically equivalent to a thermocouple which can be made to generate any required e.m.f. (in millivolt steps) and to have any required resistance between 1.2 and 12.2 ohms. Use of instrument.

TEXTILE MACHINERY

HOSIERY MACHINES. The Automatic Hosiery Machine, G. R. Merrill. Textile Wld., vol. 67, no. 14, Apr. 4, 1925, pp. 103, 107 and 109, 8 figs. Description of plain full automatic machine with explanation of operating parts; needle action in knitting; sinker action as used in place of take-up device; stich cams and needle control; regulating length of stitch for various parts of a stocking.

TEXTILES

REFINING METHODS AND MACHINERY. Refining Textile Wares, P. Beckers. Eng. Progress, vol. 6, no. 3, Mar. 1925 pp. 75-79, 12 figs. Deals with carbonization, bleaching, washing, mercerizing, steaming, warping, treatment of textile fabrics with dressing materials, waterproof textile fabrics, calendering, hot pressing, calico printing, etc.; succession of operations with different wares.

TESTING. Rejto Method of Textile Testing, J. Beresi. Textile Wld., vol. 67, no. 17, Apr. 25, 1925, pp. 53, 55 and 57, 7 figs. Mechanical examination of fibres and yarns as conducted by Prof. A. Rejto of Budapest Royal Joseph Technologic Univ.; description of strength testing instruments which draw diagrams of work, graphically representing force and elongation.

TIMBER

CONSERVATION. Our Timber Problem. Bell Telephone Quarterly, vol. 4, no. 2, Apr. 1925, pp. 103-113. Existing timber situation in United States; timber conservation in the Bell System.

TORSION

TESTING MACHINE. A New Machine for Experiments in Torsion, R. W. Chapman. Instn. Engrs. Australia——Quarterly Bul., vol. 2, no. 5, Jan. 1925, pp. 20-23, 4 figs. In machine, constructed in testing laboratory of Adelaide University, balancing is automatic and bar may be twisted in either direction so that complete hysteresis diagrams of behavior of material may be obtained.

TUBES

BRASS AND COPPER, MANUFACTURE. The Manufacture of Brass and Copper Tubes, G. Evans. Metal Industry (Lond.), vol. 26, nos. 14 and 17 Apr. 3 and 24, 1925, pp. 335-338 and 405-406, 8 figs. Apr. 3: Storing, testing and inspection; discusses layout of stores or warehouse for receiving and dispatch of finished tubes, handling of materials in warehouse, and necessary testing and inspection processes. Apr. 24: Method of stock taking of materials in various stages of manufacture throughout works.

TURBO-GENERATORS

WINDINGS. Methods for Taking Data on Turbo-Generator Windings, A. C. Roe. Indus. Engr., vol. 83, no. 4, Apr. 1925, pp. 178-181 and 209, 8 figs. Describes also single-layer, one-bar-per-slot windings and two-layer lap windings used in these machines.

V

VOLTAGE REGULATION

A. C. DISTRIBUTION SYSTEMS. Voltage Regulation by Static Transformers, G. Rattenbury. Elec. Rev., vol. 96, no. 2471, Apr. 3, 1925, pp. 524-527 6 figs. New apparatus for new conditions created by linking power stations.

W

WATER

BACTERIOLOGICAL EXAMINATION. Isolation of Colon Group in Water N. J. Howard and R. E. Thompson. Can. Engr., vol. 48, no. 16, Apr. 21, 1925, pp. 413-417, 3 figs. Observations on value of comparative media, with special reference to brilliant green and bile salt, together with a description of colonies isolated from eosin methylene blue agar, showing their carbohydrate reactions and production of indol.

WATER PIPES

CORROSION. Action of Hot Wall; a Factor of Fundamental Influence on the Rapid Corrosion of Water Tubes and Related to the Segregation in Hot Metals, C. Benedicks. Am. Inst. Min. & Met. Engrs.——Trans., no 1449-E., Apr. 1925, 30 pp. 23 figs. From facts presented, it is concluded that particular form of segregation in molten iron which implies concentration of carbon toward cooler portions—being apparently contrary to heterogeneous equilibrium diagram—is due to Ludwig-Soret phenomenon occurring likewise in domain of alloys.

WATER SUPPLY

GROUNDWATER. The Protection of Underground Water. Engineer, vol. 139, no. 3619, May 8, 1925, p. 512. Need for alteration of existing law; suggested scheme of control; waste from overflowing bore holes; contamination of underground water; provisions in water acts; regulations by (British) Minister of Health in special cases.

WATER TREATMENT

PURIFICATION, Testing a Hard, Muddy, Polluted River Water, N. T. Veatch. Jr. Am. City, vol. 32, no. 5, May 1925, pp. 504-508, 3 figs. Operation results at water purification plant at Topeka, Kans. From paper read before Ia. Sec., Am. Water Works Assn.

PURIFICATION PLANTS. Vest Station-Charlotte Water Works, E. G. McConnell. Pub. Wks., vol. 56, no. 4, Apr. 1925, pp. 109-114, 8 figs. New purification plant at Charlotte, N. C., of 8,000,000 gal. capacity contains several novel features, including rate controller and filter bottom original with designing engineer; electrically-driven centrifugal pumps with gasoline standby engines.

WATER WORKS

REGINA, CANADA. Improvements to Water Works Systems, Regina, J. W. E. Farrell. Can. Engr., vol. 48, no. 15, Apr. 14, 1925, pp. 393-395, 2 figs. New pumping equipment consisting of two Rees Roturbo 2300 g.p.m. capacity pumps driven by Sterling engines; also one 255-hp. motor and one 200-390 hp. motor for driving existing pumps; new suction and discharge mains installed.

WELDING

CAST IRON WITH BRONZE. Welding Cast Iron with Bronze. Am. Welding Soc.—Jl., vol. 4, no. 3, Mar. 1925, pp. 36-40, 1 fig. Advantages of bronze welding; uses to which process may be put.

ELECTRIC. *See Electric Welding, Resistance.*

RAILWAY SHOPS. Railroad Shop Welding, W. H. Ludington. Am. Welding Soc.—Jl., vol. 4, no. 4, Apr. 1925, pp. 39-41. How to ensure performance of good welds. See also article in same journal, entitled, Welding in Railroad Shops, E. Wanamaker, pp. 43-45, dealing with inspection of welds, and testing skill of operators for specific work.

STANDARDIZATION. Standardization in Welding, W. Spraragen. Am. Welding Soc.—Jl., vol. 4, no. 4, Apr. 1925, p. 37-39. Testing of welds; testing skill of operators; in writer's belief too much responsibility has been placed upon welder and engineer has dodged his responsibility in matter of design, technique, and selection of materials.

WELDS

ARC., TESTS. Non-Destructive Tests of the Reliability of Arc Welds, L. Warner. Am. Welding Soc.—Jl., vol. 4, Apr. 1925, pp. 47-55, 1 fig. Inspection and mechanical tests; electrical and vibration tests. See also article by O. H. Eschholz, entitled, Inspection of Metallic Electrode Arc Welds, pp. 55-58, extracted from Ry Mech. Engr., July 1918.

EXAMINATION. Visual Examination of Welds. Welding Engr. vol. 10, no. 4, App. 1925, pp. 26-27, 1 fig. Some surface indications of quality of welders work and danger signs which predict failure.

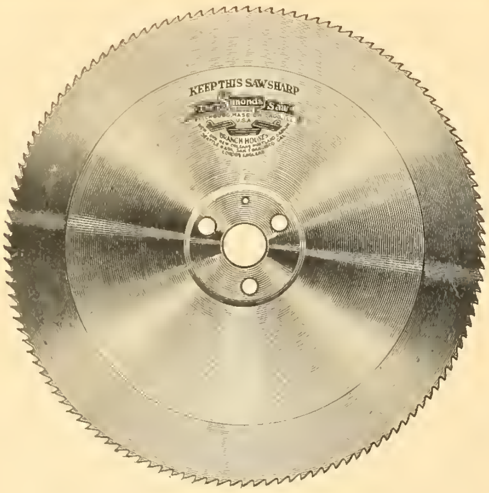
INSPECTION. Inspection of Spot and Butt Welds, A. L. De Leeuw. Am. Welding Soc.—Jl., vol. 4, no. 4, Apr. 1925, pp. 4143. Describes tests and their application.

WINDING ENGINES

ELECTRIC. A Large Electric Winder. Engineer, vol. 139, no. 3615, Apr. 10, 1925, pp. 404-405, 8 figs. partly on p. 408 Geared winder supplied by English Electric Co. to coal mine of Dominion Coal Co. of Canada.

WOODWORKING MACHINERY

TYPES. New Wood-working Machines. Engineer, vol. 139, no. 3619, May 8, 1925, pp. 522-523, 4 figs. Details of universal woodworker, mortising machine for railway-car timbers, and molding machine for general saw-mill use, made by Thos. Robinson & Son.



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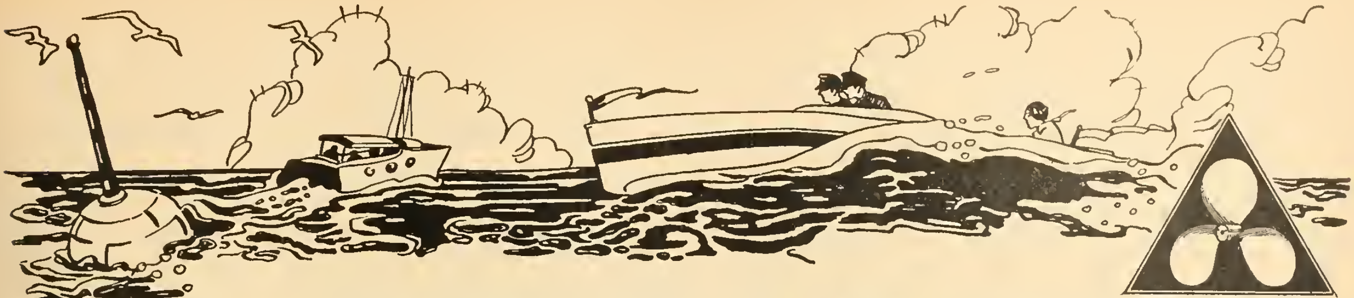

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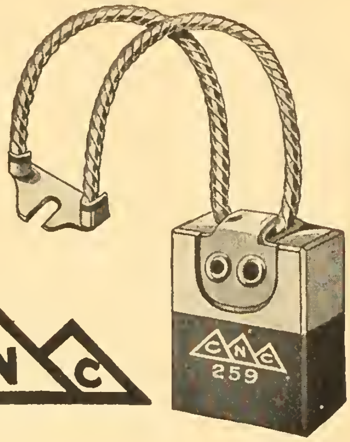

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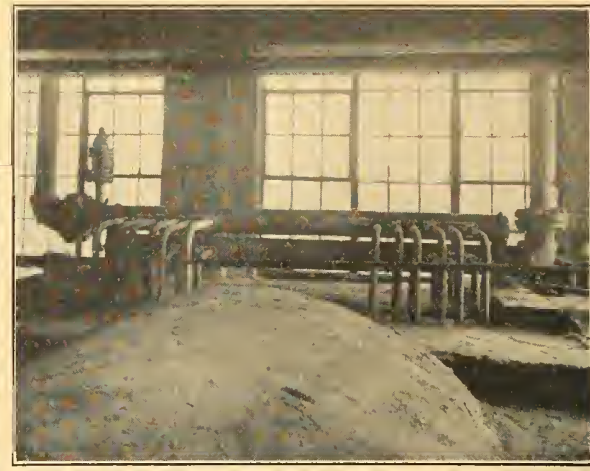

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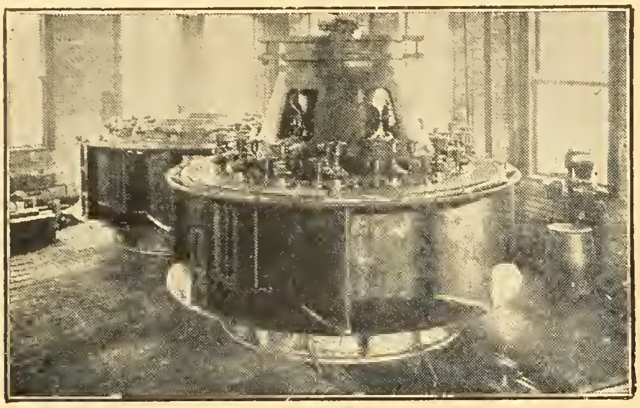

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For Alphabetical List of Advertisers see page 46

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Horton Steel Works Ltd.

Air Brakes:
Canadian General Electric Co., Ltd.

Air Compressors:
Lancashire Dynamo and Motor Co. of Can. Ltd.

Air Coolers:
Laurie and Lamb.

Air Hose Clamps:
Knox Mfg. Co.

Air Hose Couplings:
Knox Mfg. Co.

Air Receivers:
Horton Steel Works Ltd.

Air Valves, Throttle:
Knox Mfg. Co.

Alumina Sulphate:
Nichols Chemical Co., Ltd.

Ammonia Controlled Water Regulators:
Riley Engineering & Supply Co. Ltd.

Ammonia Valves and Fittings
Crane Ltd.

Anchorage Equipment:
Canadian Line Materials, Ltd.

Angle Bars:
British Empire Steel Corp., Ltd.

Angles:
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.

Arches, Flat Suspended:
Combustion Engineering Corp., Ltd.
Riley Engineering and Supply Co., Ltd.

Asbestos Products:
Canadian Johns-Manville Co., Ltd.

Asphalt:
Imperial Oil Ltd.

Ash Handling Equipment:
Combustion Engineering Corp., Ltd.
Link-Belt Ltd.

Automatic Air Valves:
Jenkins Bros., Ltd.

Automatic Underfeed Stokers:
Combustion Engineering Corp., Ltd.
Riley Engineering and Supply Co., Ltd.
Taylor Stoker Co., Ltd.

B

Baffle Walls:
Canadian Johns-Manville Co., Ltd.

Bale Ties:
British Empire Steel Corp., Ltd.

Balls, Chromang Grinding:
William Kennedy & Sons, Ltd.

Balls, Steel:
Openshaw & Bennet Ltd.

Barbed Wire:
British Empire Steel Corp., Ltd.

Barking Drums:
Horton Steel Works Ltd.

Bars, Reinforcing:
Algoma Steel Corp., Ltd.
British Empire Steel Corp., Ltd.
Burlington Steel Co., Ltd.
Steel Co., of Canada, Ltd.

Bars, Steel & Iron:
Burlington Steel Co., Ltd.
Steel Co., of Canada Ltd.

Beams:
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.

Bearings, Ball:
Openshaw & Bennet, Ltd.
N. Slater Co., Ltd.

Belting:
Jones and Glassco, Regd.

Bending Machines:
John Bertram & Sons Co., Ltd.,

Billets, Blooms and Slabs:
British Empire Steel Corp., Ltd.

Bins:
Horton Steel Works Ltd.

Blankets:
Grant-Holden-Graham, Ltd.

Blowers, Centrifugal:
De Laval Steam Turbine Co.

Blue Print Machinery:
Montreal Blue Print Co.

Boiler Feed Water Controllers:
Riley Engineering and Supply Co., Ltd.

Boilers:
Combustion Engineering Corp., Ltd.
Wm. Hamilton Co. Ltd.
E. Leonard & Sons, Ltd.
Mussens Limited.

Boilers, Electric:
Dominion Engineering Works, Ltd.

Boilers, Heating:
Combustion Engineering Corp., Ltd.
E. Leonard & Sons, Ltd.
Taylor Stoker Co., Ltd.

Boilers, Marine:
Combustion Engineering, Corp., Ltd.

Boilers, Portable:
E. Leonard & Sons, Ltd.

Boilers, Return Tubular:
Babcock-Wilcox & Goldie-McCulloch Ltd.
E. Leonard & Sons, Ltd.

Bolts:
British Empire Steel Corp., Ltd
N. Slater Co., Ltd.
Steel Co., of Canada, Ltd.

Bonds, Rail:
Dominion Insulator & Mfg. Co., Ltd.

Boring and Turning Mills:
John Bertram & Sons Co., Ltd.,

Boxes, Valve:
Jenkins Bros., Ltd.

Brass, Sheets, Rods, Tubes:
Openshaw & Bennet Ltd.

Brick Calcine:
Canadian Johns-Manville Co., Ltd.

Bridge Designs and Engineering Services:
Strauss Bascule Bridge Co.

Bridges, Steel:
Canadian Bridge Co., Ltd.
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.

Broadcasting Equipment:
Northern Electric Co., Ltd.

Buckets, Clamshell:
F. H. Hopkins & Co., Ltd

Buckets, Grab:
F. H. Hopkins & Co., Ltd.

Buckets, Orange-peel:
F. H. Hopkins & Co., Ltd.

Bucket Loaders:
Link-Belt Ltd.
Mussens Ltd.

Builders Supplies:
Jno. E. Russell Co., Ltd.

Building Papers:
Barrett Co., Ltd.

Buildings, Steel:
Canadian Bridge Co., Ltd.
Combustion Engineering Corp., Ltd.
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.

Bus-Supports:
Canadian Line Materials, Ltd.

C

Canvas Goods:
Grant-Holden-Graham, Ltd.

Car Dumpers:
Link-Belt Ltd.

Car Equipment Specialties:
Dominion Insulator & Mfg. Co. Ltd.

Car Pullers:
Link-Belt Ltd.

Car Steps, Safety:
Irving Iron Works Co.

Car Wheels, Chilled Iron.
Canada Iron Foundries, Ltd.

Cars, Dump:
Clare Osborn Ltd.
F. H. Hopkins & Co., Ltd.
Mussens Ltd.

Casements, Steel:
Can. Metal Window & Steel Products, Ltd.
Trussed Concrete Steel Co., of Canada, Ltd.

Castings:
Babcock-Wilcox & Goldie-McCulloch Ltd.
William Kennedy & Sons, Ltd.

Castings, Brass:
N. Slater Co., Ltd.
Superheater Co., Ltd.

Castings, Iron:
Canada Iron Foundries, Ltd.
Dominion Engineering Works, Ltd.
Gartshore-Thomson Pipe and Foundry Co., Ltd.
Wm. Hamilton Co. Ltd.
E. Leonard & Sons, Ltd.
Superheater Co., Ltd.

Catenary Materials:
Canadian Line Materials, Ltd.
Dominion Insulator & Mfg., Co. Ltd.
N. Slater Co., Ltd.

Cement, Dealers:
Jno. E. Russell Co., Ltd.

Cement, High Temperature:
Canadian Johns-Manville Co., Ltd.

Cement, Manufacturers:
Canada Cement Co., Ltd.

Chain Grate Stokers:
Babcock-Wilcox & Goldie-McCulloch Co., Ltd.
Riley Engineering and Supply Co., Ltd.

Chains:
Link-Belt, Ltd.

Chains, Silent:
Jones and Glassco, Regd.
Link-Belt Ltd.

Channels:
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.

Chemist, Industrial:
Milton Hersey Co., Ltd.

Chimneys:
Combustion Engineering Corp., Ltd.
Horton Steel Works, Ltd.

Chip Tanks:
Horton Steel Works, Ltd.

Circuit Breakers:
Dominion Engineering Agency, Ltd.

Clamps, Double Bolt:
Knox Mfg. Co.

Clamps, High Pressure Hose:
Knox Mfg. Co.

Clamps, Rock Drill:
Knox Mfg. Co.

Clamps, Sectional:
Knox Mfg. Co.

Clamps, Single Bolt:
Knox Mfg. Co.

Coal:
British Empire Steel Corp., Ltd.

Coal Handling Equipment:
Combustion Engineering Corp., Ltd.
Dominion Bridge Co. Ltd.
Link-Belt, Ltd.
Mussens Limited.

Coke:
British Empire Steel Corp., Ltd.

Combustion Control System:
Riley Engineering and Supply Co., Ltd.

Compressors:
Babcock-Wilcox & Goldie-McCulloch Co., Ltd.
Combustion Engineering Corp., Ltd.
General Supply Co., of Canada, Ltd

Compressors, Air:
Canadian Westinghouse, Co., Ltd
Lancashire Dynamo and Motor Co. of Can. Ltd.
Mussens Limited.

Compressors, Ammonia:
Taylor Stoker Co., Ltd.

Compressors, Centrifugal.
De Laval Steam Turbine Co.

Concrete Armouring, Surface:
Irving Iron Works Co.

Concrete Mixers:
Clare Osborn, Ltd.
General Supply Co., of Canada, Ltd.
F. H. Hopkins & Co., Ltd.
Mussens Ltd.

Condensers, Synchronous & Static:
Canadian General Electric Co., Ltd.
Griswold & Co., Ltd.
Lancashire Dynamo and Motor Co. of Can. Ltd.

Conduit, Telephone Cable:
Pacific Coast Pipe Co. Ltd.

Conduit, Underground Fibre:
Canadian Johns-Manville Co., Ltd.

Conduit, Underfloor Duct:
Canadian Johns-Manville Co., Ltd.

Connecting Rods:
British Empire Steel Corp., Ltd.

Construction Material Electrical:
Northern Electric Co., Ltd.
N. Slater Co., Ltd.

Contractors:
E. G. M. Cape & Co.
Randolph MacDonald Co., Ltd.
D. P. Robinson & Co. Inc.

Contractors' Plant and Supplies:
Clare Osborn, Ltd.
F. H. Hopkins & Co., Ltd.
Mussens Limited.

Contractors' Pumps:
De Laval Steam Turbine Co.

Controllers, Electric:
Canadian Westinghouse Co. Ltd.

Conveyors:
Combustion Engineering Corp., Ltd.
Link-Belt Ltd.

Conveyors, Portable Belt:
Link-Belt Ltd.
Mussens Ltd.

Copper, Sheets, Rods, Tubes:
Openshaw & Bennet, Ltd.

Couplings, Air Hose:
Knox Mfg. Co.

Couplings, High Pressure Hose:
Knox Mfg. Co.

Couplings, Rock Drill:
Knox Mfg. Co.

Couplings, Steam Hose:
Knox Mfg. Co.

Couplings, Suction Hose:
Knox Mfg. Co.

Cranes:
Babcock-Wilcox & Goldie-McCulloch Ltd.
Combustion Engineering Corp., Ltd.
F. H. Hopkins & Co., Ltd.
Link-Belt Ltd

Cranes, Locomotives:
Clare Osborn, Ltd.
F. H. Hopkins & Co., Ltd.
Link-Belt, Ltd.
Mussens Ltd.

Cranes, Travelling:
Dominion Bridge Co , Ltd.

Creosote Oils:
Barrett Co., Ltd.

Cross Arm Braces:
Burlington Steel Co., Ltd.
N. Slater Co., Ltd.

Crushed Stones:
Jno. E. Russell Co., Ltd.

Crushers, Jaw, Gyratory, Stone:
Combustion Engineering Corp., Ltd.
F. H. Hopkins & Co., Ltd.

Culvert Pipe:
Gartshore-Thomson Pipe and Foundry Co., Ltd.
Jno. E. Russell Co., Ltd.

Cutters, Milling:
Pratt & Whitney Company of Canada, Ltd.

Cutting off Machines:
John Bertram & Sons Co., Ltd

D

Damper Regulation:
Riley Engineering & Supply Co. Ltd.

Dampproof Coating:
Canadian Johns-Manville Co., Ltd.

Derricks:
F. H. Hopkins & Co., Ltd.
Mussens Ltd.

Die Screw Plates:
Pratt & Whitney Company of Canada, Ltd.

Dies:
Pratt & Whitney Co., of Canada, Ltd.
N. Slater Co., Ltd.

Digesters:
Horton Steel Works, Ltd.

Doors, Fireproof:
Mussens Limited.
N. Slater Co., Ltd.

Dredges:
Combustion Engineering Corp., Ltd.
F. H. Hopkins & Co., Ltd.

Drills:
Pratt & Whitney Company of Canada, Ltd.

Drilling Machines, Metal:
John Bertram & Sons Co., Ltd

Drill Sharpeners:
Lancashire Dynamo and Motor Co. of Can. Ltd

Purchaser's Classified Directory

E

Economizers:
Babcock-Wilcox & Goldie-McCulloch Ltd.
Combustion Engineering Corp., Ltd.
General Supply Co., of Canada

Electric Control Gear:
George Ellison.

Electric Motors:
Lincoln Electric Co., of Canada, Ltd.

Electric Switch Gear:
George Ellison.

Electric Welders:
Lincoln Electric Co., of Canada, Ltd.

Electrical Appliances:
Northern Electric Co. Ltd.

Electric Railway Car Couplers:
Dominion Insulator & Mfg. Co., Ltd.

Electrical Supplies:
Northern Electric Co., Ltd.

Enamels, Acid & Fume Resisting:
Dominion Paint Works, Ltd.

Enamels, Industrial Lighting:
Dominion Paint Works, Ltd.

End Mills:
Pratt & Whitney Company of Canada, Ltd.

Engines, Gas and Oil:
Canadian Fairbanks-Morse Co. Ltd.
Combustion Engineering Corp., Ltd.

Engines, Steam:
Babcock-Wilcox & Goldie-McCulloch Ltd.
Combustion Engineering Corp., Ltd.
Laurie and Lamb.
E. Leonard & Sons, Ltd.
Riley Engineering and Supply Co., Ltd.

Excavators:
Mussens Limited.
F. H. Hopkins & Co., Ltd.

Excavators, Dragline:
F. H. Hopkins & Co., Ltd.
Link-Belt Ltd.

Exhaust Steam Injectors, Locomotive:
Superheater Co., Ltd.

F

Fan Engine Regulators:
Riley Engineering & Supply Co. Ltd.

Feed-Water Heaters, Locomotive:
Superheater Co., Ltd.

Fence Posts, Steel:
Burlington Steel Co., Ltd.

Files:
Simonds Canada Saw Co. Ltd.

Fillers, Wood and Metal:
Dominion Paint Works, Ltd.

Fire Alarm Apparatus:
Northern Electric Co., Ltd.

Floor Stands:
Jenkins Bros., Ltd.

Flange Couplings:
Cumberland Steel Co.

Flanges, Companion:
Jenkins Bros., Ltd.

Files, Valve:
Jenkins Bros., Ltd.

Flooring, Fireproof:
Irving Iron Works Co.

Flooring, Open Steel:
Irving Iron Works Co.

Flooring, Steel:
Irving Iron Works Co.

Flooring, Non-Slipping:
Irving Iron Works Co.

Flooring, Ventilating:
Irving Iron Works Co.

Floors, Monolithic:
Canadian Johns-Manville Co., Ltd.

Forgings:
British Empire Steel Corp., Ltd.
Dominion Bridge Co., Ltd.
N. Slater Co., Ltd.

Friction Clutches:
Link-Belt Ltd.
Canadian Johns-Manville Co., Ltd.

Fuel, Oil:
Imperial Oil, Ltd.

Furnaces, Automatic:
Riley Engineering & Supply Co., Ltd

G

Galvanizing, Hot Dip:
N. Slater Co., Ltd.

Gasoline:
Imperial Oil, Ltd.

Gasoline Storage Tanks:
Horton Steel Works, Ltd.

Gauges:
Pratt & Whitney Co., of Canada, Ltd.

Gear Reductions:
Hamilton Gear & Machine Co.

Gears:
Combustion Engineering Corp., Ltd.
Hamilton Gear & Machine Co.
Link-Belt, Ltd.

Gears, Machine Cut:
Jones and Glassco, Regd.

Gears, Double Helical:
De Laval Steam Turbine Co.

Gears Reduction:
De Laval Steam Turbine Co.

Generators:
Canadian General Electric Co., Ltd.
Canadian Westinghouse Co.Ltd.
Griswold & Co., Ltd.
Lancashire Dynamo and Motor Co. of Can. Ltd.

Gold pans:
Horton Steel Works, Ltd.

Grab Buckets:
Link-Belt Ltd.
Mussens Limited.

Grating, Steel:
Irving Iron Works Co.

Gratings, Area, Sidewalk:
Irving Iron Works Co.

Grease Extractors:
Riley Engineering and Supply Co., Ltd.

Ground Joints Unions:
Dart Union Co., Ltd.

Ground Shafting:
Cumberland Steel Co.

Gauges — Draft:
Riley Engineering and Supply Co., Ltd.

Guards, Truck Radiator:
Irving Iron Works Co.

H

Hammers, Steam:
John Bertram & Sons Co., Ltd.,

Hangers:
Link-Belt Ltd.

Hangers, Door:
N. Slater Co., Ltd.

Headlights, Electric Railway:
Dominion Insulator & Mfg. Co., Ltd.

Heat Exchangers:
Riley Engineering and Supply Co., Ltd.

Heaters, Boiler Feed-Water:
Babcock-Wilcox & Goldie-McCulloch Ltd.
Combustion Engineering Corp., Ltd.
Riley Engineering and Supply Co., Ltd.

Heating Material:
Crane Ltd.

Hobs:
Pratt & Whitney Company of Canada Ltd.

Hoisting Engines:
Clare Osborn, Ltd.
F. H. Hopkins & Co., Ltd.
Lancashire Dynamo and Motor Co. of Can. Ltd.
Mussens Ltd.

Hoists, Electric:
Lancashire Dynamo and Motor Co. of Can. Ltd.
Link-Belt Ltd.
Taylor Stoker Co., Ltd.

Hoists, Hydraulic:
Combustion Engineering Corp., Ltd.

Hoists, Mono-Rail:
Link-Belt Ltd.
Taylor Stoker Co., Ltd.

Hose Couplings, High Pressure:
Knox Mfg. Co.

Hydraulic Press Control Systems:
Taylor Stoker Co., Ltd.

Hydraulic Turbines:
Boving Hydraulic & Engineering Co.
Dominion Engineering Works, Ltd.
General Supply Co., of Can. Ltd.
Wm. Hamilton Co. Ltd.

I

Industrial Electric Control:
Canadian General Electric Co., Ltd.
Dominion Engineering Agency, Ltd.

Insulated Rail Joints, Continuous:
Rail Joint Co., of Canada, Ltd.

Insulation, Steam Pipe Casing:
Pacific Coast Pipe Co. Ltd.

Insulation, Underground Systems:
Canadian Johns-Manville Co. Ltd.

Insulators, Porcelain:
Dominion Insulator & Mfg., Co. Ltd.

J

Joints, Filler Paving:
Barrett Co., Ltd.

K

Kerosene:
Imperial Oil Ltd.

L

Ladder Steps, Steel:
Irving Iron Works Co.

Lathes:
John Bertram & Sons Co., Ltd.,

Lightning Arrestors:
Canadian General Electric Co., Ltd.
Dominion Engineering Agency, Ltd.

Lighting Equipment, Industrial and Street:
Canadian General Electric Co., Ltd.

Line Materials:
Dominion Insulator & Mfg. Co., Ltd.
N. Slater Co., Ltd.

Locomotives:
Clare Osborn, Ltd.
F. H. Hopkins & Co., Ltd.
Mussens Ltd.

Locomotives, Electric:
Canadian General Electric Co., Ltd.
Canadian Westinghouse Co.,Ltd

Lubricating Oils & Greases:
Imperial Oil Ltd.

Lumber, Asbestos:
Canadian Johns-Manville Co., Ltd.

M

Machine Knives:
Simonds Canada Saw Co. Ltd.

Machine Tools:
John Bertram & Sons Co., Ltd.

Machinery:
Canadian Fairbanks-Morse Co., Ltd.
Dominion Engineering Works, Ltd.

Mackinaw Clothing:
Grant-Holden-Graham, Ltd.

Mandrels:
Pratt & Whitney Company of Canada, Ltd.

Marine-Machinery:
William Kennedy & Sons, Ltd.

Material Handling Plants:
Combustion Engineering Corp., Ltd.
Link-Belt Ltd.
Mussens Limited.

Menders, High Pressure Hose:
Knox Mfg. Co.

Men's Furnishings:
Grant-Holden-Graham, Ltd.

Merchant Bars:
British Empire Steel Corp., Ltd

Metal Lath:
Trussed Concrete Steel Co. of Canada, Ltd.

Metal work, heavy plates:
Horton Steel Works, Ltd.

Meters:
Ferranti Meter & Transformer Mfg., Co., Ltd.

Milling Cutters:
Pratt & Whitney Co., of Canada, Ltd.

Milling Machines:
John Bertram & Sons Co., Ltd.

Mine Hoists, Steam and Electric:
Lancashire Dynamo and Motor Co. of Can. Ltd.

Mining Machinery:
Wm. Hamilton Co. Ltd.
William Kennedy & Sons, Ltd.

Motors:
Canadian Fairbanks-Morse Co., Ltd.
Dominion Engineering Agency Ltd.
Lancashire Dynamo and Motor Co. of Can. Ltd.

Motors, Electric:
Canadian General Electric Co., Ltd.
Canadian Westinghouse Co., Ltd
Ferranti Meter & Transformer Mfg., Co., Ltd.
Lancashire Dynamo and Motor Co. of Can. Ltd.
Lincoln Electric Co., of Canada Ltd.

Motor Oils:
Imperial Oil Ltd.

N

Nails:
British Empire Steel Corp., Ltd.

Nipples, High Pressure Hose:
Knox Mfg. Co.

Nipples, Pneumatic Hose:
Knox Mfg. Co.

Nipples, Rock Drill:
Knox Mfg. Co.

Nozzles, Malleable Iron:
Knox Mfg. Co.

Nuts:
British Empire Steel Corp., Ltd,

Oil Storage Tanks:
Horton Steel Works, Ltd.

O

Oil Burning Equipment:
Combustion Engineering Corp., Ltd.

Oil Purifiers, Centrifugal:
De Laval Steam Turbine Co.

Oil Storage Tanks:
Horton Steel Works, Ltd

Oxy-Acetylene Welding & Cutting Apparatus and Supplies:
Dominion Oxygen Co., Ltd.

Oxygen:
Dominion Oxygen Co., Ltd.

P

Packings, Asbestos Sheet:
Canadian Johns-Manville Co., Ltd.

Packings, Rod and Plunger:
Canadian Johns-Manville Co., Ltd.

Paints, Metal Protectives:
Barrett Co., Ltd.

Paper Mill Machinery:
Dominion Engineering Works, Ltd.

Paving Contractors:
Standard Paving Ltd.

Pencils:
American Lead Pencil Co.

Penstocks:
Wm. Hamilton Co. Ltd.
Horton Steel Works, Ltd.
Pacific Coast Pipe Co., Ltd.

Pinions:
Hamilton Gear & Machine Co.
Jones & Glassco, Reg'd.

Pipe Coils:
Superheater Co., Ltd.

Pipe, Concrete:
Jno. E. Russell Co., Ltd.

Pipe Couplings, Union:
Dart Union Co., Ltd.

Pipe Cutting and Threading Machinery:
Riley Engineering and Supply Co., Ltd.

Pipe Fittings:
Crane Ltd.

Pipe, Lead:
Steel Co. of Canada, Ltd.

Pipes, Cast Iron:
Canada Iron Foundries, Ltd.
Gartshore-Thomson Pipe and Foundry Co., Ltd.
Kennedy & Company, Ltd
National Iron Corp., Ltd.

Pipe Insulations:
Canadian Johns-Manville Co., Ltd.

Pipe riveted:
Horton Steel Works, Ltd.

Pipe, Wood Stave:
Pacific Coast Pipe Co., Ltd.

Pipes, Reinforced Concrete:
Jno. E. Russell Co., Ltd.

Pipes, Wrought Iron:
Crane Ltd.

Planing Machines, Metal:
John Bertram & Sons Co., Ltd.,

Plate and tank works.
Horton Steel Works, Ltd.

Plate Rolls:
John Bertram & Sons Co., Ltd.,

Plates, Brass and Copper:
Openshaw & Bennet, Ltd.

Plates, Steel:
British Empire Steel Corp., Ltd.
Hamilton Bridge Works Co., Ltd.
Vulcan Iron Works, Ltd.

Plumbing Material:
Crane Ltd.

Pole Line Hardware:
Canadian Line Materials, Ltd.

Posts, Indicator:
Jenkins Bros., Ltd.

Porcelain, Insulators:
Dominion Insulator & Mfg. Co., Ltd.

Power Apparatus:
Northern Electric Co., Ltd.

Power Plant Equipment:
Babcock-Wilcox & Goldie-McCulloch Ltd.
Combustion Engineering Corp. Ltd.
Riley Engineering and Supply Co., Ltd.

Presses, Hydraulic:
John Bertram & Sons Co., Ltd.

Pressure Tanks:
Horton Steel Works, Ltd.

Purchaser's Classified Directory

Propellor Wheels:
Combustion Engineering Corp., Ltd.
Wm. Kennedy & Sons, Ltd.
Pulp Mill Machinery:
Dominion Engineering Works, Ltd.
William Hamilton Co., Ltd.
Pulp Pumps:
De Laval Steam Turbine Co.
Pulpwood Machinery:
Combustion Engineering Corp., Ltd.
Wm. Hamilton Co. Ltd.
Pulverized Fuel Systems:
Combustion Engineering Corp., Ltd.
Riley Engineering & Supply Co. Ltd.
Pump Governors:
C. A. Dunham Co., Ltd.
Riley Engineering & Supply Co. Ltd.
Pump Valves:
Jenkins Bros., Ltd.
Pumps:
Canadian Fairbanks-Morse Co., Ltd.
Dominion Engineering Works, Ltd.
General Supply Co., of Canada, Ltd.
F. H. Hopkins & Co., Ltd.
Jones & Glassco, Reg'd.
Mussens Limited.
Pumps and Condensers:
Babcock-Wilcox & Goldie-McCulloch Ltd.
Pumps, Centrifugal:
De Laval Steam Turbine Co.
Dominion Engineering Works, Ltd.
F. H. Hopkins & Co., Ltd.
Laurie & Lamb.
Pumps, Hydraulic:
Taylor Stoker Co., Ltd.
Pumps Oil:
Taylor Stoker Co., Ltd.
Punches and Punch Dies:
Pratt & Whitney Company of Canada, Ltd.
Punches and Shears:
John Bertram & Sons Co., Ltd.

R

Radiator Traps:
Canadian Johns-Manville Co., Ltd.
Radiator Valves:
Jenkins Bros., Ltd.
Radio Receiving Sets:
Northern Electric Co., Ltd.
Rail Bonds:
Dominion Insulator & Mfg., Co. Ltd.
Rail Joints:
Rail Joint Co., of Canada, Ltd.
Rails:
Algoma Steel Corp., Ltd.
British Empire Steel Corp., Ltd.
Burlington Steel Co., Ltd.
F. H. Hopkins & Co., Ltd.
Steel Co. of Canada, Ltd.
Railroad Spikes:
Steel Co., of Canada, Ltd.
Railway Equipment:
Canadian General Electric Co., Ltd.
Rawhide Pinions:
Hamilton Gear & Machine Co.
Rawlplugs:
Dominion Engineering Agency Ltd.
Reamers:
Pratt & Whitney Co., of Canada, Ltd.
Recording Instruments:
Combustion Engineering Corp., Ltd.
Refrigerating Machinery:
Taylor Stoker Co., Ltd.
Reinforcing Steel:
Burlington Steel Co., Ltd.
Trussed Concrete Steel Co., of Canada, Ltd.
Rivets:
British Empire Steel Corp., Ltd.
Road Oils & Preservatives:
Barrett Co., Ltd.
Road Rollers:
Dominion Insulator & Mfg. Co., Ltd.
F. H. Hopkins & Co., Ltd.
Mussens Limited.
Rock Drills, Air and Steam:
Lancashire Dynamo and Motor Co., of Can. Ltd.
Rods, Steel:
British Empire Steel Corp., Ltd.
Roofing, Prepared:
Barrett Co., Ltd.
Roofs, Built up, Felt & Pitch:
Barrett Co., Ltd.
Roofing, Asbestos and Prepared:
Canadian Johns-Manville Co., Ltd.
Roofs, Asbestos Built up:
Canadian Johns-Manville Co., Ltd.
Roofing, Asbestos Ready-to-lay:
Canadian Johns-Manville Co., Ltd.
Roofing, Corrugated Asbestos:
Canadian Johns-Manville Co., Ltd.
Rope, Wire:
Dominion Wire Rope Co., Ltd.
Mussens Limited.
Rubber Goods, Mechanical:
Jenkins Bros., Ltd.

S

Safes:
Babcock-Wilcox & Goldie-McCulloch Co., Ltd.
Sash, Steel:
Trussed Concrete Steel Co., of Canada, Ltd.
Sawmill Chains:
Link-Belt Ltd.
Sawmill Machinery:
William Hamilton Co., Ltd.
Saws:
Simonds Canada Saw Co. Ltd.
Scales:
Canadian Fairbanks-Morse Co. Ltd.
Screening Equipment:
Combustion Engineering Corp., Ltd.
Link-Belt, Ltd.
Mussens Limited
Screw Blanks, Lead:
Cumberland Steel Co.
Separators — Steam, etc.:
Riley Engineering and Supply Co., Ltd.
Sewer Pipe:
Jno. E. Russell Co., Ltd.
Shaft Couplings, Flexible:
De Laval Steam Turbine Co.
Shafting, Cold Drawn:
Cumberland Steel Co.
Sheathing:
Barrett Co., Ltd.
Sheets:
Steel Co., of Canada Ltd.
Shingles, Asbestos:
Canadian Johns-Manville Co., Ltd.
Shingles, Prepared Asphalt:
Barrett Co., Ltd.
Skip Hoists:
Combustion Engineering Corp., Ltd.
F. H. Hopkins & Co., Ltd.
Link-Belt Ltd.
Mussens Limited.
Sleeping Robes:
Grant-Holden-Graham, Ltd.
Smoke Stacks:
Combustion Engineering Corp., Ltd.
Wm. Hamilton Co. Ltd.
Horton Steel Works, Ltd.
Sodas:
Nichols Chemical Co., Ltd.
Soot Blowers:
Riley Engineering and Supply Co., Ltd.
Speed Reducers, Gear:
Hamilton Gear & Machine, Co.
Spikes:
British Empire Steel Corp., Ltd.
Springs:
B. J. Coghlin Co., Ltd.
Sprinkler Tanks:
Horton Steel Works, Ltd.
Stacks:
Horton Steel Works. Ltd.
Stair Steps, Safety:
Irving Iron Works Co.
Staples:
British Empire Steel Corp., Ltd.
Steam Heating Specialties:
C. A. Dunham Co., Ltd.
Steam Joints, Flexible:
Riley Engineering and Supply Co., Ltd.
Steam Shovels:
F. H. Hopkins & Co., Ltd.
Mussens, Ltd.
Steam Traps:
C. A. Dunham Co., Ltd.
Canadian Johns-Manville Co., Ltd.
Steel, Ground Alloy:
Cumberland Steel Co.
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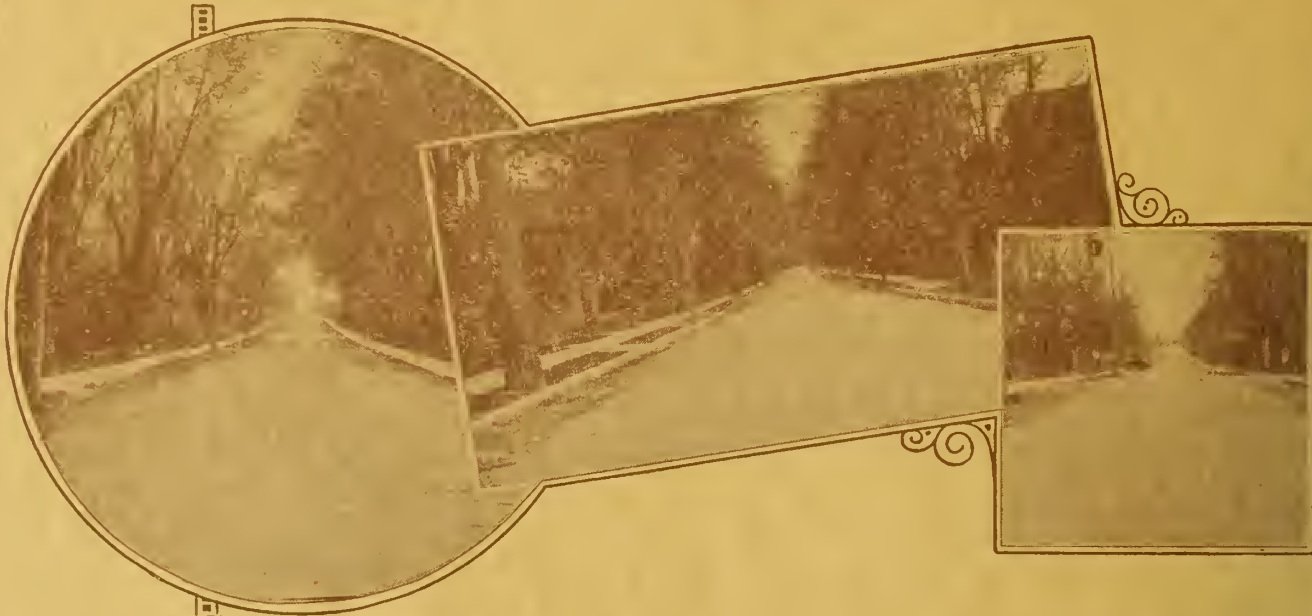

THE
ENGINEERING JOURNAL

THE JOURNAL OF
THE ENGINEERING INSTITUTE
OF CANADA

"TO FACILITATE THE ACQUIREMENT AND INTERCHANGE OF PROFESSIONAL KNOWLEDGE AMONG ITS MEMBERS, TO PROMOTE THEIR PROFESSIONAL INTERESTS, TO ENCOURAGE ORIGINAL RESEARCH, TO DEVELOP AND MAINTAIN HIGH STANDARDS IN THE ENGINEERING PROFESSION AND TO ENHANCE THE USEFULNESS OF THE PROFESSION TO THE PUBLIC"

THE ENGINEERING INSTITUTE OF CANADA FOUNDED 1887

AUGUST 1925

PUBLISHED MONTHLY BY THE ENGINEERING INSTITUTE OF CANADA

AT 176 MANSFIELD STREET, MONTREAL

Vol. VIII No. 8

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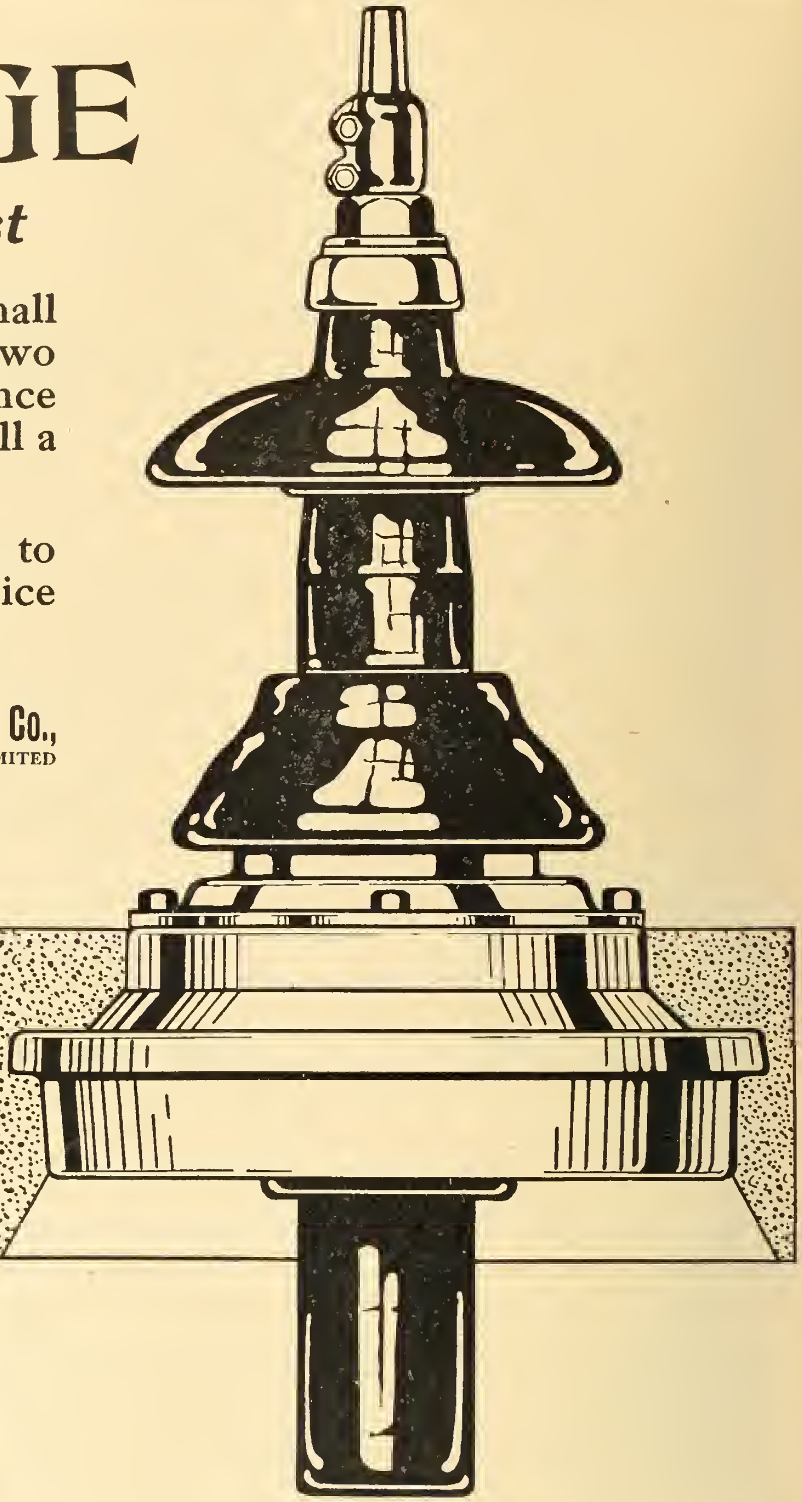

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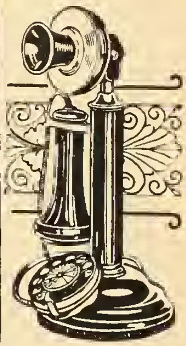
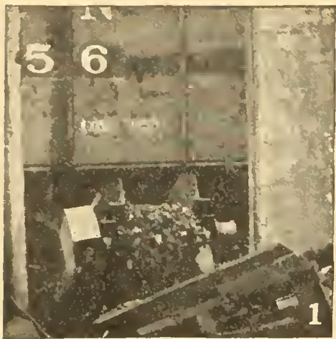
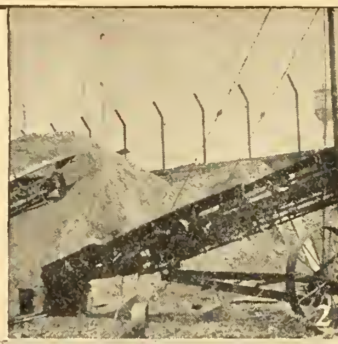




1—Unloading coal from car to storage, without shovelers, at the McCord Radiator Co., a Barber-Greene Coal Feeder and two Barber-Greene Conveyors increased the speed of storing 250%, cutting its costs 75%. No track pit is required.



2—Another McCord Radiator scene. The feeder, in a permanent track hopper, feeds to the first conveyor, which relays the coal to the second conveyor. In this manner, a car was unloaded in 50 minutes. This equipment saves the company $17.31 on every car handled.

3—A Barber-Greene Conveyor coaling a ship at the Tampa Coal Co. Before noon, this and two other Barber-Greenes had loaded a car with gravel, coaled a ship, and unloaded and stored a car of coke.

4—Showing how a single Barber-Greene Conveyor has enabled the D. L. & W. Coal Co. to increase their storage 75,000 tons. It will handle at least 25 cars a day.

5—Barber - Greene Conveyors unloading a car of coke at the Tampa Coal Co.—one of three widely differing jobs completed in five hours.

75.000 Tons Increased Storage
—with a Single Barber-Greene

The D. L. & W. Coal Co., of Dover, N. J., bought a Barber-Greene 30-foot Conveyor to increase their coal storage, later lengthening it to 45 feet, and then to 60 feet.

When asked about the Barber-Greene's performance, the superintendent of the company said: "It will do all you claimed for it—and then some. I figure that with the 60-foot conveyor, we can stock an additional 75,000 tons. It will handle at least 25 cars per day."

The layout is instructive. The photograph above shows the 30-foot Barber-Greene shortly after installation. It was placed on top of an 85-foot coal pile, and laid horizontally on rollers so that it could be pushed out as the pile advanced. Taking the coal as it came from the "trimmers," it distributed it well out over the pile.

One of the invaluable features of the Barber-Greene is that its intermediate sections are of Warren Truss Construction, standardized and interchangeable. Thus you can start with a short conveyor, and as the need arises you can lengthen it in multiples of 3 feet to any desired length—at the same time maintaining a powerful, rigid conveyor that will not get out of alignment.

With wages high, and immigration restriction threatening to raise them even higher, coal and industrial plants that are large employers of unskilled labor face a costly and serious problem.

The only effective solution is to stop depending on unskilled labor to handle your product. Reports of Barber-Greene performances under every conceivable condition, prove clearly that Barber-Greene methods will accomplish this work at several times the speed of hand labor, and at far less cost. For instance, the McCord Radiator Co., with a Barber-Greene Coal Feeder and two Barber-Greene Conveyors, have increased the speed of storing coal 250%, reducing its cost 75%.

Send for Catalog E. It may hold the key to your unsolved material-handling problems.

MUSSENS LIMITED

MONTREAL WINNIPEG
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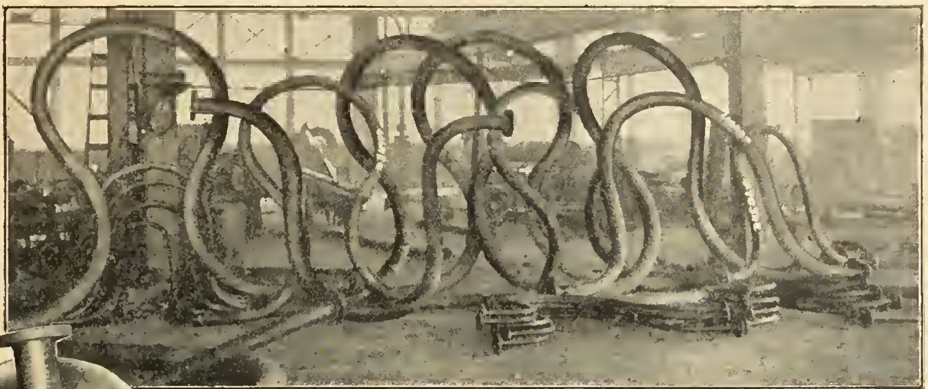
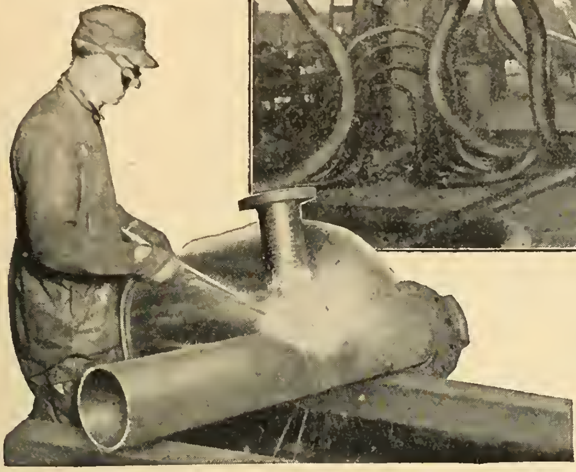
ALL welds furnished by Grinnell are the work of specially trained welders, each of whom stamps his number on every job. Photo below shows welder at work welding a nozzle on a small header.





"ABSOLUTELY 100%" was the word received from the plant where the array of bends shown above was installed. A typical instance of Grinnell Service on pipe fabricating regardless of the size or complexity of the job.

Translating Specifications into usable Finished Products

SATISFACTORY pipe bending, welding and the furnishing of lap joints are largely bound up in the ability of the fabricator to do several things well.

First of all is the proper interpretation of a specification. In this we offer the advantage of a long experienced engineering organization.

Second is the workmanship involved, because these fabricated items are more largely a matter of workmanship than any other element in a piping specification.

In bending, for instance, proper filling is vital. On all bends furnished by Grinnell, special machinery is utilized to do the work which is otherwise done by back-breaking human labor with all its attendant uncertainties.

Then take welding. It is a truism in the industry that no weld is better than its welder. Specifications for welding placed with Grinnell are carried out only by properly trained workmen. Each weld bears the stamped number of the welder. Consequently, good workmanship is made as certain as possible because the worker knows that responsibility for poor workmanship cannot be avoided.

In addition to being able to offer accurate and dependable service on your bending, welding and lap joint work, Grinnell Company of Canada, Ltd., is also able to furnish supplies of the highest quality for everything that has to do with piping—adjustable hangers, malleable and gray iron fittings and Penberthy Brass Valves.

Plants and warehouses at Toronto, Montreal, Winnipeg and Vancouver permit us to promise especially prompt shipments. For prices and detailed information address our Toronto office, 2440 Dundas Street West.

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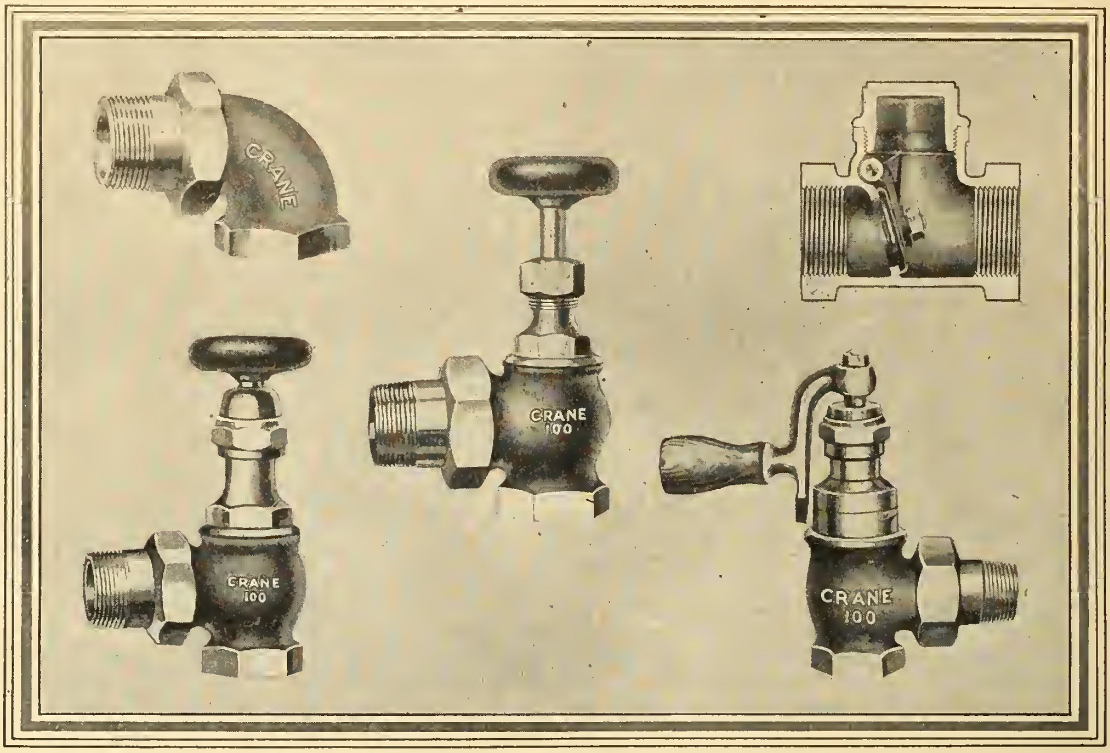

Crane Y branch drainage fitting

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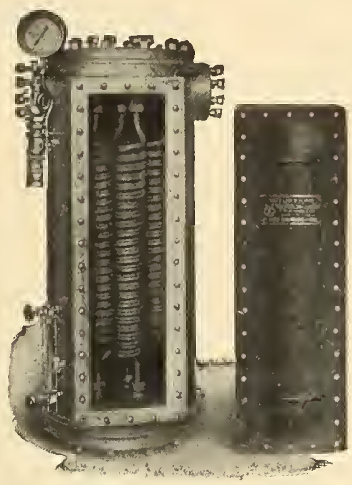

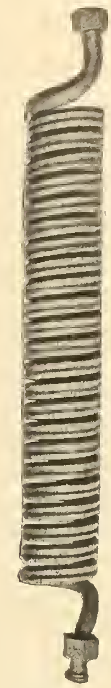

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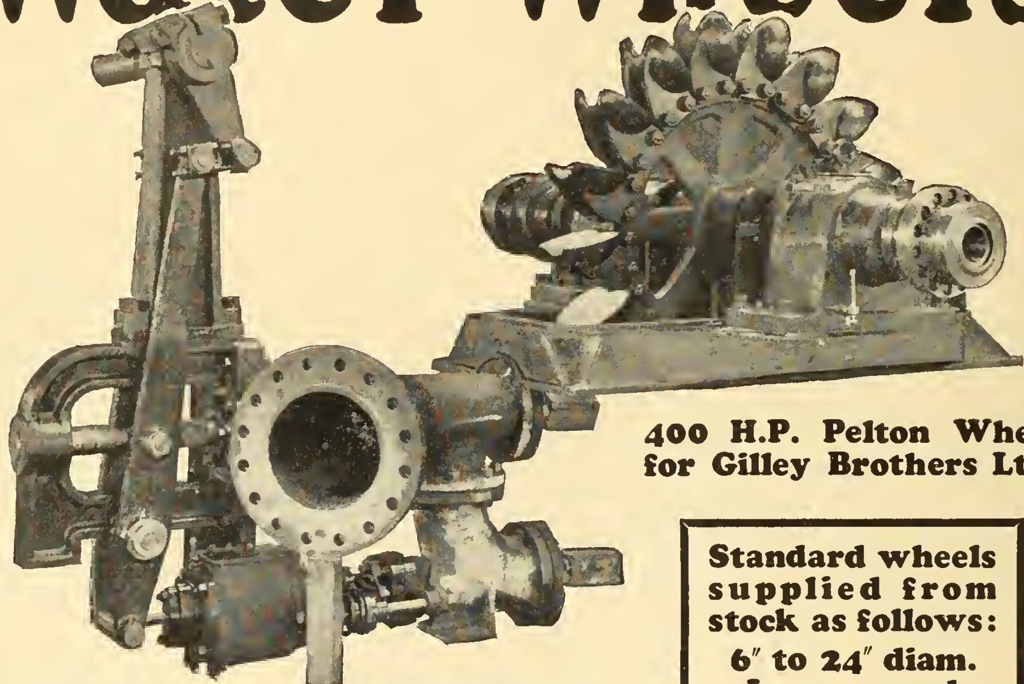

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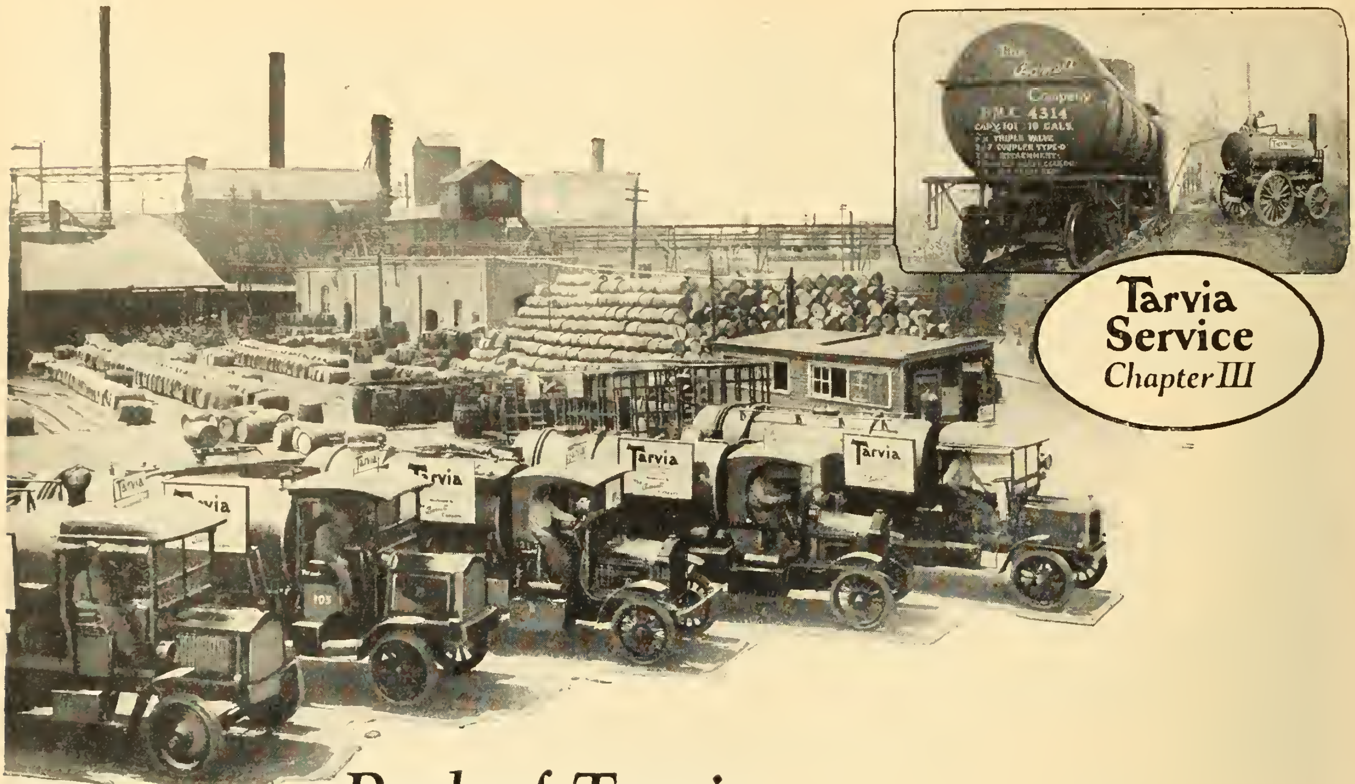

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AUGUST, 1925

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Cost of Electric Power

An Analysis and Discussion of the Complementary Items Entering into the Organization, Management, Operation and Distribution Costs of Power.

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Paper read before the Montreal Branch, The Engineering Institute of Canada, December 11th, 1924.

In order to bring out the great influence, in fact almost overbearing influence which the cost of distribution has on the cost of power, I have taken the liberty of expanding this paper and reciting and developing afresh values for each of the arbitrary divisions into which power conveniently falls, viz: generation, transmission and distribution.

First, let us analyze roughly the respective capital investments in the three classes into which the property of an hydro-electric power company is usually divided, namely, generating, transmitting, and distributing property.

Generating Stations

Hydro-electric generating plants vary in cost very considerably, depending, first, on the physical characteristics, — the head, the distance between the head- and tail-water, the distance from existing railways, the geological formation, the availability of rock, gravel, and sand, the climate, the character of the flow of the river; secondly, — the price of labour, of the lands to be acquired, of existing developed rights which will be destroyed; thirdly, — upon the prevailing price of materials; and fourthly, — upon the cost of money, which must either be reflected in higher bond interest, or as is frequently the case, in heavy security selling expense, finally appearing in the cost of the plant as discount on bonds requiring the necessary issuance of more bonds to obtain the required amount of money, or lastly in the issuance of a certain proportion of common stock, popularly known as watered stock, to each purchaser of bonds, giving him a participating interest in the future profits of the company as well as rent for the use of his money.

Before leaving this last item, it may not be amiss to say a word in favour of watered stock. In the minds of some of our best and most expressive citizens, watered stock conjures up a picture of prosperous capitalists by some devious process, creating in secret large issues of securities which have no excuse for existence and which in course of time appear from out a maze of finance and demand their pound of flesh, thus preventing the duped customer from enjoying cheaper rates and generally increasing the cost of service. The real picture, however, is quite different. It is the public themselves who create the watered stock by offering new ventures no inducements to finance otherwise. The choice lies between paying a high rate of interest which may throttle the venture, — eight per cent bonds are still being issued on new hydro-electric enterprises in this province in this year of grace and at a discount from par, — or in paying a lower rate of interest when money is most needed and offering the subscribers a chance on the future profits of the company.

The creation of too heavy a bonded indebtedness has sunk many a company and even when watered stock has helped to reduce the earlier fixed charges, the owner has often waited for dividends for many a year, — in the case of the company with which I am connected, to be exact, eight years.

It has become common practice to use the figure of $100.00 per horse power as an average index of the cost of a power plant. While this may have been a pre-war average, covering the easiest and most accessible developments, the writer does not think this figure anything like a true average of the cost per horse power of the present total developments, as the largest portion of Canada's hydro-electric development has taken place at a high price time. The growth of the installed capacity of water wheels, according to our Ottawa records, is as shown in figure No. 1.

In order to emphasize the change in prices, there is shown in figure No. 2, a curve of the prices of identical 10,000-h.p., water wheels and generators with accessories up to the station generating busbar from 1913 to 1923, and as a matter of interest, there is also shown in figure No. 3, the cost of cement during the same period.

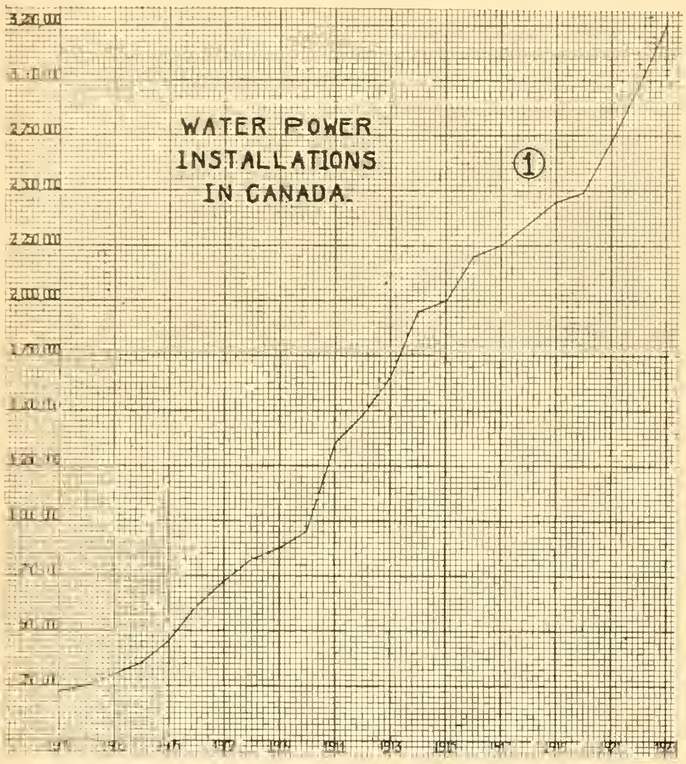

Figure No. 1.—Water Power Installations in Canada

Now, let us consider a few developments concerning which we have some rough figures. The Hydro-Electric Power Commission of Ontario report a cost at Chippawa for what should have been the cheapest possible plant, with a head of over 300 feet and an ultimate installed capacity of almost 600,000 horse power, for the present developed 400,000 horse power of $175.00 per horse power, and on the completed development a probable cost of $150.00 per horse power. Again, tentative figures on the St. Lawrence development, a low-head development, now so actively under consideration are quoted at from $150.00 to $200.00 per horse power. Once more, if we look at Mr. Brown's discussion or Professor Christie's paper last year, he cites various systems which vary from $390.00 per horse power, to $121.00 per horse power, deducting $50.00 per horse power for transmission and eliminating the two large power developments which average $157.00 per horse power, we have a capital cost for seven plants of various sizes which average $300.00 per horse power.

It would seem therefore that the figure of $100.00 per horse power, so frequently quoted as a normal average capital cost for water power development, is not a figure that is based on the average installed price of the plants existing; $150.00 per horse power would certainly seem a better average figure although even this may be low.

Transmission Lines

Turning now to transmission lines, we are confronted with another set of variables which depend, firstly, on physical matters such as the length of the line, typography, distance from railroads or good highways; secondly, climate, cost of labour, cost of right-of-way, clearing; thirdly, cost of materials; and lastly, the cost of money. This last item is just as important as the others. If money is hard to get and power is plentiful, power losses are cheaper than money, and cheap lines, light in copper of only temporary usefulness and life, must often be built in order to get a system into operation to demonstrate its earning power, so that cheaper money can be later attracted to the undertaking. These are wasteful methods, not defensible from any economic viewpoint but forced upon us as watered stock is, because of a lack of confidence in humanity and the desire of the financial houses to restrict the money loaned to the lowest amount possible so as to protect the equity of their clients.

The cost of transmission for an average distance of 50 miles at present prices, at equated losses, will be around $1.00 per mile per horse power capital cost, so that $50.00 per horse power, a figure already used by Professor Christie, seems a fair figure to take.

Now, to come to the subject matter of this paper, distribution costs, let us endeavour to determine the items of the distribution costs in a general way, to set up a fair average cost per horse power for distribution and compare it with the capital costs for plant and transmission, and then finally, to put rough calipers on operation, maintenance, and depreciation charges, so as to make a total comparison between the cost of the three items of public utility business, generation, transmission and distribution, in an endeavour to prove or disprove statements which were made last year, that as is common to the handling of practically all commodities of general use, the cost of distribution is a major item in setting the price to the customer.

Distribution Systems

In similarity with the items affecting the cost of power plants and transmission lines, we have quite uncontrollable variables affecting the cost; first, physical conditions, which include narrow streets, narrow sidewalks, trees, shallow sewers, house and garage entrances, overhanging balconies, high trolley wires, existing telephone lines, rock, railroad crossings, parks, stock yards, blind streets, and many other barriers to straightforward construction; secondly, climate, and the price of labour; thirdly, price of material; fourthly, the old enemy, cost of money, which acts exactly in the same way as in the

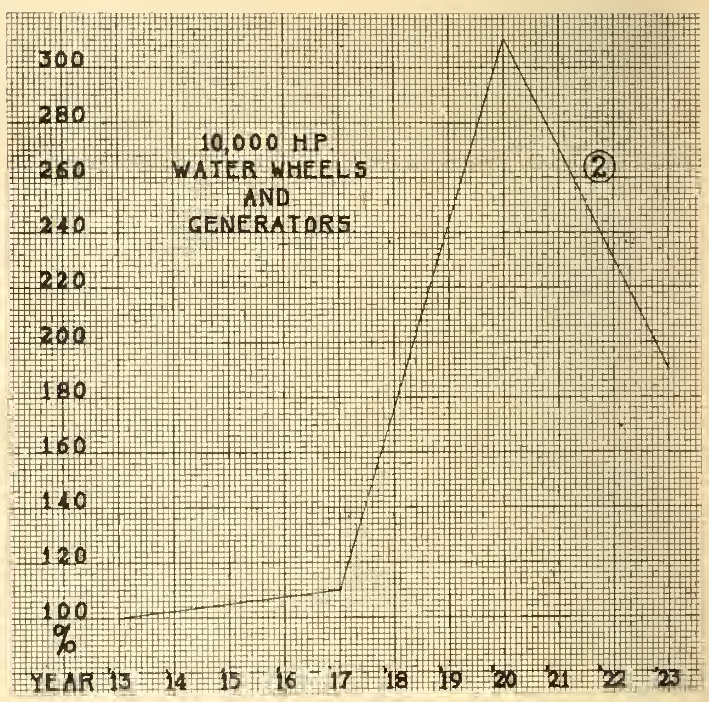

Figure No. 2.—Prices of 10,000-h.p., Water Wheels and Generators

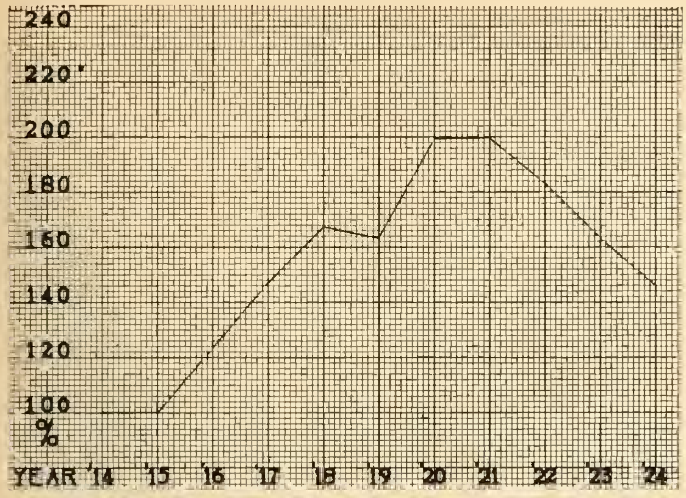

Figure No. 3.—Cost of Cement

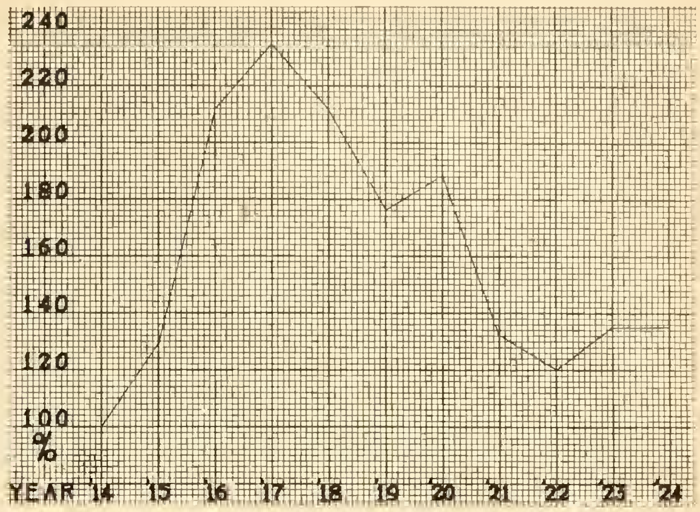

Figure No. 4.—Cost of Copper

case of transmission lines; if one is short of money one has to put in small copper, stand the losses, explain away low voltage, risk transformers, and pray nightly that the god of diversity slumber not.

So far I have only indicated the variables in regard to cost of overhead systems; we are slowly learning the same truths regarding underground systems. In a growing city such as Montreal, there is a never-ceasing progression, buildings are torn down and larger buildings spring up overnight, and existing equipment may be discarded before it has hardly had a chance to get warm. This paper, however, will not attempt to delve into underground costs.

Returning to the items of costs of distribution lines, let us pause for a moment to consider the life of this equipment. While the equipment in our oldest hydro-electrical developments is in many case the same as that originally installed, a good example being Chambly power house, where Stanley inductor generators installed in 1897 are still, after 27 years, grinding out their daily kilowatt hours, how much of the distribution equipment originally placed in Montreal is standing to-day—not one pole or wire; and how much of the equipment, poles, wires, transformers, etc., erected in 1904, 20 years ago, is here to-day,—very little, certainly no transformers, and few poles.

At that time the major load in Montreal was 2-phase, 66-cycle, the arcs were all a.c., and a 40-k.w., distribution transformer unknown, to-day, as you know, service is all 3-phase, the arcs d.c., and the standard distribution transformer 40-k.w. I remember well, seventeen years ago, the splendid 60-foot poles we had on the harbour front carrying 50 arc circuits and 8 or 10 primary circuits, to-day, only a memory is left. A great section of our city has no pole-line equipment at all, twenty years from to-day with thermionic valves promising to provide a low loss conversion from a.c., to d.c., and also the reverse, it would be a brave man who would be satisfied to predict that much of to-day's distribution material will be left.

How many meters in use in 1905 are in use to-day? In 1907, out of some 18,000 meters in use in Montreal, over 50 per cent were Stanley magnetic suspension type meters: to-day they grace the museums, 22 pounds of material valued at $25.00 has given place to 6 pounds of better material costing only $10.00.

Table No. 1, — Cost of one-quarter mile Distribution System. Single-Phase primary, 2,200 volts No. 6 copper wire, No. 4 three wire 110/220 v. secondary. Transformer, meters and services to take care of ten customers, one of whom has a range.

	1914	1916	1918	1920	1922	1924
Poles	$ 50.00	$ 62.50	$ 85.00	$ 91.00	$ 94.00	$105.00
Crossarms, brackets, insulators	15.40	16.62	20.52	36.50	28.91	24.97
Hardware	22.55	25.70	33.16	44.69	41.00	37.42
Engineering, Right-of-way, etc	10.00	13.00	15.00	18.50	24.00	35.00
Copper	157.00	333.00	333.00	295.50	188.50	212.25
Transformer	47.50	65.00	100.00	96.00	74.00	66.50
Meters	85.00	90.00	95.00	100.00	90.00	92.00
Labour	90.00	110.00	123.50	250.00	202.50	219.00
Total	$477.45	$715.82	$805.18	$932.19	$742.91	$792.14

Now, to get back to the cost of distribution systems, let us call in the rough calipers again. The city of Toronto generates no power, buying its power at a gradually increasing rate from the Hydro-Electric Power Commission of Ontario. In passing we might note these prices as they show the gradually increasing cost of service. (See figure No. 11.)

The investment in Toronto as shown in the Hydro-Electric Power Commission's report for 1923, amounts to $24,399,652.00, the amount of horse power taken by

Figure No. 5.—Cost of 45,000-volt Installations

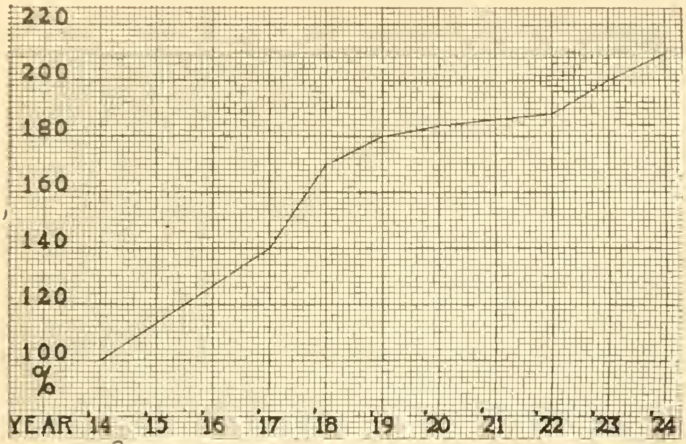

Figure No. 6.—Cost of 35-foot Poles

Toronto, December 1923, amounts to 121,996 horse power, which makes a distribution cost of $200.00 per horse power for the power received, taking no consideration of losses or diversity. Toronto, however, represents an ideal distribution system, as the customers are all close together, the factory district segregated, and the city having a reasonably square formation; smaller communities cost considerably more per horse power for distribution, and in the company with which I am connected, 400 miles of distribution lines are required to serve 16,000 customers or 40 customers per mile. The average price for pole line to serve these forty customers has varied as shown in figure No. 12. The actual cost to-day, amounts to over $3,000.00 per mile for very simple construction.

The load upon 40 residence consumers would be 4 k.w., if, however, we add to this 10 per cent electrical stoves, we would have a total demand of 8 k.w., on this pole line. The price per horse power therefore will be $280.00, with stove load, and without stove load over $500.00.

Considerable consideration has to be given to the economics of distribution lines. Mr. Stanger, distribution engineer of the Southern Canada Power Company, has developed a very interesting economic equation by which he has added to the perplexity of the situation; the fact developed is, that it pays to put in larger copper than is required at the moment because the cost of changing the copper within ten years is greater than the interest charges on the added investment due to the use of larger copper. The perplexity lies in the consideration that the work under review may be dismantled before the anticipated change becomes necessary. The economics of this are well shown in the following memorandum for which I am indebted to Mr. Stanger:—

> "Any serious consideration of the proper size of overhead secondary distribution copper must of necessity take into account many factors other than voltage regulation. Some of these are:—Probable growth of load. Continuity of service. Financial position of the company. Cost of power losses. Relative value of copper and transformers as an investment. Plans for growth. Operating and maintenance costs. Diversity. Probability of underground construction.
>
> "The majority of these factors point to the use of heavy copper for secondary distribution; just how heavy is open to question. It would seem, however, that apart from highly developed towns such as Montreal, Toronto, Quebec, a minimum of No. 2 B. & S. copper wire is about right for the lowest annual cost when considered over a period of years of normal growth.

"It has been common practice, particularly in small companies, to use light copper for distribution secondaries. This is quite justified in some cases where the cost of money is high, and power is cheap; but when a company is able to use its own earnings, or by reason of its financial position is able to borrow money at a reasonable cost for new work or reconstruction, heavy copper for secondaries is less expensive in the long run.

"To illustrate this, two examples follow, both based on the cost of serving a section one thousand feet long with a maximum demand of ten kilowatts.

"The first case does not take account of any power lost, while the second does.

1,000 feet No. 2 secondary in place......	$129.33
1,000 feet No. 6 secondary in place......	65.00
Annual cost No. 2 secondary (interest and depreciation)......................	14.23
Annual cost No. 6 secondary (interest and depreciation)......................	7.15
No. 2 secondary costs $7.08 per year more than No. 6.	
Labour cost to change No. 6 for No. 2, and reconnect services and original labour to be written off.....................	$33.25

"The greater annual cost of the heavier copper, $7.08, crosses the cost of making the change, $33.25, at 4.3 years. That is to say, if we neglect the cost of power losses the lighter copper would show a saving if it remained in service over 4.3 years.

"Taking the annual costs of the two sizes of secondary as before and adding the losses in each under the same load conditions changes the cost as follows:—

Annual cost No. 2 copper........	$14.23	
Losses 231 k.w.hrs. at 1 cent.....	2.31	
Total annual cost No. 2.......		$16.54
Annual cost No. 6 copper........	$ 7.15	
Losses 924 k.w.hrs. at 1 cent.....	9.24	
Total annual cost No. 6.......		$16.39
		$ 0.15

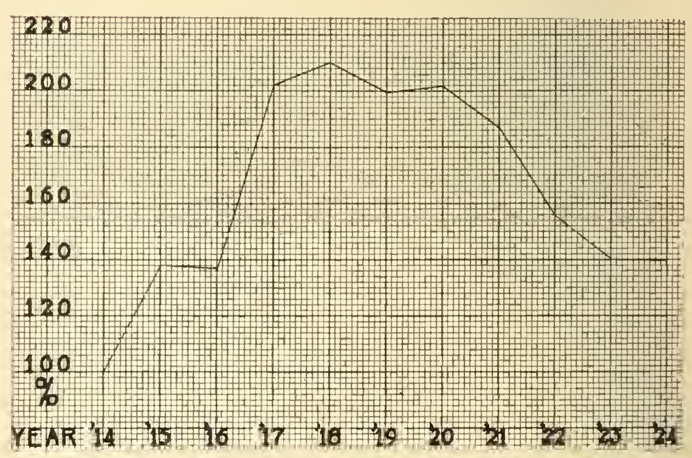

Figure No. 7.—Cost of Distribution Transformers

"The greater annual cost of the heavier copper is therefore only 15 cents and the economies call for some 40 years to elapse before the extra cost crosses the difference in the fixed charge of original installation of No. 2 copper instead of No. 6.

"There are other considerations, hard to express in terms of dollars and cents, that warrant the installation of heavy copper in the first instance, such as: Better regulation, resulting in fewer low voltage complaints to be explained or investigated; avoidance of interruptions to service to make changes in copper, the value of which appears in good public relations, as an interruption of this nature usually follows a period of low voltage complaints, and with the steady growth of cooking and appliance load, it is more and more difficult to find a time when no customers are inconvenienced by a prearranged shutdown; ability to handle sudden growth of load or seasonal peaks without extensive changes; ability to serve large sections of lightly settled territory from one transformer location, thereby gaining in lower transformer losses and increased diversity, and allowing for ultimate growth without change in copper, by installing additional transformers and sectionalizing.

"While the examples and points cited have all been based on secondaries, the same arguments apply to primaries; particularly the value of power losses, as the average feeder is under load more hours per day than the secondaries.

"To sum up: If a power company can afford to set aside from five to ten per cent of their power house capacity to supply distribution losses, it would probably pay them to use small copper."

It may be thought that in preparing this paper the writer has paid too much attention to the smaller or domestic business but one has to treat distribution as a

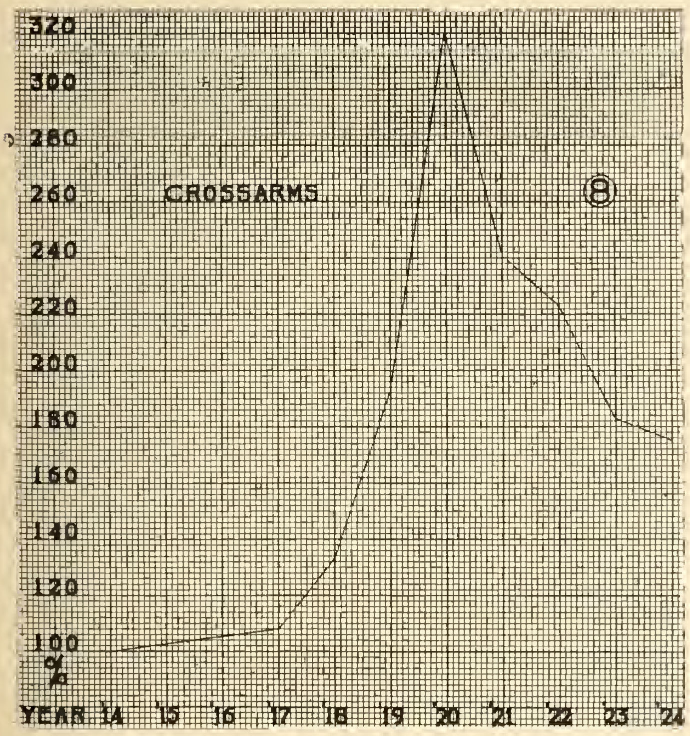

Figure No. 8.—Cost of Cross-arms

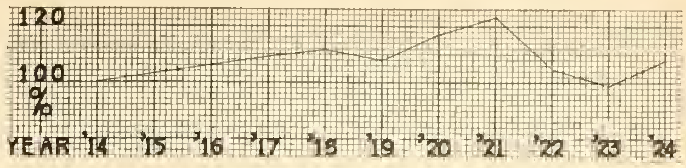

Figure No. 9.—Cost of Electricity Meters

whole. Pole lines are the common means of supplying both large and small customers and after all is said and done, the owners of an electrical system only want a fair return on their money and the splitting up of the revenue into power and light is more a matter of meeting popular desires than equating the exact cost against each class of consumer.

The cost of distribution for power customers varies so enormously from the simplest case where an industrial plant sits under a transmission line, supplies its own transformers, and has only one meter, to a 100-horse power customer who requires service five miles away from a sub-station and necessitates rebuilding the circuit right back to the 2,200-volt busbar, that it is impossible to in any way average the distribution cost to a power customer and individual cases are not interesting since it is the practice of all power companies both in Ontario and Quebec to charge the same price irrespective of the location of the consumer with regard to the available service. Distribution cost, then, can only be averaged for the whole supply. As noted above, Toronto offers an example where the cost has been $200.00 with money borrowed at a low rate of interest. For private corporations and for distribution in more scattered localities, the price certainly will not be less than $200.00 per horse power and in many cases will be well over $300.00 per horse power as compared with $150.00 per horse power for generation and $50.00 per horse power for transmission.

Before turning to a consideration of the operating and maintenance and depreciation costs of distributing lines, let us examine briefly the hope of our being able to cheapen distribution costs.

As far as the writer's experience goes there seems no hope of cheaper lines, poles are becoming more expensive, telegraph and telephone lines more numerous, trees more hardy and the temperament of the owners of these trees more adamant. Electrical companies are rapidly becoming, in the minds of those who imagine they have a claim, of the same type as railroads, "make them pay", rather than conciliatory attitude being the rule.

Another new expense is the cost of government regulation, which is rapidly threatening to hinder the natural development of the industry. Compare the conditions under which a line could be built on a highway in 1914 and to-day. In 1914, if a company had a charter, most of us had, all that was necessary to do was to go ahead and build the line, settle for the trees, dodge the telephone wires and live on the farms. Now, however, we must have a survey gang, a right-of-way man and submit plans to the commission and to the Telephone Company and to the Railway Commission, then wait until the plans have been approved and the engineers of the various commissions visited the spot, then, the development of monumental formulae which will discover in just how many places the telephone and telegraph lines might have to be transposed, — delays, which all cost money and are promptly reflected in the cost of the erected line.

Now, I am not going to say that the present system is not necessary, I have too much respect for the various engineers involved, but I do know that it costs a pile of money and the power company is the one that pays. Some day perhaps, some new utility will come along, a purveyor of taste or perfume, which will need pole lines, then perhaps the power companies will get their own back.

In an endeavour to find a cheap and good method of construction, many companies have departed from the old cross-arm construction and followed continental practice in using vertical separation between wires instead of horizontal. This makes for cheaper construction and a more sightly pole line.

Operation

In the consideration of operation the losses in various parts of the system must be taken into consideration, generating losses on the electrical equipment may be around 2 per cent, transmission line losses depend upon the amount of money invested on the line, but at $50.00 per horse power, should not exceed 5 per cent; distribution losses however are very hard to control and it is not unusual for there to be a difference as great as 20 per cent between the kilowatt hours delivered to the 2,200-volt busbars and delivered to the customer. This matter of losses of course affects all the other items, as if we have for instance $150.00 per horse power paid at the power house, with a loss of 2 per cent, and $250.00 per horse power paid for distribution, with a loss of 20 per cent, it is evident that the relative costs of the two sections will not be as $150.00 is to $250.00 but as $153.00 is to $312.00.

The operating costs of the company with which I am connected, has the following ratios:—

Generation.............	100 per cent
Transmission............	59 per cent
Distribution............	178 per cent

In the cost of distribution has been included not only actual operation of the lines but also the cost of meter reading, billing, collecting, and service to the customers, which is after all distribution expense, but no attempt has been made to include taxes, head office

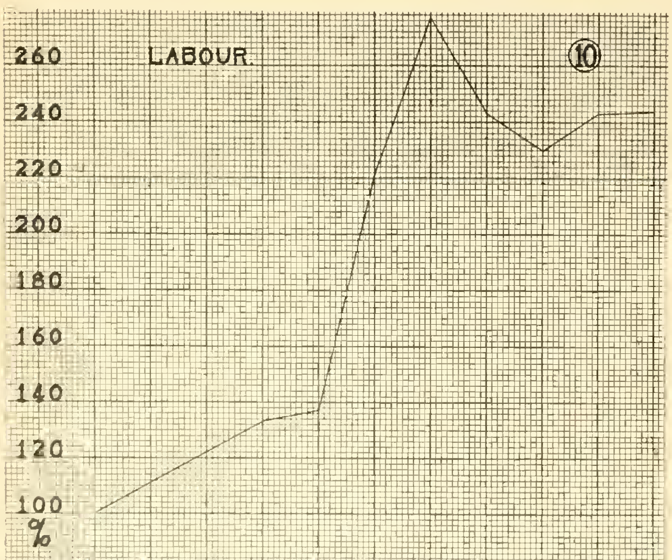

Figure No. 10.—Prevailing Cost of First-class Linemen

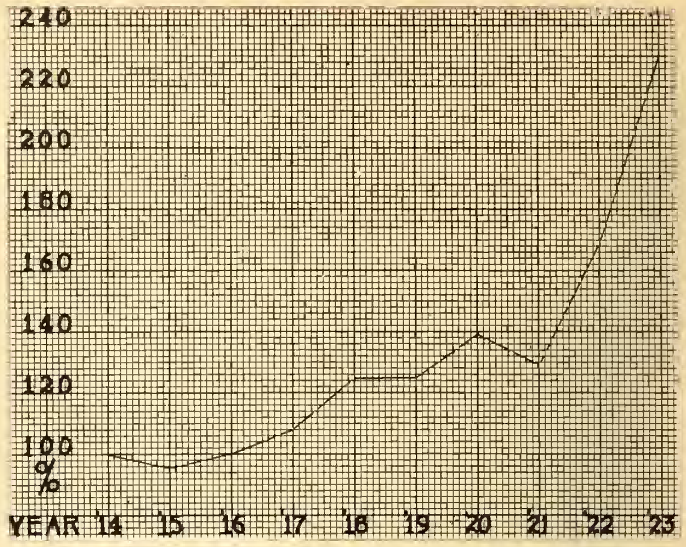

Figure No. 11.—Cost of Power to City of Toronto

expense and other general expenses which manifestly are more frequently chargeable to distribution and customer expense than to generation or transmission.

Maintenance

It must be obvious to anyone that the maintenance of distribution equipment is a much more costly affair than that of generating and transmission equipment, because there is much more mechanical interference to the property through such items as new building operations, accidents from vehicles, tree troubles, foreign line construction, road and side-walk changes, and again distribution equipment has to absorb all shocks from short circuits and overloads on consumers' premises. Maintenance expense from the same source as noted above, give the following ratios:—

Generation.............	100 per cent
Transmission............	245 per cent
Distribution............	470 per cent

Depreciation

The treatment of depreciation and the separating out of it from maintenance in a distribution system is subject to wide variations. Distribution material as has been noted above has such an uncertain life that some companies go so far as to charge all labour and a considerable amount of material used on running services to customers to operation. This is a practice however that finally creates a peculiar position and I am going to digress at this point for a short time to discuss this practice of making extensions out of earnings and not by the issuance of some form of capital obligation. Inasmuch as operating costs reduce profits, the effect of charging extensions to operating or other accounts, merely uses some of the profits on capital account, thus improving the equity of the shareholders at the expense of their dividend rate. The final effect of this practice is, that the surplus in the property due to the use of earned profits on construction account, becomes unwieldy, and the position is created where a stock dividend becomes necessary if this equity is to be restored to the shareholders to whom it belongs. The declaration of such stock dividends is seized upon by demagogues, branded as watering stock and the shareholder begins to wonder if he has received illgotten gains.

As a matter of fact, if a business is profitable and can be kept so, it is often to everyone's advantage to have as little paid in dividends as possible and as much kept in the property; the profits being nowhere better invested than in the property. However, as previously stated, the result of prudence of sacrifice on the part of the shareholders seems to finally bring instead of a just reward, a public sentiment which throws such virtues into the shadow. It would seem unfortunately advisable therefore to distribute all profits as earned to capitalize all construction account, to grow to be a large rather than a profitable company and to cultivate popular sentiment rather than the strengthening of the utility's position.

In order to demonstrate the quick way in which an equity can be increased, the following table has been prepared, based on an investment of $100.00 upon which a profit of 12 per cent is being earned per annum and upon which 6 per cent dividend rate is paid and the balance reinvested in the property for a period of ten years.

Table No. 2, — Effect of Reinvesting Profits instead of Issuing New Securities.

Capital earning dividend	Gross profits	Dividend	Reinvested
$100.00	$ 12.00	$ 6.00	$ 6.00
106.00	12.72	6.00	6.72
112.72	13.52	6.00	7.52
120.24	14.42	6.00	8.42
128.66	15.44	6.00	9.44
138.00	16.56	6.00	10.56
148.56	17.83	6.00	11.83
160.39	19.24	6.00	13.24
173.63	20.83	6.00	14.83
188.51	22.62	6.00	16.62
205.13	24.61	6.00	18.61

This table shows that by allowing half the profits to be reinvested for a period of ten years, an investor having received $60.00 in dividends has had his equity increased by $105.13, or a total of $165.13, instead of $120.00 plus whatever interest rate could have been obtained from the dividend by re-investment. However, investors desire to take out their equity which can only be done by a distribution of assets which however may not be liquid or by the issuance of a stock dividend, which dividend will now be called water and hence poisonous.

Depreciation rate on generating equipment certainly will not exceed 2 per cent. On transmission lines, steel tower lines are certainly not built with the expectation that their life will be much less than 30 years, so that a depreciation rate of 3 per cent should be ample. The depreciation rate on distribution material however is high, transformers probably not less than 10 per cent, poles in the order of 8 per cent, cross-arms and hardware about 8 per cent, wire, through constant changing of size probably does not have more than scrap value at the end of ten years, which would make a depreciation rate of say 5 per cent. Taking all these items the writer is of the opinion that an 8 per cent depreciation rate is not too generous for distribution material.

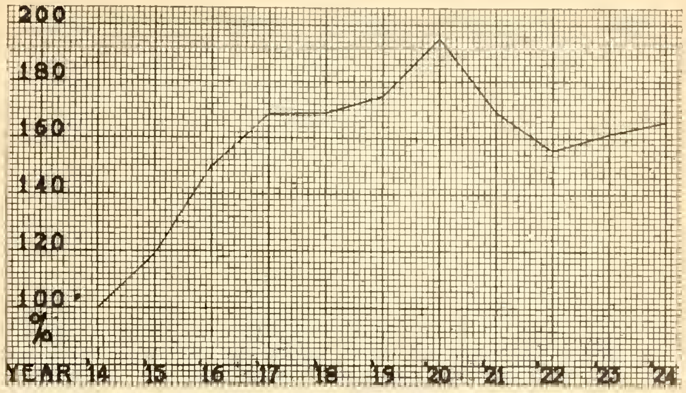

Figure No. 12.—Cost of a Mile of Distribution Line Serving Forty Customers

We are now in a position to reduce to a final table percentage figures showing the relative cost of investment, operation, maintenance and depreciation on the three items treated in this paper, generation, transmission and distribution.

Table No. 3, — Comparison of Various Costs involved in Generation, Transmission and Distribution of Power.

	Investment per H.P.	Per Cent Fixed charges	Per Cent Operating charges	Per Cent Mtce. charges	Per Cent Depreciation charges
Generation	$150.00	100	100	100	100
Transmission	$ 50.00	33	59	245	150
Distribution	$200.00	133	178	470	400

From this table, I think you will admit that I have been able to make out a prima facie case to support my

Table No. 4, — Index of Domestic Rates in Canada, 1911 to 1923, from Information compiled by the Department of Labour.

Rates in 1913 — 100

Year	Canada	Nova Scotia	Prince Edward Island	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
1911	113.4	100.0	....	100.0	107.7	117.3	144.4	123.0	129.3	124.7
1912	109.1	100.0	....	100.0	101.7	114.6	100.0	100.0	121.3	120.0
1913	100.0	100.0	....	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1914	96.5	100.0	100.0	100.0	96.7	95.7	100.0	100.0	94.9	92.0
1915	90.8	100.0	100.0	100.0	95.9	82.2	100.0	100.0	85.3	92.0
1916	87.6	97.2	100.0	100.0	93.5	74.9	100.0	100.0	84.6	92.0
1917	87.2	95.2	109.1	100.0	91.6	71.6	100.0	107.8	83.3	92.0
1918	85.8	96.0	127.3	100.0	79.4	69.2	100.0	112.5	83.3	90.7
1919	85.8	99.7	127.3	100.0	79.2	69.0	100.0	112.5	87.7	86.5
1920	84.2	99.7	127.3	100.0	78.6	65.7	100.9	103.2	92.2	86.5
1921	84.9	99.7	127.3	100.0	78.6	65.5	109.2	107.5	103.1	80.0
1922	82.7	99.7	127.3	100.0	73.6	63.5	100.0	107.5	99.3	78.6
1923	79.5	99.7	127.3	88.9	62.1	60.9	100.0	103.2	96.1	74.8

contention of last year, that distribution is the major expense in the cost of power to the consumer. Too often the uninformed person is prone to make statements to the effect that water power being a natural phenomenon should bring in its train a very low rate for power for all people who are finally supplied by the energy derived from water power.

As I stated last year, and as is quite common knowledge, the mere existence of a water power in no way means that people obtaining service from it at far distances can be guaranteed cheap rates. If power were developed by a philanthropic institution and given free of charge to distributing companies at the point of generation, the price could not be decreased to the ultimate consumer by more than half a cent per kilowatt hour. A good steam plant, situated near the coal fields can produce power just as cheaply in a fair size city as it can be laid down from a water power which is situated at any considerable distance away.

There are some natural water powers, such as Niagara, some of the original St. Maurice developments, where water power has been developed for something under $100.00 per horse power, making it possible for such power, if financed in a cheap money market, to perhaps be generated at $12.00 per horse power. This does not represent the price after transmission and distribution. This power however constitutes only a fraction of the total power which is in use in Canada to-day and will constitute a decreasing fraction as the requirements for power in Canada grow.

If we are to look for cheaper rates from power companies to a large bulk of their consumers, cheaper methods of distribution must be found or larger amounts of power distributed to each customer thereby giving a greater total revenue from each customer, which will spread the fixed investment.

I look forward to the time when the power companies will be able to give cheaper rates to the consumers but only by passing on the burden of distribution expense to the consumers themselves. I see in the future all residence consumers served at 2,200 volts with individual transformers used in combination with small fixed condensers and with regulating taps on the transformers so that the consumers can adjust their own voltage. It may be that instead of using transformers and condensers, we will use vacuum tubes, and 10 kilowatts or more per house will not be unusual, but the power companies' investment will be kept down to 2,200-volt cable entering the premises and the meter.

There is well over 10 kilowatts of useful utilization equipment now available, ranges, ironing machines, refrigerators, small portable heaters, also water heaters, appliances that constitute almost necessities, where the customer can afford the necessary capital to invest in them. Supplying power in bulk in this way to consumers, the price may easily be brought down to between 2 cents and 3 cents per kilowatt hour.

Power Development in Norway and Sweden

An account of the Scandinavian Tour arranged for Delegates to the World Power Conference, London, England, July 1924.

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Chief Engineer, Nova Scotia Power Commission.

Abstract of Paper read before the Halifax Branch, The Engineering Institute of Canada, January 22nd, 1925.

As an essential part of the World Power Conference, which was held in London, England, in July 1924, three alternative tours were arranged to visit outstanding power developments in various parts of Europe, one involving an itinerary through France, Switzerland and Italy, another through Scandinavia and a third through Great Britain. The writer chose the Scandinavian trip for a variety of reasons. Hydro-electric development in the countries of Norway and Sweden, where many physical conditions are the same as those existing in Canada, is very extensive, and there are many things to see of direct practical interest. Moreover, the writer was particularly interested to learn at first hand something of the workings of the public authorities in Sweden particularly, where very extensive power generating and supply operations are carried on as a State enterprise. There was also the fact, that the writer was directly interested in equipment being manufactured in Sweden for the Nova Scotia Power Commission.

It is proposed to give running comment on this tour in some detail since no official records of the same are available and very few Canadians participated.

The Scandinavian Tour

There were in all thirty-six members of the party including, in addition to the three delegates from Canada, representatives from the following countries,—England, Roumania, Russia, United States, Java and Italy.

The tour began on the morning of July fifteenth and the party departed from Kings Cross Station, London, bound for Bergen, Norway, arriving there early in the evening of the following day. On July seventeenth an opportunity was afforded of visiting the city of Bergen. In the afternoon of July seventeenth the party left Bergen by train for Norheimsund stopping on the way at Samnanger, the first hydro-electric power station of our itinerary.

Samnanger Power Development

This station is owned and operated by the municipality of the city of Bergen, being the main source of electricity supply for that city and its environs, from which it is distant about 22 miles. It has a total installed capacity of 28,000 h.p. in four units of 3,500 h.p. each, and two units of 7,000 h.p. each. Energy is generated at 7,500 volts and 50 cycles, a combination which is quite unusual with us, and is transmitted at 45,000 volts.

The plant is relatively old, having been completed in 1912, and has no features of particular interest or novelty. In general hydraulic layout, it is typical of the majority of the Norwegian hydro-electric developments. Relatively small quantities of water whose continuity and regularity of supply are assured by storage basins cheaply provided in natural lakes at high altitudes, are diverted from their natural channels through low pressure or open flow rock tunnels and pipe lines in such

Bjolvo Development 36,000 h.p., 2,800-foot head.

Tysse Development 142,000 h.p., 1,350-foot head.

Figure No. 1.—Hardangerfiord Development, Norway.

a way as to be utilized at high heads. The use of the tunnels is very common and for the most part, the nature of the rock is such that no lining is required from the standpoint of water tightness. So far as capacity is concerned, Norwegian engineers have found it more economical to dispense with lining, and overcome the increased frictional resistance of the natural rock surfaces by enlarging the cross-sectional area.

In the case of the Samnanger development, the head is 492 feet, a very high head indeed for us in this country, but insignificant as compared with at least two others in Norway which we were to see later.

With pipe lines of considerable length and great thickness due to the pressures utilized, expansion and contraction with varying temperatures becomes a serious matter. At Samnanger, and elsewhere, we saw pipe lines painted white with a view to preventing absorption of heat. We were unable to learn, however, anything precise as to the effect of this treatment.

The party returned to Norheimsund the same evening and on the morning of July eighteenth embarked on one of the attractive and comfortable fiord steamers on the well-known Hardanger-fiord. Our first call was at Aalvik where we visited the Bjolvo hydro-electric power station.

Bjolvo Power Development

This station is unique for the great head utilized, about 2,800 feet, or considerably over one-half mile. This head is made effective by means of rock tunnels and a single pipe line. The installation is comparatively modern, having been first started in 1918 for the purpose of furnishing power for the manufacturing of calcium carbide. The venture was not a success and only a small portion of the total installed capacity of 36,000 h.p. is now being utilized by sale in bulk for use in Bergen. Economically the whole project was a failure, and there seemed to be no immediate hope of improvement.

In the afternoon we visited one of the largest hydro-electric plants of our whole itinerary, that at Tyssedal.

The Tysse Power Development

The total installed capacity of this development is 142,000 h.p. and the head is about 1,350 feet concentrated in the manner already indicated in the Samnanger development by means of diversion tunnels and pipe lines. It is a comparatively old plant, the initial installation having been made in 1908 for chemical purposes in the adjacent town of Odda. Due to the failure of this industry, however, the development has now only a very small output, although we understood that a new chemical industry about to be established would take a considerable amount of the power now available.

After an evening meal at Tyssedal we again embarked on a small steamer for a brief ride to the town of Odda where we spent the night.

Industrially the situation at Odda is tragic. It is a place to which there has been extensive reference within the past few years due to the establishment there of great chemical works utilizing hydro electric energy from the large plant at Tyssedal. Since the war, economic conditions have been such that the operation of these chemical works has been abandoned, and they now appear to be rapidly falling into decay.

On the morning of July 19th, the party left Odda travelling all day by motor cars to Dalen. Early the following morning we boarded a small lake steamer and after a great variety of scenery and modes of travel arrived finally at Rjukan, having passed through the very considerable power and industrial centre of Notodden.

The route from Notodden to Rjukan lay in the valley of the Tinne river and its tributary the Maane. This is an important industrial area depending on extensive hydro-electric developments. From Notodden to Rjukan inclusive, there are seven hydro-electric developments on the same water course. At Notodden there are extensive pulp and paper establishments and chemical works. At Rjukan there are enormous chemical works and large hydro-electric developments for the fixation of atmospheric nitrogen. Rjukan developments, both chemical and hydro-electric, are most magnificiently housed. The valley in which Rjukan is situated is extremely deep and narrow, and it is stated that only during three months of the year do the residents of this community see any direct sunlight. A very well ordered and substantial town has been built for the officials and employees of the hydro-electric developments and chemical works, and every effort seems to be made to make living conditions as comfortable as possible in a location not well suited for habitation during a large part of the year.

Of all the hydro-electric and industrial developments in this particular section, we had an opportunity of visiting only one at Notodden, a pulp and paper industry, and the hydro-electric and chemical works at Rjukan.

Rjukan Power Development

The two developments in the Rjukan vicinity are of particular interest from the standpoint of their own magnitude, as well as the magnitude of the chemical industry which they support, their general scheme of development and the beauty of their structures. The upper station has an installed capacity of 160,500 h.p. and utilizes a head of about 1,000 feet by means of a tunnel over 2½ miles long and 11 steel penstocks. The water supply is regulated by storage to a continuous flow of about 1,750 cubic feet per second. A rock tunnel conducts the water from the tailrace of this upper station to a second development nearly three miles below, where a head of about 800 feet is utilized. The total installed capacity of the lower station is 120,000 h.p. Power is generated in both cases at 10,000 volts and 50 cycles.

An interesting feature of the whole situation is the utilization of steam storage locomotives for local transportation. Moreover the steam supply is a by-product of the electric furnace process for the fixation of atmospheric nitrogen. The hot gases from the electric furnaces are cooled by being passed through ordinary steam boilers.

At Notodden, on the return from Rjukan, special cars were provided for the railway journey from Notodden to Christiania where we arrived on the evening of July 21st. From Drammen, a railway divisional point, to Christiania we travelled over a section of state railway recently electrified. This electrification is being extended.

At Christiania an opportunity was afforded of visiting the various points of interest in and around the city and we were supplied with an excellent little booklet in English giving a short history and description of the supply of electricity in the city. The whole electricity and gas supply system is owned and operated by the municipality. The source of supply is largely hydro-electric from a variety of sources, including the municipality's own producing station and those of private organizations who supply in bulk. The diversity of its sources of supply and the rather extensive transmission network on which it depends tends to great reliability and continuity of service.

On the morning of July 23rd, we left by motor car for the vicinity of Askim where we visited two very large hydro-electric developments, one at Vamma, completed, and one at Morkfos-Solbergfos, under construction. Both of these are on the Glommen, the largest river in Norway, there being two other developments on the same river. The Vamma development with an installed capacity of about 50,000 h.p. is of the conventional low head type with horizontal units and does not call for special comment. It is privately owned.

The Morkfos-Solbergfos Development

The Morkfos-Solbergfos development with a head varying from 69 to 54 feet depending upon the stage of the river stood out in sharp contrast to the previous developments we had seen in Norway with tremendous heads, and in that respect was typical of the remainder of the developments we were to see in Scandinavia. As the name would indicate, the drop in two separate falls is concentrated at one point. Although originally begun in 1911, it is only now nearing completion. On the whole, although we had little time for inspection, it did not impress us favourably. The general plan of development is of a conventional modern type for the head involved with vertical, direct connected units with no unusual features. The whole construction, but particularly the power house, seemed unduly massive and consequently expensive. The dam, while built of concrete, is faced with granite masonry as a protection against ice and frost.

Taking into account the extended period of construction and the character of the resulting structures, there was grave doubt that the final result would be the most economical which could have been obtained. It did not appear even that the development would have any merit from the architectural standpoint. How much of the situation was due to force of circumstances and how much to design, we did not learn.

The writer did notice one small feature in connection with the installation of switching equipment which seemed worth remembering. This was the use of portable vacuum cleaners. The accumulation of dust and dirt in and around small switching equipment during construction is often not only a great nuisance but detrimental to the apparatus.

The development is being carried out by the municipality of Christiania and the government of Norway, jointly. The initial installation will be 87,500 h.p. with an ultimate installation of about 150,000 h.p.

We were picked up late in the afternoon by a special train at Askim station in the vicinity of the two developments just mentioned, and taken to the Swedish frontier at Kronsjo. Arriving at Kronsjo about 10 o'clock at night, we found awaiting us a special train of three sleeping cars and one baggage car, which was to be virtually our travelling home for the next few days. Here, too, Mr. Edy Velander of the Swedish Board of Waterfalls, who, accompanied us throughout our journey in Sweden, awaited us. The train was provided by the Swedish State Railways although in certain parts of our journey it was operated over private railway lines.

Upper Development, 160,500 h.p., 1,000-foot head. Chemical Work and Lower Development. Note tunnel location in hillside.) Chemical Works and Townsite.

Figure No. 2.—Rjukan Development, Norway.

Figure No. 3.—Vamma Development, Glommen River, Norway, 50,000 h.p., Low Head Type

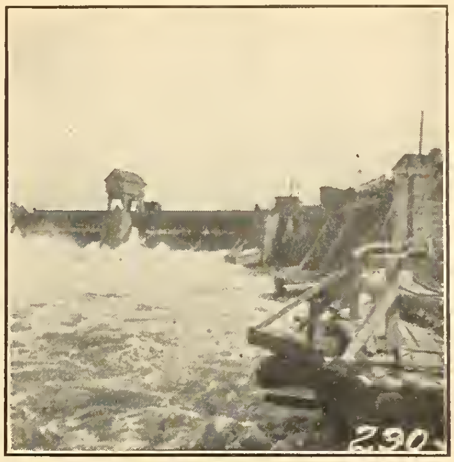


Figure No. 4.—Lila Edet Development

General Observations with respect to Norway

We left Norway with regret and a certain amount of feeling that conditions in Norway were not as happy as they might be. The country is exceedingly rough and rugged, and to obtain a mere existence must be a serious business. As is well known, during the past few years both the fishing and shipping industries on which the country mainly depends have been at an extremely low ebb. Moreover, as noted at Bjolvo and Tyssedal, we found huge power plants and chemical works for the most part lying idle. With the return to normal conditions since the war, the chemical works on which the hydro-electric plants depended for their market cannot be economically operated. Literally tens of thousands of horse-power are going a-begging! Since there are substantially no other industries in the country there is no immediate market for the power released from the chemical works, and the outlook in this direction does not seem at all bright.

Lila Edet Development

By the morning of July 24th we had arrived at Lila Edet, our first stop in Sweden, where we visited a power plant under construction by the Royal Board of Waterfalls of Sweden.

From the standpoint of new and unusual features this was the most interesting development seen on the whole trip. It is under construction, but sufficiently advanced that the general arrangement is readily apparent. In addition we were later to see both the generators and one of the hydraulic units in advanced stages of construction at Vasteras and Kristinehamm respectively. At the time of our visit, construction work was at a standstill due to labour difficulties. The site of the development is an existing navigation lock. Due to limitations of power-house space, it was necessary to limit the development to as few units as possible, with the result that in point of physical magnitude, these units are by far the largest in the world. The fact that each unit has a capacity of 11,200 h.p. at a head of 21.25 feet, and a speed of 62.5 r.p.m. gives some conception of their enormous proportions. The turbine runners are about 20 feet in diameter.

However, interest in this development lies not so much in the physical dimensions of its units as in the type of prime movers employed. The propellor type of runner with high specific speed is now quite common. In this particular development, however, two novel modifications of this type are being utilized. Two of the units are of the Lawaczech type with relatively numerous fixed blades which gives somewhat higher maximum efficiency than the usual propellor type.

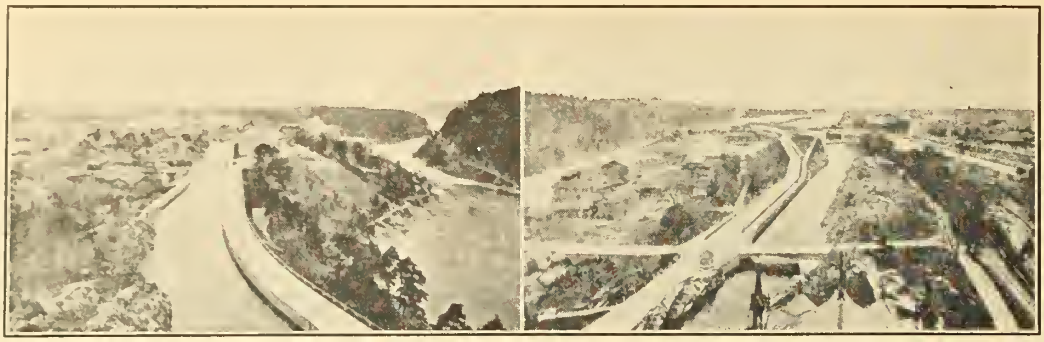
In common with all high speed types of runners, however, its efficiency is good over a comparatively narrow range of load. The third unit being installed is designed to overcome this difficulty. It is of the Kaplan type, and is of exceedingly novel construction in that the buckets which are few in number are movable. By the action of the governor, changes in load not only alter the gate openings but also the pitch of the turbine buckets. In this way, good efficiency is obtained over a wide range of load, although as yet the maximum efficiency obtained has never reached that of the more conventional types. Manipulation of the turbine buckets is accomplished through a hollow main driving shaft. A number of small runners of this type are already in successful operation, although nothing approaching the magnitude of the present unit has ever previously been attempted. Unfortunately, due to limitations of space, the draft tubes are of the elbow tube type instead of the more desirable spreading tube. A small but interesting detail of these tubes, which are of enormous proportions, is the fact that at the throats they are lined with vitrified brick to prevent any possibility of erosion by the high velocity of the discharging water. Such attention to details with a view to permanency, is typical of the Scandinavian developments. In particular, they do not seem to place the same reliance in concrete to which we are accustomed in this country.

Trollhattan

Embarking on a small steamer at Lila Edet we proceeded by water to Trollhattan, passing on the way through a series of locks. As has already been noted, throughout the Swedish trip we were the guests of the Royal Board of Waterfalls, which Board, in addition to its power development activities, administers the canals of the country. These are allied activities as indicated by the fact that both the Lila Edet and the Trollhattan developments involve both power and navigation.

Before visiting the Trollhattan power development, we were taken through the locomotive and turbine works of Messrs. Nydquist and Holm in the same vicinity. In these shops, we saw an order of 500 locomotives for the Russian Government in process of construction.

The Trollhattan power development, one of the earliest undertakings of the Royal Board of Waterfalls,



Power Canal Looking Towards Power House. Power Canal Looking Upstream, showing also old and new Navigation Canals.

Figure No. 5.—Trollhattan Development, Royal Board of Waterfalls, Sweden

was much featured in technical publications some few years ago, and by name, at any rate, was known to some of the party. Strange to say the writer had conceived of it as being located at an inaccessible and unattractive site. On the other hand, it is situated in a beautiful location on one of the historic water transportation routes of the country where for many years there have been navigation locks and canals and power development works of one kind or another. It is surrounded by a modern industrial town of great attractiveness. Here, as in some other small cities in Sweden, we found an excellent community building constructed and maintained as a public enterprise, combining the necessary public buildings with an excellent hotel. In this way, facilities were available for entertaining visitors which were much superior to those which would be expected in cities of such a size where hotel accommodations are left entirely to private enterprise.

The present power development was begun in 1907, opened in 1910, and from time to time during the years 1915 to 1920, extended to its present capacity of 150,000 h.p. The head utilized is 105 feet. A series of falls are concentrated by means of a canal about 3,300 feet in length. Water is conducted from the lower end of the canal by steel penstocks in rock excavations. The penstock intake chambers at the lower end of the canal are housed and extensive electrical equipment is provided to prevent and overcome ice troubles. The main generating station is a most attractive building of coursed, granite masonry. All switching is done in a separate building located at some distance from the generating station. This arrangement was also encountered in the other large development of the Royal Board of Waterfalls which we visited, that at Alvkarleo, and is somewhat unusual, although there is a similar arrangement in this country in the case of the Ontario Power Company development at Niagara Falls. Both generating station and switching room were in immaculate order, and here as everywhere, one was most favourably impressed with the operations of the Board and the excellent condition in which all its work and equipment were maintained.

While we had travelled from Lila Edet to Trollhattan by water, our sleeping cars had been brought around by rail, and late on the night of July 24th we departed for Ludvika, arriving there early on the morning of the 25th. Here we visited the transformer works of the Swedish General Electric, and later travelled by rail a distance of about 70 miles to Vesteras where the main works of the Swedish General Electric are located. The journey from Ludvika to Vasteras served to demonstrate a Diesel electric locomotive. Our special train was hauled by a locomotive of this type, and we were given every opportunity of inspecting its operation. It is a type of locomotive propelled by electricity generated aboard the locomotive itself with a Diesel engine as the prime mover. This type of equipment for light traffic is not new but appears to have received particular attention in Sweden due to the absence of coal and the mechanical aptitude of the Swedish people.

Vasteras

At Vasteras, we were the guests of the Swedish General Electric Company, commonly known as the ASEA, and were taken through their excellent shops. Here again, we found a large amount of equipment in process of manufacture for Russia. Large generators for the Lila Edet plant, the largest in the world from the standpoint of physical magnitude, were also to be seen partially assembled. From the writer's standpoint, this part of the journey was of particular interest because of the fact that there were in this shop two generators in process of manufacture for the Nova Scotia Power Commission which he had an opportunity of inspecting. These machines, by the way, are now installed in the Ruth Falls generating station at Sheet Harbour, N.S.

Here, too, we were able to visit a large steam plant of the Royal Board of Waterfalls, which is maintained as a stand-by and auxiliary to the Board's network of transmission lines depending mostly on hydro-electric sources of power. The fact, by the way, that all the industrial towns visited, such as Vasteras, Ludvika and Trollhattan, are supplied with power from hydro-electric sources, no doubt accounts in a very large measure for the cleanliness and attractiveness of these cities from a residential standpoint.

Uppsala

Leaving Vasteras early in the morning of July 26th, we arrived at Uppsala, the ancient university and cultural centre of Sweden, about noon. Of the greatest interest from our particular standpoint, was a visit to an electrified rural farming area adjacent to the city. Unfortunately, this part of our visit, as indeed the whole visit, was marred by a downpour of rain.

The general scheme under which electricity is supplied to farming areas was explained to us, and we were shown an electrical plough in operation. Great progress has been made in the electrification of the farming areas of Sweden, and it was stated that 40 per cent of all agricultural sections of Sweden are now provided with electrical service, chiefly through the medium of the Royal Board of Waterfalls, a state organization operating without profit. During the war, inability to secure oil for lighting purposes was a powerful incentive to extensions of electrical service in the rural districts. We gathered the impression that some of these extensions carried out under the exigencies of war would not entirely stand on their own feet economically.

Leaving Uppsala by train, we reached the hydro-electric power station of the city of Stockholm at Untra late in the afternoon. Part of this journey was made in a small electric storage battery car over the private railway line connecting the state railways with the power development. This is rather an old plant but in excellent condition. It is of the horizontal, open setting, multi-runner type, with a total capacity of 50,000 h.p. and calls for no particular comment except as to the extent of the embankments and dykes involved in conducting the water to the power house site.

Alvkarleo

From Untra we drove by motor car to Alvkarleo which is the site of the Alvkarleby power development of the Royal Board of Waterfalls, including extensive testing laboratories.

While more recent than that at Untra, it is of the same general type with a total capacity of 75,000 h.p. and a head of 60 feet. Each unit has four runners on a single horizontal shaft in an open flume setting. All switching is done in a separate building at some distance from the generating station. The outstanding feature of the whole development is the entire absence of all high tension protecting devices. This was frequently called to our attention as an outstanding feature of all the Board's operations.

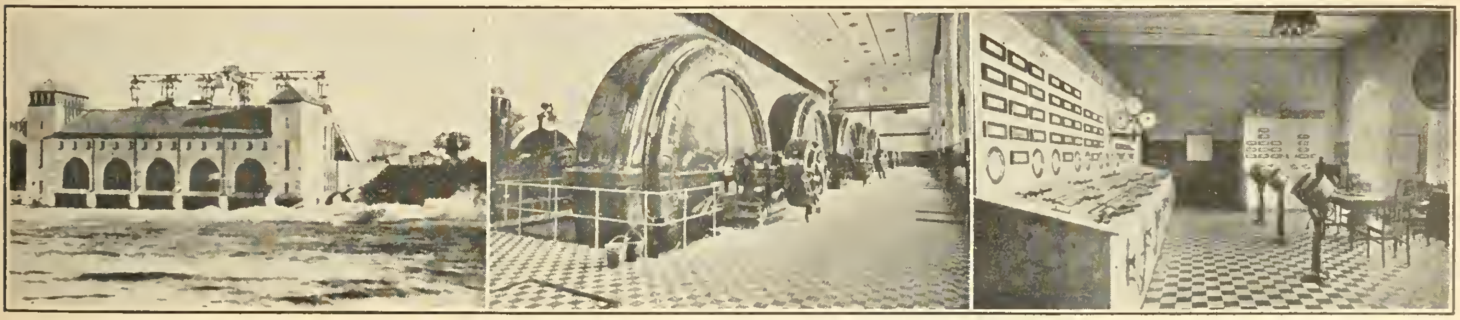
About noon, we departed for Stockholm where we arrived early in the afternoon. That part of the journey from Uppsala to Stockholm was an essential part of our itinerary as a demonstration of power development. Over this division of the railroad, a distance of some 70 miles, we were hauled by a turbine locomotive. A dynamometer car was attached between the locomotive and the train so that all the workings of the locomotive could be studied. The application of the turbine principle, which has almost completely revolutionized the art of power generation in the stationary field, to locomotives is quite new. The performance of this locomotive was excellent and its great advantage over the ordinary reciprocating type in smoothness of acceleration was readily apparent. We were informed that its efficiency from the standpoint of fuel consumption was just double that of the ordinary type of locomotive. In other words, it would do the same amount of work as the ordinary reciprocating type of locomotive with one-half the fuel consumption. Moreover, as the turbine works condensing, very little water is consumed.

The particular locomotive which was used in this demonstration had been used for some considerable time in regular operation over various divisions of the state railroads, and as a result of experiences with it, other locomotives of the same type are shortly to be placed in regular operation. The incentive, too, to use this type of locomotive in Sweden is particularly strong due to the absence of coal. While electrification is more ideal and is rapidly taking place, these locomotives will have a great field of usefulness in sections where existing conditions do not economically warrant electrification. In addition, too, in arid or semi-arid districts where water for steaming purposes is scarce or unsuitable, this particular type of locomotive may be used to advantage.

At Stockholm there was a distinct breaking up of our party, although we had already lost a few of the original group. Quite a number took advantage of a subsidiary tour to Lapland, others left for Copenhagen, while others of us continued to Hamburg on the main route of the itinerary.

Monday, July 28th, in accordance with the schedule arranged, was to be spent in Stockholm and its environs. However, by private arrangement three of us, Messrs. White of the Allis-Chalmers Company, Gale of the Hull Electric Company, and the writer, made arrangements to visit the "Verkstaden" Turbine works at Kristinehamm. We left Stockholm by train early in the morning reaching Kristinehamm along in the afternoon. We found here an excellent hydraulic testing laboratory for turbine runners and draft tubes. We also saw the largest turbines in the world, from the standpoint of physical magnitude, those being constructed for the development at Lila Edet, as well as some very large turbines for Russia. As already noted, particular interest has centered in the Lila Edet turbine not only because of its physical dimensions, but because of its unique type in that it is designed with movable blades.

By means of a hurried motor drive of some 70 miles we were enabled to catch a train at a place called Orebro, which train eventually landed us about one o'clock the following morning at a junction point called Mjolby, where we picked up the train carrying our through sleep-



Exterior View of Power House. Interior View of Power House. Control Room in Transformer Station.

Figure No. 6.—Alvkarleo Development. Royal Board of Waterfalls, Sweden ing cars from Stockholm to Hamburg on which were the other members of our party who were proceeding direct to Hamburg.

About nine o'clock on the following morning our sleeping cars were placed on board a large train ferry of the magnitude of an ocean liner and we were landed at Sassnitz on the north of Germany and proceeded by rail to Hamburg. As far as seeing power developments was concerned our itinerary was at an end and this later part of the journey was merely by way of returning home.

General Observations on Sweden.

Our itinerary through Sweden had been most delightful. The striking contrast between Sweden and Norway in many respects had been an added source of interest. It is true that the languages of both countries are much alike, to such an extent indeed, that each can understand the other. However, as compared with Norway, the whole atmosphere in Sweden is that of a wealthy prosperous nation. The general aspect of the country itself is for the most part much more hospitable, and as a matter of fact, in years of normal crop, Sweden is about two-thirds self supporting. Its population is about three times that of Norway, while its area is not materially different. It is highly industrialized, and all industries seem to be in a fair state of prosperity. One always felt in Sweden that the hospitality and attentions of the Swedish people could be accepted without any reservation whatever, since it required no unusual effort on their part. As confirmation of the relatively prosperous times existing in Sweden, it may be pointed out that at the time of our visit Swedish currency was at a slight premium internationally.

Scandinavian Tour from Power Development Standpoint

From time to time through this commentary on the Scandinavian tour, attention has been called to various items of technical interest. For the most part we visited older plants in which there was nothing of outstanding interest, or anything differing materially from our own practice in this country. Everywhere, however, there was an indication of greater attention to details than is generally shown in this country. Invariably power house floors are tiled. One small feature, but quite prominent everywhere, is phase indication in all leads and busbars by colors. Elaborate switch boards of the bench type with flush instruments are common, and no expense seems to have been spared to make generating and switching stations complete and attractive. Generating voltages in the vicinity of 10,000 are almost universal, as is also a frequency of 50 cycles. At Trollhattan, originally designed for 25 cycles, the latter units are arranged for either 25 or 50 cycle operation, and the earlier 25 cycle operation is evidently being abandoned wherever possible. With us, of course, 60 cycles is standard except in the outstanding case of the Niagara system of the Hydro-Electric Power Commission of Ontario which is being perpetuated at 25 cycles. As a rule too, our generating voltages are lower, 2,300 or 6,600 at the most, except in cases where for special reasons such as transmission at generator voltage, the higher voltages are used.

Economically it was difficult to understand in some areas, particularly in Norway, light transmission and distribution lines extending in seeming great profusion over the roughest and most thinly populated territory. However, these lines were obviously of the lightest possible construction and the roughness of the general aspect of the country may have been deceiving as to the number of people served. Statistics indicate too, that individual consumption is high. The type of construction was singularly uniform and characteristic. Light wood poles, easily obtained locally, are used and the wires are supported on simple, individual, iron brackets resembling a sickle with the point turned upwards and carrying an insulator and the handle driven into the pole.

On the hydraulic side, the use of roller gates seems to be almost universal. Generally, too, no chances are taken of the disintegration of concrete surfaces by ice or rapidly flowing water, and pier noses and other exposed surfaces are faced with masonry. The installation of electrical heating devices in some of the gate openings of the dams to prevent ice troubles was of considerable interest. In only one case, however, that of Trollhattan, did this electrical installation seem actually to be used. The construction and utilization of unlined rock tunnels is common practice.

In the Lila Edet development, however, of the Royal Board of Waterfalls of Sweden, we found a development which in every way exhibited new and novel features. In the first place there are the enormous physical proportions of the equipment. We were able to descend into the draft tubes which are of enormous proportions as compared with anything of the kind in this country. A special feature of these tubes, which are formed of concrete, is the lining of the restricted portions, where the velocity is the highest, with vitrified brick. In addition we have the Kaplan runner with its movable buckets which, while not quite the first of its type to be placed in commercial operation, is certainly the first of anything like its magnitude. There are in addition the Lawaczech runners which are a distinct variation from the usual type of turbine runners now in use. On the whole, this development represents a very distinct advance in hydro-electric practice, and when completed, the results of its operation under commercial conditions will be of much interest.

The Royal Board of Waterfalls of Sweden created an extremely favourable impression. It is a state organization owning and operating about one-third of all power developments throughout Sweden, including by far the most extensive system of transmission lines. The pride of all the officials and employees, from the director-general down, in their organization and in their whole operations, was a revelation to many, particularly from the United States who are not accustomed to expect such a situation in state enterprises. Every part of their works and equipment even to their motor cars were immaculate in appearance, and in the highest state of efficiency. All operators and attendants were in uniform.

From the technical standpoint, the one thing which was emphasized time and again, and which stands out prominently in the operations of this Board, is the simplicity of its electrical arrangements, and the absence of all protective devices against disturbances arising on their lines from lightning or other causes. Notwithstanding the absence of such devices, the Board was obviously furnishing continuous and satisfactory service, and had been doing so for many years. Officials of the Board did not attempt to make any explanation other than to say that they were prepared at any time to adopt such devices if they experienced unsatisfactory service with their present apparatus. It was evident, however, that the Board is continually carrying on experimental work along these lines, and the experiments of Dr. Norinder, one of its employees, on lightning phenomena are internationally known.

It is probable that lightning conditions throughout their territory are not so severe as in the interior of the North American continent, and in addition they are afforded some protection by their transformer construction. It seemed, too, that their line insulation had a much larger factor of safety than that which we are accustomed to employ in this country.

The utilization of diesel-electric locomotives and turbine locomotives, to which reference has already been made, indicates that Sweden is in advance of other countries in this particular field of fuel power. Steam accumulators or reservoirs developed in Sweden are receiving a great deal of attention, while steam storage locomotives recently featured in the technical press of this country were seen in regular operation at the Rjukan chemical works, and evidently had been in use for a number of years. Furthermore, in this particular instance, the steam is a by-product of the electric furnaces used primarily for the fixation of atmospheric nitrogen. The hot gases from the furnaces are passed through boilers of the usual type to generate steam.

In general, there was evidence on every hand of a very high degree of engineering skill on the part of the Swedish people as a whole, not only in purely scientific attainments but in the practical application of scientific principles.

In Canada and the United States there has been, and still continues, active controversy as between public and private ownership and operation of public utilities. Both in Great Britain and in Scandinavian countries, by far the greater part of the electricity consumed is supplied under public auspices. The writer understands that throughout Great Britain, about 80 per cent of the electricity supply systems are publicly owned. In Bergen, Christiania and Stockholm the electricity supply systems are exclusively municipal. The extent of its operations and the nature of the RoyalBoard of Waterfalls in Sweden has already been mentioned. In fact, it seemed to the writer that there is no question in those countries as to the public ownership and operation of public utilities, although there is some conflict of jurisdiction as between the state and individual municipalities. Whereas in this country, there is controversy as regards the principle itself, in those countries the principle of public ownership has been generally accepted and it is now merely a question of the agency involved. In Ontario, where the state body is in effect a union of municipalities, no such difficulty is likely to arise, and the same is true as regards the policy now in effect in the Province of Nova Scotia.

Not the least important part of the Scandinavian trip was the opportunity afforded to learn at first hand the conditions existing in the various countries represented by the delegates. The Russian delegates, however, were somewhat of a disappointment in this connection due to the difficulty in conversing with them, and it seemed quite impossible to learn anything from them as to the actual conditions in Russia, social, economic or otherwise. Since the electricity supply situation in the British Isles is of outstanding importance not only to Great Britain but to the British Empire as a whole, and for sometime past has been receiving the greatest possible attention on the part of public men, we were fortunate in having in our party Mr. Archibald Page, one of the Electricity Commissioners for Great Britain. Mr. Page was not only well informed in his own particular field of activity, but was a most congenial travelling companion, as were also his English associates, Messrs. Twiss and Masters. Mr. Page had a particular interest in Canada and in Halifax especially because he had been trained in the public utility business under a Mr. Starr, originally from Halifax. It is exceedingly difficult to evaluate associations with men of intelligence, experience and responsibility from various parts of the world, but certainly, that the mental stimulation thereby obtained, as well as that the incidental information, is of very real value, is not to be doubted.

EDITOR'S NOTE: *In Mr. Smith's paper, of which this is an abstract, the author speaks very highly of the courtesies extended to the touring party throughout their visit to Norway and Sweden. In addition to the description of the various plants which is reproduced herewith, Mr. Smith has gone into considerable detail describing various points of interest in these two countries.*

The Steam Accumulator

Its Principles and Application to various Industries

G. E. Lofgren,
Chief Engineer, Pulp and Paper Division, Combustion Engineering Corporation, Limited.

Paper read before the Montreal Branch, The Engineering Institute of Canada, March 19th, 1925.

In the mechanical field the problem of equalizing fluctuations has, from the first, been a subject of intense study. The steam engine, as invented by Watt, was not considered complete without a flywheel of sufficient weight to equalize the variations. The energy stored in the rim of the flywheel was sufficient to take care of fluctuations *lasting for a few seconds.* In many cases the fluctuations to be taken care of required enormous flywheels. By separating the flywheel from the engine and driving it at considerably higher speed, Ilgner succeeded in constructing a device which, as it allowed higher speed variations than before, could store sufficient energy to equalize fluctuations *lasting for several minutes.*

A parallel to the evolution of the steam engine and the flywheel can be drawn by the steam boiler. As steam is transformed in the steam engine into power, so in the boiler is heat transformed into steam, the water space being the substitute for the flywheel. By allowing pressure variations in the boiler, fluctuations can be taken care of due to the accumulator capacity of the water contained in the water space. The equalizing effect, however, is limited by the size of the water space and the range of the pressure variations. The aim of this paper is to describe a device by which energy storage can be obtained and by means of which it is possible to take care of fluctuations *lasting for hours.*

Early Types of Steam Accumulators

The pioneer boilers did not make evident the need of a steady load. This was due largely to the fact that the first boilers were operated at low pressure and were constructed with large water volume. As the industries became more elaborate, the steam consuming processes became more irregular and complicated, the steam demand and the steam pressures were increased. The boilers were built for correspondingly high pressures, in larger units and, in order to lower manufacturing costs, with smaller water space, which, however, made it more difficult to follow fluctuating loads, and engineers began to look for some solution to this problem of making the boilers independent of the fluctuating steam demand.

In this connection, several inventions were brought forward. The MacNicol boiler, for instance, was a combination of the old large water space boiler and the modern water tube boiler. The Druitt-Halpin accumulator was, in effect, a feed water heater which had in view the provision of a means for overcoming peak loads in electric power plants. The Rateau accumulator was designed for the sole purpose of utilizing exhaust steam from intermittently working steam driven machinery, etc. Of these various inventions the Rateau accumulator alone has survived, and is used within a limited field of application.

All of the above mentioned systems were based on the principle of the steam accumulating power of water. The first man, however, to so realize the value of water as a medium for energy storage as to develop a system for storing large quantities of energy, quantities large enough to take care of fluctuations lasting for hours, was the eminent Swedish engineer, Dr. J. Ruths. In 1917, after five years of extensive research, he built his first accumulator which is still operating successfully in a Swedish pulp and paper mill. Since that time, over two hundred of these accumulators have been installed in various industries.

Principle of the Ruths Steam Accumulator System.

The steam accumulator system is based on a well known physical principle, namely, the property of hot water to absorb heat in proportion to the quantity and the rise of temperature. In figure No. 1 is shown the amount of steam evaporated by one cubic foot of boiler water when there is a pressure drop of 10 pounds per square inch, from different initial pressures. It can be seen from the diagram that if the pressure should drop from 200 to 190 pounds per square inch, 0.27 pounds of steam would be evaporated, whereas if the pressure dropped from 20 to 10 pounds per square inch, the evaporation would amount to 1.10 pounds, or four times

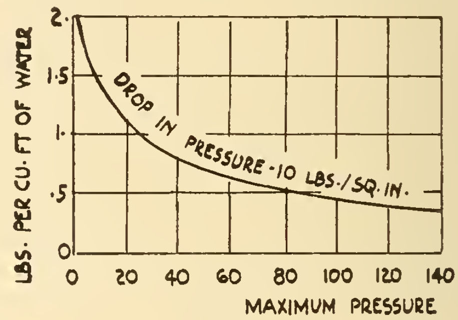


FIG. 1

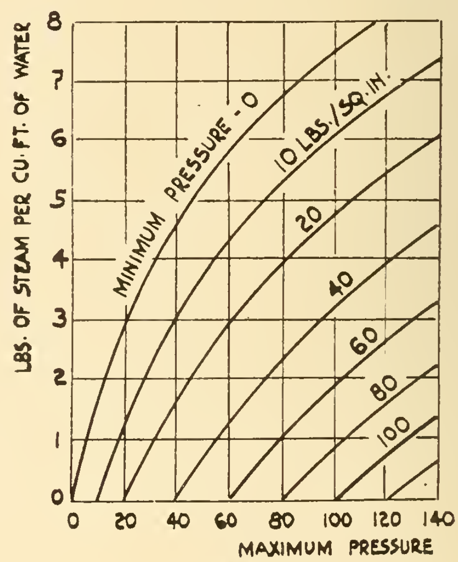


FIG. 2.

Figures Nos. 1 and 2

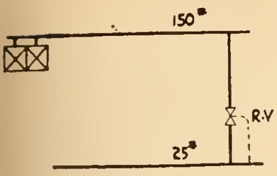


Figure No. 3

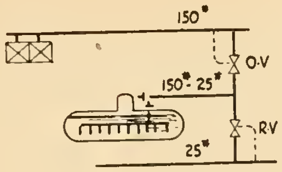


Figure No. 4

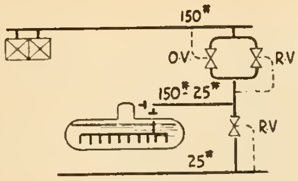


Figure No. 5

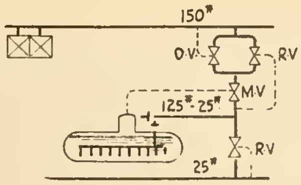


Figure No. 6

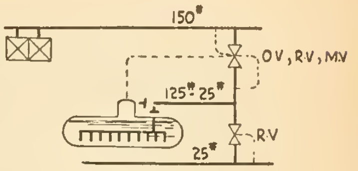


Figure No. 7

as much steam. Water cannot store or give up heat unless pressure variations are permitted. The larger the permissible variation in the pressure, the greater is the amount of steam which can be stored. Figure No. 2 shows the quantity of steam which can be stored in one cubic foot of water under a wide variety of conditions. Between a pressure range of 140 to 60 pounds per square inch, 3.3 pounds of steam can be stored. The same quantity can be stored between 65 and 20 pounds per square inch. From these two diagrams it is easily understood that an efficient steam accumulator comprises a large tank of boiling water from which steam should be discharged at the lowest possible pressure, and in which considerable pressure variations must be allowed in order to obtain high storage capacity.

The arrangement of the steam accumulator tank in the power plant must be such that it is connected between a high pressure and a low pressure steam line. At times when there is an excess of steam supply over requirements, steam flows from the high pressure line to the accumulator, causing in it a rise of pressure. At other times, when there is a peak load in the plant, steam flows from the accumulator to the low pressure line, causing in the accumulator, a drop of pressure. The pressure in the steam header is always kept constant, and the accumulator pressure only is allowed to vary.

Figure No. 3 shows an arrangement often used in industrial plants. Steam is generated in the boiler house at, for instance, 150 pounds per square inch pressure and reduced by means of a reducing valve *RV* to 25 pounds. Due to a fluctuating steam demand, the boiler pressure cannot be kept constant. Ruths' idea was to insert an overflow valve *OV*, (figure No. 4), which only passes enough steam to maintain a constant pressure in the boiler. In most cases, however, the steam supply through *OV* and the steam demand through *RV* are not always equal and there is a difference in time between them. Therefore, a steam storing device, i.e. a steam accumulator, has to be inserted between *OV* and *RV* capable of storing enough steam to maintain the balance. The combination of these special valves with the accumulator, is the distinguishing feature of the Ruths steam accumulator system.

If the pressure in the accumulator drops to 25 pounds and there is still demand for steam in excess of the supply from the boilers, the low pressure will drop below 25 pounds. To prevent this, a reducing valve *RV* is connected in parallel with *OV* by passing steam enough to maintain the low pressure regardless of the condition of *OV*, (figure No. 5). Sometimes the accumulator is built for a lower pressure than that of the boilers, for instance for 125 pounds. In this case a valve is required which will protect the accumulator from being overcharged, i.e., a valve *MV*, (figure No. 6), which throttles the supply of steam if the accumulator pressure reaches 125 pounds regardless of the condition of the valves *OV* and *RV*. By using these four valves an absolute balance and constant pressure are maintained except in such extreme cases as have been mentioned above. Figure No. 7 shows an improved arrangement in which a single valve replaces the three valves *OV*, *RV* and *MV* and still performs their various functions in exactly the same way. It can be seen that this triple function valve has considerably simplified the system. The arrangement shown in figure No. 7 can be applied to the various conditions existing in different industries.

Construction of the Accumulator

The accumulators are built in the form of cylindrical steel tanks with hemispherical ends. They are filled with water up to 90-95 per cent of their capacity. Figure No. 8 shows such an accumulator in longitudinal section. *B* is the vessel constructed of riveted steel plates. *I* is a covering of non-conducting material usually consisting of a magnesis composition. *I-K* are insulation blocks covering the riveted seams of the shell. They are made removable, so as to enable the inspection of the seams to be readily carried out. The lagging is protected by a sheet iron cover, *E*.

The heat losses of the accumulators are considerably less than is generally imagined, and are so small that they are of no practical consequence. Results of insulation tests made on accumulators in practice show that

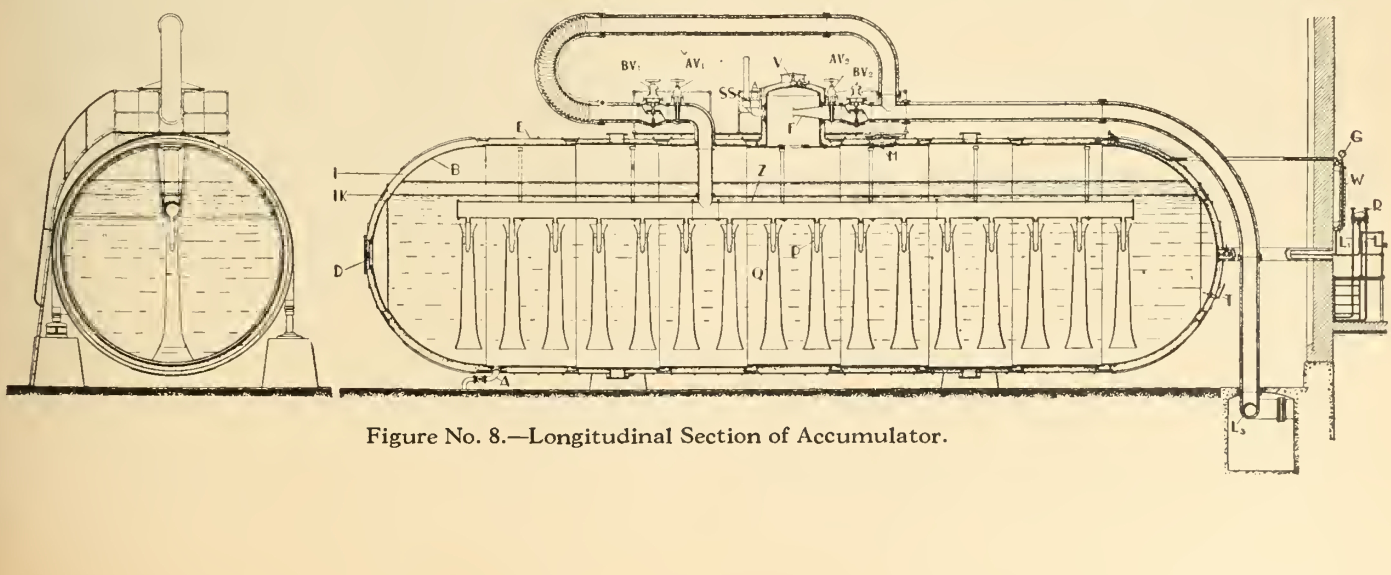


Figure No. 8.—Longitudinal Section of Accumulator.

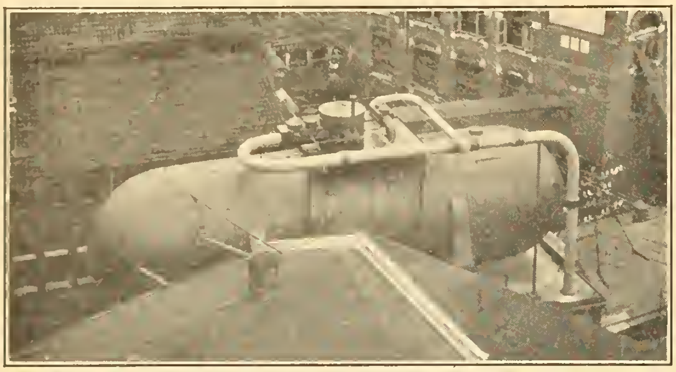


Figure No. 9.—Typical installation of Accumulator.

with the thickness of insulation generally adopted, the heat losses correspond to from 0.1 to 0.5 per cent only, of the coal consumption of the boilers, and are, therefore, of little importance. That being so, the accumulators are usually erected in the open air, and often at some distance from the boiler house, in factory yards, etc.

The accumulators are equipped with the fittings usual in boiler practice, and further with arrangements for the charging and discharging of the steam. The non-return valve BV_1 admits charging steam to the internal steam distribution pipe Z, and the charging nozzles P, which are equipped with the circulation pipes Q to ensure a uniform heating of the water. Through valve BV_2 the discharge of steam takes place.

The expansion of the accumulator is provided for by erecting it on four lugs of cast steel which are riveted to the sides of the tank and distribute the bearing reaction over a large surface, at the same time serving to stiffen the plates. One support is fixed whereas two rest on rollers, the one enabling longitudinal, the other lateral displacement. The fourth is a pendulum support allowing displacement in either direction. Figure No. 9 shows a typical installation of an accumulator.

Size of the Accumulator

The capacity of an accumulator for a given plant is determined by the magnitude of the fluctuations of the steam consumption only and not by the capacity of the boiler plant. Thus a steam flow chart showing the total steam consumption of the plant, or, if the steam consumption is fluctuating in one department only, a chart from this department will be sufficient for calculating the capacity of the accumulator. The storage capacity must be equal to the largest surface area above or below the line of the average steam demand.

The volume of the accumulator is a function of the required accumulating capacity and the permissible pressure drop. The relationship between maximum pressure, minimum pressure and storage capacity of one cubic foot of water at different drops in pressure, is already shown in figure No. 2. By using this diagram the volume of the accumulator can be easily calculated. Suppose the accumulator is connected between two pipe lines carrying a pressure of 140 pounds per square inch and 25 pounds per square inch, according to the diagram, one cubic foot of water then can store 5.5 pounds of steam. If a storage capacity of 25,000 pounds of steam is desired and the accumulator is filled to 95 per cent with water, the volume of the accumulator will be, $\frac{25000}{5.5 \times 0.95} = 4800$ cu. ft.

Steam accumulators have been built in sizes of from 200 cubic feet volume to 13,000 cubic feet, and in one mill an accumulator installation of a total volume of 37,000 cubic feet with a capacity of 150,000 pounds of steam has been erected. However, it was subdivided into three separate compartments.

The Steam Switchboard

The regulating valves, which are of special design, play an important part in the proper operation of a steam accumulator installation. They are oil pressure operated, and are very sensitive and reliable. All valves necessary for the regulation of the system, in most cases two to five valves being required, are erected in a central part of the mill forming a "steam switchboard" and making possible a reliable and simple centralized steam control. It is easily understood that unless steam is available the instant it is required, and can also be stored the instant it is available, difficulties must arise.

The valves must be of a high degree of accuracy even with as simple an arrangement as that shown in figure No. 7. If the system were more complicated, involving a larger number of valves working in parallel or series with, for instance, steam turbine governors, the necessity of a high standard is even more evident.

This problem has been excellently solved by the A.V.A. valves used in connection with the Ruths accumulator. The valves are automatically controlled by the different steam pressures as indicated on the piping diagrams by dotted lines. A relais is mounted on each valve in which a small variation in the steam pressure of a fraction of a pound causes a considerable change in the oil pressure by means of which the valve is operated.

The most remarkable features of the A.V.A. pressure regulator are: It is sensitive in operation; a single valve can be controlled from two and more different pressures; all parts work in oil and, therefore, are subject to practically no wear, with consequent reliability; it can be shut in a moment by means of an emergency trip handle and it can be operated if necessary by means of a hand wheel. Figure No. 10 is a photograph of a typical steam switchboard.

General Benefits

The benefits of the steam accumulator system are dependent upon the condition in the individual steam plant. In some plants the fuel saving ranging from 10

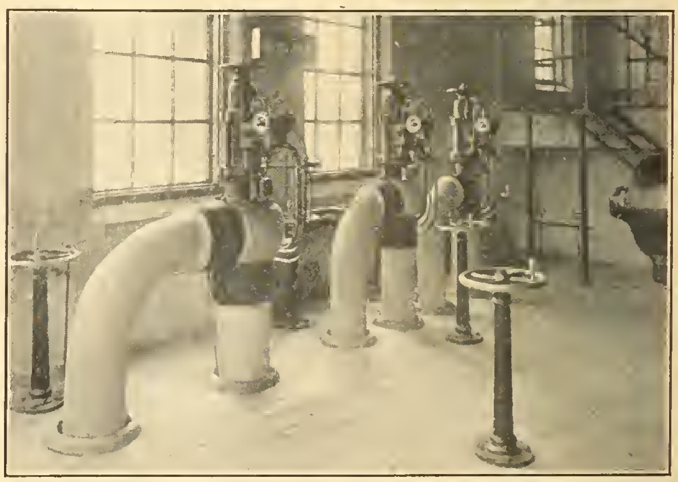


Figure No. 10—Typical Steam Switchboard.

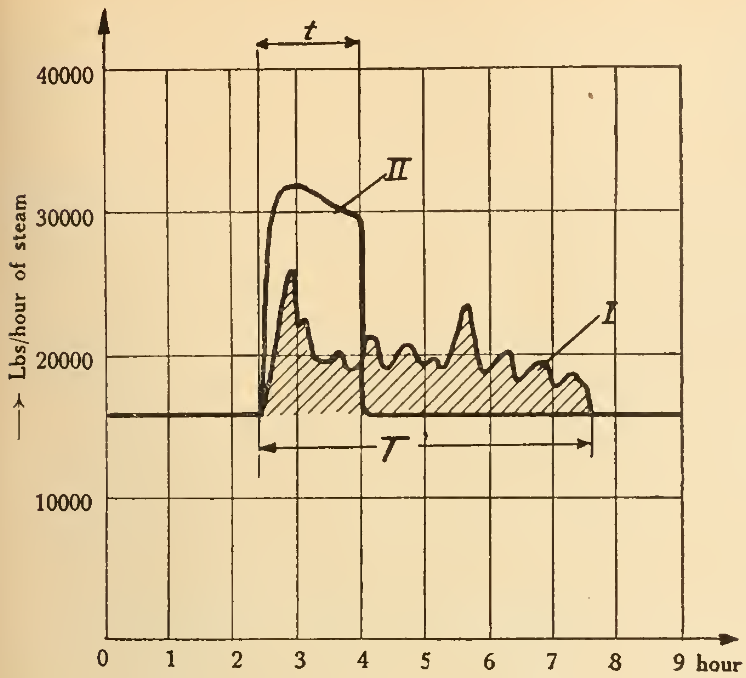


Figure No. 11.—Reduction in Time required to get up Steam in Factory after Installation of Ruths Accumulator.

to 30 per cent is the most important advantage; in another, increased output of back pressure power or increased production in the manufacturing department due to sufficient supply of steam, is most valuable. Often the accumulator makes unnecessary the installation of additional boilers or makes it possible to carry the load with fewer boilers in operation i.e., it increases the boiler capacity. For a new boiler house, this means saving in first costs of the steam generating plant. The entirely automatic operation of the accumulator results in a noteworthy labour saving and the elimination of peak loads means a reduction in the strains placed on the boiler brickwork which accompanies a fluctuating load and further the stokers never need be forced. This will reduce the upkeep costs for boilers and stokers to a minimum.

Of special benefit is the accumulator in plants where process steam is used for generating power in back pressure or bleeder turbines; the power output being considerably increased by the equalizing influence of the accumulator.

A great number of accumulators have been installed for storing of steam generated by surplus electric energy. In plants equipped with electric boilers only, the accumulator has proved to be of indispensable assistance. If power is purchased on a maximum demand basis, the elimination of all peak loads means a corresponding saving in cost for electric power and the operation of the electric boilers will be much simplified. A large accumulator to be installed in connection with electric boilers in a Canadian paper mill, is now under erection.

The economy in fuel consumption is readily understood but the increased output from the factory seems to be a more important matter and needs some explanation. Lack of steam often occurs in factories just when an increased supply of steam is badly needed for carrying on a manufacturing process. The process is then delayed or the quantity of the product lowered. Through eliminating the loss of time due to the sluggishness of the boilers in face of a sudden demand for extra steam, the accumulator makes possible an increased production. For example, a heating process normally consuming steam at the rate shown by curve 1 in figure No. 11, (which rate is dependent on the steam supply from the boilers), can be intensified by accumulated steam to the high rate shown by curve 2, whereby the time (T-t) is saved.

Further it must be borne in mind that as a rule, of two operations proceeding simultaneously, the cruder process, such as "heating up", etc., will generally use steam to the detriment of the more refined operations like drying or chemical processes. By impediments of this kind the conduct of the manufacture, from the point of view of obtaining high quality, is rendered more difficult, and, as a matter of fact, irregularities of this nature in the steam supply to the individual apparatus are frequently the cause of the production of so-called "second grade" qualities.

By the adoption of an accumulator, the steam generating plant and the different manufacturing departments can be conducted independently of one another. In certain factories equipped with accumulators, increased output of up to 25 per cent has been obtained without any further equipment being installed.

Field of Application for the Accumulator

By the use of an accumulator it is possible: To eliminate variations in the rate of consumption of steam; to eliminate variations in the rate of consumption of power; and to eliminate variations in the supply of heat.

There is practically no industry where variations of one or more of the kinds mentioned above do not occur. The elimination of these variations is accomplished by the accumulator. Among those industrial works in which the accumulator has proved to be of exceptional value are: the pulp and paper industry, the textile industry, the chemical industry, the steel and mining industry, the rubber industry and the sugar industry.

In plants where surplus electric energy can be used for steam generation, the accumulator renders an indispensable service. When hydro-electric power is transmitted over long distances, it is usually necessary to install local standby steam power stations in order to safeguard the supply. The operation of such standby stations can be considerably improved by installing an accumulator.

The accumulator has further been installed in distilleries, breweries, starch mills, marmalade and candy works, dairies, tanneries, hospitals, hotels, laundries, etc.

As a flywheel is considered to be an indispensable part of a power engine, so within a few years, will the accumulator be considered to be an indispensable part of a steam or power installation as it performs exactly the same function as the flywheel.

THE

ENGINEERING JOURNAL

THE JOURNAL OF
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VOL. VIII AUGUST 1925 No. 8

The Institute's Employment Bureau

After a long period of comparatively little activity in the employment of engineers there have been decided indications that the situation is improving, and within the past few weeks enquiries have been received from a number of organizations indicating that they will be requiring the services of a number of technically trained men. These enquiries are for men with experience in design and detail draughting on structural steel work and in connection with pulp and paper mill extensions. The receipt of such enquiries usually precedes renewed activity in general construction work, and it is anticipated that a considerable increase in the number of enquiries will be received for men in the different branches of the profession

The employment bureau of *The Institute* as operated from the headquarters office and through *The Engineering Journal*, is maintained for the benefit of the members, and its services are free to all members, so that those desiring positions should place on file a record of their experience, preferably in duplicate, in such a form that it may be submitted to prospective employers without the delay of communicating with the individual member.

One of the chief difficulties in the operation of the employment bureau, in the past, has been the lack of co-operation received from both the men desiring employment and the employer, in the matter of keeping *The Institute's* office advised frequently as to requirements. If the members would notify headquarters as soon as they have secured a position or as soon as they have received a decision from the employer with whom they have been placed in touch through *The Institute*, it would be of great assistance in keeping the records complete and would facilitate the placing of men in suitable positions.

Lists are maintained of men of different qualifications and a member's name will be kept on the list for a period of two months after the receipt of his application for employment. If in that time the member has not secured a position he should again notify headquarters that he is still available. This procedure is necessary in order to avoid delay in communicating with members who have secured positions since filing their applications, and it is hoped that through a closer co-operation in this manner more effective work may be carried on in connection with the employment bureau.

The co-operation of members of *The Institute* who are engaging engineers, is also earnestly desired. Advertisements for engineers will be inserted in *The Engineering Journal* without charge, and pending the receipt of replies to such advertisements, this office will supply the names of members, who have the desired qualifications, from the lists on file.

A large percentage of the enquiries for technically trained men, which have been received in the past few months, have required personal interviews, and as the majority of these enquiries emanate from the vicinity of Montreal, it is only natural that men in this locality have the advantage of being able to present their case personally. It is the policy, however, of the employment bureau to submit the qualifications of all the men on the lists, no matter where located, so that the openings may be available to all members.

Applications for employment should be made on regular letter size paper and should be typewritten if at all possible. These applications should include the following information:—Name, address, telephone number, academic qualifications, class of work desired, salary expected, when available, experience (with dates,) names of employers, and details of work. Special forms for this purpose are available at *Institute* headquarters upon request.

The Maritime General and Professional Meeting

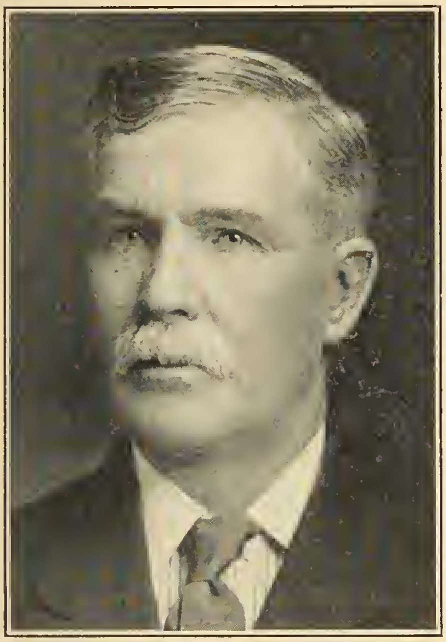
The Maritime General Professional Meeting will be held in Halifax early in October. Dates will be announced in the next issue of *The Journal*. Members of *The Institute* who have had the good fortune to visit the Maritime Provinces in the fall of the year will look forward with considerable pleasure to joining the members of the Maritime Branches of *The Institute* at their professional meeting which is being held under the auspices of the Halifax Branch. Arrangements for this meeting are being completed and members are assured of a meeting at which the business sessions will be well balanced with entertainment.

OBITUARIES

John Edington, M.E.I.C.

News of the death of John Edington, M.E.I.C., former city engineer of Moncton, New Brunswick, which occurred at his home, 59 Union street on Wednesday, July 8th, 1925 will be received with very sincere regret by a wide circle of friends both within the profession and in private life. He was taken ill on June twenty-second while on his way to St. John's Presbyterian church and had been confined to his home ever since. For about twenty-five years Mr. Edington had filled the position of city engineer of Moncton and retired in April 1924, occupying since the position of consulting engineer for the city.

The late Mr. Edington was 71 years old having been born in Troon, Ayrshire, Scotland, on May 6th, 1854. While still a boy he moved to Muthill, Perthshire, where he received his education in the public school and at the Academy, Crieff, Perthshire, later going to Glasgow, where he graduated from the Athenaeum Technical Institute of that city. He was resident engineer for a number of corporations in Scotland.



JOHN EDINGTON, M.E.I.C.

Mr. Edington was elected Member of *The Institute* on October 12th, 1894, when it was still the Canadian Society of Civil Engineers. He came to Canada in 1883 as engineer for the Moncton Gas, Light and Water Company. The water system, both the old reservoir along the Irishtown road and the new reservoir on McNutt's brook, along the McLaughlin road, as well as the old gas and electric light plants were all constructed under Mr. Edington's supervision.

When the Moncton Gas, Light and Water Works were expropriated by the city of Moncton, some twenty-six years ago, Mr. Edington continued as engineer in the service of the city. At that time the late Geo. W. McCready was city engineer, having charge of streets, etc., but upon Mr. McCready's retirement some twenty years ago, Mr. Edington was appointed city engineer, having charge of gas, light and water, the streets and all branches of engineering work in connection with the city. In this position he continued to render the city that efficient and faithful service which marked all his work.

Charles Frederick Cameron, A.M.E.I.C.

News has just been received of the death of Charles Frederick Cameron, A.M.E.I.C., which occurred in Winnipeg in January of this year. The late Mr. Cameron was a graduate of the University of Manitoba, having received the degrees of B.A., in 1911, and B.C.E., in 1912.

Born in Winnipeg on June 7th, 1889, Mr. Cameron spent most of his life in the Prairie Provinces. Prior to graduation he was engaged as chainman, rodman and instrumentman on survey work for the Canadian Northern Railway in the Winnipeg district. In 1910 he was assistant engineer on the construction of a branch line of the Canadian Northern Railway and for the following four years he was assistant engineer on the construction of the Brazeau branch of the same railway.

Subsequently Mr. Cameron continued his work with the Canadian Northern Railway occupying the positions of fence inspector, assistant engineer on location and construction and assistant engineer on bridge location and construction and on maintenance work. In the fall of 1918 he was appointed demonstrator in physics at the University of Manitoba, carrying on his work of assistant engineer with the railway company during the summer vacation. He was later appointed assistant professor at the University of Manitoba, a position which he occupied at the time of his death. The late Mr. Cameron was admitted to *The Institute* as an Associate Member on February 25th, 1919.

PERSONALS

W. L. Reford Stewart, S.E.I.C., has joined the Newton Dakin Construction Company, Limited, and is located at Sherbrooke, Quebec. Mr. Stewart graduated from the Royal Military College in 1920.

Donald Stewart, S.E.I.C., who was with this year's graduating class at McGill University has been appointed to the maintenance department of the Bell Telephone Company, Montreal.

R. J. Fuller, A.M.E.I.C., of the John V. Gray Construction Company Limited, who has been located in London, Ontario, for the past three years, has returned to the company's Toronto office.

W. W. Graham, S.E.I.C., of Montreal has joined the draughting staff of the Shawinigan Engineering Company of Montreal. Mr. Graham graduated in mechanical engineering from McGill University this year.

A. Ross Robertson, A.M.E.I.C., sales engineer with McGregor and McIntyre, Limited, has been elected vice-chairman of the Toronto Branch of the Canadian Manufacturers Association.

G. E. Vernot, S.E.I.C., has accepted a position with Messrs. E. G. M. Cape & Company in Montreal as instrumentman on construction work in connection with the extension to the Royal Victoria Hospital.

W. M. Prudham, S.E.I.C., is located in Pittsburgh, Pennsylvania, where he is taking the graduate students' course at the Westinghouse Electric and Manufacturing Company's plant. Mr. Prudham graduated from McGill University in electrical engineering this year.

James Fear, S.E.I.C., has been appointed assistant engineer in the department of records of Messrs. Price Brothers and Company, Limited, at Kenogami, Quebec. Mr. Fear graduated from Nova Scotia Technical College in mechanical engineering this year.

Charles E. Crease, S.E.I.C., who graduated this year in electrical engineering from the Nova Scotia Technical College has been appointed to the students' course in the test department of the Canadian General Electric Company at Peterborough, Ontario.

T. H. Dickson, Jr.E.I.C., who has been connected with the staff of the Nova Scotia Technical College is now with the Canadian National Railways at Moncton, New Brunswick, as assistant to the chief electrical and signal engineer.

L. N. Jenssen, M.E.I.C., has joined the staff of the Duke-Price Power Company at Isle Maligne, Quebec, as designing engineer. Mr. Jenssen has for the past year been construction engineer with the Cherry River Paper Company at Richwood, West Virginia.

H. H. Vaughan, M.E.I.C., has been elected to the Council of the Institution of Civil Engineers, Great Britain, according to the announcement of the results of the elections held on May twelfth last. Mr. Vaughan was president of *The Engineering Institute of Canada* in 1918 and vice-president during the years 1912, 1913 and 1914, and councillor for the two years previous to 1912.

John Stephenson, A.M.E.I.C., is designing engineer on the staff of the Carnegie Steel Company at Munhall, Pennsylvania, having resigned from the engineering staff of the Bethlehem Steel Company, Lackawanna, Pennsylvania. Mr. Stephenson was formerly designing engineer with the Nova Scotia Steel and Iron Company, Limited, at Sydney Mines, Nova Scotia.

S. R. McDougall, S.E.I.C., has accepted the position of chemical engineer with the Northern Electric Company at Montreal. Mr. McDougall received the degree of M.A.Sc., in chemical engineering from the University of British Columbia in 1923. During the college term of that year he was instructor of advanced analytical chemistry at the university.

Major H. R. Lynn, A.M.E.I.C., president of the Lynn Macleod Engineering Supplies, Limited, of Thetford Mines, has been spending some time in Three Rivers, Que., where a branch of the above company is contemplated. Considerable success has been met with in the asbestos mining district of Quebec where the company has specialized for the past five years.

Vernon R. Davies, A.M.E.I.C., is with the Highway Commission of Manitoba, engaged on road construction work for the rural municipality of Birtle. Mr. Davies was demonstrator in the Department of Geodesy and Surveying and assistant at the meteorological observatory, McGill University, during the session of 1922-23. He is a graduate of McGill University from which he received his degrees of B.Sc., and M.Sc., while in 1923 he received the degree of M.C.E. from the University of Manitoba. He was a lecturer on the staff of the University of Saskatchewan prior to taking up his present position.

Horace L. Seymour, M.E.I.C., town planning consultant of Toronto, has been retained by the Lago Petroleum Corporation to undertake development work on their properties at Lake Maracaibo, Venezuela, and sailed from New York on July 10th. George W. Smith, S.E.I.C., who was formerly associated with Mr. Seymour goes with him as principal assistant. During Mr. Seymour's absence his practice will be in charge of A. G. Dalzell, M.E.I.C., consulting engineer, Toronto, as both have been closely associated for some years in professional work.

E. J. Owens, A.M.E.I.C., has been appointed chief engineer of the St. John and Quebec Railway succeeding Burton M. Hill, M.E.I.C., who has resigned following his appointment as minister of public works of New Brunswick. Mr. Owens is a graduate of the University of New Brunswick of the year 1915, and has been connected with the St. John and Quebec Railway since June 1916, originally joining the engineering staff of this company as office engineer. In addition to his new position Mr. Owens will continue as a member of the engineering staff of the New Brunswick Electric Power Commission.

R. A. Logan, A.M.E.I.C., of New York has been elected an active resident member of the Explorers' Club. On June of this year he was elected an Associate Fellow of the Royal Aeronautical Society. Mr. Logan is a graduate of the Nova Scotia Technical College and later attended the University of Alberta. He has had extensive experience in land survey work in western Canada and subsequent to 1915 he had a wide experience in aviation and particularly in connection with aerial photography and some time ago was appointed manager of the mapping division of the Fairchild Aerial Camera Corporation of New York.

RICHARD H. MATHER, A.M.E.I.C.

R. P. Fairbairn, M.E.I.C., honoured by Staff of Ontario Public Works.

R. P. Fairbairn, M.E.I.C., deputy minister of public works, of the province of Ontario, was presented with a handsome loving cup by the members of the staff as a token of esteem on the occasion of his retiring from the service on June thirtieth, after forty-five years of faithful work in the department. The presentation was made by H. F. McNaughten, secretary of the department, who expressed the high regard in which Mr. Fairbairn was held by every member of the staff, their good wishes for his future welfare and the regret they felt at his going.

Mr. Fairbairn was born in London, Ontario, May 20th, 1855. He attended the high school of that city.

Subsequently he was articled student with Messrs. Robinson and Tracy and was commissioned a provincial land surveyor in 1876. From 1877 to 1879 he was a member of the firm of Robinson, Tracy and Fairbairn, engineers and land surveyors of London, Ontario, and was engaged in various construction works in that locality. In 1895 Mr. Fairbairn joined the provincial civil service as assistant engineer in the Department of Public Works and was promoted in 1903 to the position of chief engineer, which he occupied until 1910 when he became deputy minister of public works of the province, from which position he has recently retired.

Richard H. Mather, A.M.E.I.C., appointed Power Sales Engineer

Richard H. Mather, A.M.E.I.C., of the Shawinigan Water and Power Company, Montreal, has been appointed power sales engineer with that company. Mr. Mather is a graduate of McGill University of the year 1913, and during his vacations while attending college, he spent two summers with the Westinghouse Company, at Pittsburgh, Pa., and subsequently eleven months with the Canadian Westinghouse Company, at Hamilton, Ont. Following graduation he was on the staff of the electrical department of McGill University for two years, first as junior demonstrator and later as senior demonstrator. He was later with the cable engineering department of the Northern Electric Company of Montreal, and for three years from January 1916 to January 1919, he was with the Sir W. G. Armstrong Whitworth Company Limited, Elswick Works, Newcastle-on-Tyne, England, in charge of installation and maintenance of all electrical gear in their works in the Newcastle area. Following his return from overseas he was appointed to the staff of the Shawinigan Engineering Company, Montreal, and subsequently received an appointment with the Shawinigan Water and Power Company, Montreal, as electrical engineer. For some time past Mr. Mather has been connected with the power sales department of the company, under which he now assumes the position of power sales engineer.

Burton M. Hill, M.E.I.C., Appointed Minister of Public Works of New Brunswick

Burton M. Hill, M.E.I.C., chief highways engineer of the province of New Brunswick, has been taken into the provincial cabinet as minister of public works. Mr. Hill was born June 21, 1883, educated at the St. Stephen public school, and graduated from the University of New Brunswick with the degree of B.Sc. in 1907. He has, since graduation, been continuously engaged in civil engineering work; ten years in railroad work in various capacities, as resident engineer, divisional engineer and chief engineer on location and construction work. In 1917 he took over the organization of the permanent highway department for the province of New Brunswick and has since occupied that position and also acted as inspecting railroad engineer for the government.

Mr. Hill is a life member of *The Institute* which he joined on July 22nd, 1919. He was president of the Association of Professional Engineers of New Brunswick during 1923, is vice-president of the University of New Brunswick Alumni Society, and is a member of the senate of the University of New Brunswick, representing the Alumni Society on this body. He was elected for a period of two years in 1923 and was re-elected to serve two more years. His grandfather, Hon. George S. Hill, was a member of the Legislature of New Brunswick from 1830 to 1848 and a member of the Legislative Council from 1848 to 1858. His uncle, Hon. George F. Hill, represented Charlotte county in the Legislature of New Brunswick from 1865 to 1908, twenty-five years of which he was a member of the Legislative Council, and was president of this council at the time of its dissolution.

B. M. HILL, M.E.I.C.

CAPT. F. ANDERSON, M.E.I.C.

Captain Frederic Anderson, M.E.I.C., appointed Chief Hydrographer

Captain Frederick Anderson, M.E.I.C., has been appointed to the position of chief hydrographer of Canada, Department of Marine and Fisheries, in succession to the late W. J. Stewart, who held this position since the hydrographic branch was formed in 1905, until his death last May.

Captain Anderson graduated from the Royal Military College, Kingston, Ont., in 1890, and joined the hydrographic (then the Georgian Bay) survey in 1892, under Captain J. E. Boulton, R.N., and had acted as Mr. Stewart's principal assistant since 1893, when he took charge of the survey. During the years 1901-04 he carried on operations on Lake Winnipeg and in 1905 when the hydrographic branch was formed and Mr. Stewart remained at Ottawa, Captain Anderson was placed in charge of the Great Lakes survey. He occupied this position until 1910, and in the following year was detailed to take charge of the survey of Hudson bay and strait with a view to finding a suitable terminal and obtained information regarding the navigability of Hudson strait. Operations were carried on then for four seasons and the first two Captain Anderson commanded the C.G.S. Minto and the latter two the C.G.S. Acadia, specially built to meet surveying requirements and strengthened to withstand the ice. His experiences in this region were quite varied, which can be judged from reading his reports for each year.

Latterly Captain Anderson has been in charge of Atlantic coast survey operations off the south coast of Nova Scotia and the Bay of Fundy.

EMPLOYMENT BUREAU

Situations Vacant

Draughtsmen

Experienced in detailing or checking shop drawings for structural steel buildings. Apply giving full particulars to box No. 135-V.

Structural Steel Draughtsman

First class structural steel draughtsman for a position which will last two or three months and may be permanent. Give full particulars of experience and qualifications. Apply box No. 136-V.

Pulp and Paper Mill Designers

A number of first class draughtsmen and designers with experience in pulp and paper mill work are required by a pulp and paper mill in Quebec. Good salaries with excellent prospects for permanent positions. Replies received at *Institute* headquarters will be examined before being submitted so that all will be strictly confidential. Apply box No. 137-V.

Construction Engineers

A number of engineers with experience are required for a pulp and paper mill in Quebec, including a field engineer, chief draughtsman, estimator and quantity man, and inspectors. Apply giving full particulars of experience to box No. 138-V.

Assistant Town Manager

Graduate engineer with experience in municipal construction and architecture, and a general knowledge of estimating and present day costs, required for the position of assistant town engineer in an industrial town in northwestern Quebec. Give full particulars of qualifications. Apply box No. 139-V.

Senior Assistant Engineer

A senior assistant engineer, temporary, for the Department of Railways and Canals, Ottawa, at a salary of $225 per month.

Duties.—To assist the engineer in carrying out hydraulic or other engineering work, and to perform other related work as required.

Qualifications.—Education equivalent to high school graduation; either graduation in engineering from a school of applied science of recognized standing with three years of experience in engineering (preferably hydraulic) design, estimate, and construction work, two years of which shall have been in a position of professional responsibility, or five years of practical experience in engineering (preferably hydraulic) design, estimate, and construction work, two years of which shall have been in a position of professional responsibility; ability to complete and make ready for publication the results of investigations and surveys, or other pertinent data; tact and good judgment. Preference will be given to applicants who have had experience in canal surveys, operation and maintenance. While a definite age limit has not been fixed, age may be a determining factor when a selection is being made.

Application forms properly filled in must be filed with the Civil Service Commission, Ottawa, *not later than August 13, 1925.* Application forms may be obtained from the offices of the Employment Service of Canada, from the Postmasters at Prince Rupert, Vancouver, Victoria, Edmonton, Calgary, Regina, Saskatoon, Winnipeg, Quebec, Fredericton, St. John, Charlottetown, and Halifax, or from the Secretary of the Civil Service Commission.

By Order of the Commission,

W. Foran, *Secretary.*

Situations Wanted

Chemical Engineer

Graduate in chemical engineering 1921, age 29, single, desires connection with engineering firm in Canada. Experience in machine shop work, trinitrotolul production, technical work in pulp and paper mill, electro-sherardizing. At present in charge of fabrication of steel and wrought iron products by electric arc welding. Apply box No. 190-W.

Electrical Engineer

University graduate desires position, with an engineering firm or power company, where technical training combined with business experience will be of value. One year's experience in testing department of one of the largest electrical manufacturing companies in Canada. Several years business experience. Good office man. Available at short notice. Location immaterial. Apply box No. 191-W.

Building Superintendent

Advertiser, A.M.E.I.C., seeks position as above. Qualified to supervise power plant and heating systems. Construction and maintenance. Organization and efficient operation of staff. Office routine, etc. Apply box No. 192-W.

Nova Scotia Power Commission Annual Report

The Nova Scotia Power Commission of which K. H. Smith, M.E.I.C., is chief engineer, has issued their annual report for the year ending September 30th, 1924.

This report in addition to giving the usual financial statement and details of the administration of the Nova Scotia Water Act, 1919, outlines the progress made in the various developments undertaken by the commission including the St. Margaret's Bay system, the Mushamush system and the Sheet Harbour System.

The Highway, the Motor Vehicle and the Tourist in Canada

The Highways Branch of the Federal Department of Railways and Canals, of which A. W. Campbell, M.E.I.C., is commissioner of highways, has issued a circular, number 6, entitled, "The Highway, the Motor Vehicle and the Tourist in Canada".

This circular contains statistics relative to the registration of motor vehicles in Canada, with comparative tables showing the registration of various types of vehicles in different years. It also deals with the revenue received from motor vehicles and the application of this revenue to highway work. In addition it explains various regulations in connection with the use of motor vehicles.

The second part of the report is devoted to statistics of motor tourists in Canada.

Tests of a Large Boiler Fired with Powdered Coal

The Bureau of Mines of the United States Department of the Interior has issued bulletin No. 237, reporting tests carried on in connection with a large boiler fired with pulverized coal. This report gives the results of twenty-six tests of the 4-pass Edgemoor boiler fired with powdered coal at the Lakeside station of the Milwaukee Electric Railway and Light Company. The object of the tests was to determine the thermal efficiencies and capacities obtainable by burning powdered coal under large central station boilers, and the possibility of operating such boilers continuously at high efficiency and capacity without destructive effect on the furnaces and without difficulties in refuse removal.

The Canadian Fairbanks Morse Company, Limited, have issued a comprehensive catalogue, number 25, giving condensed information regarding the various machinery and equipment handled by this company. The last large catalogue of this company was issued in 1920, although the company has from time to time issued smaller catalogues dealing with special classes of merchandise. The present issue, however, contains many new lines carried by the company as well as numerous improvements in various other lines. The new catalogue is thumb-indexed for ready reference and is divided into eleven sections, covering scales, valves, steam goods, railway and contractors' equipment, shop supplies, transmission supplies, machine tools, woodworking machinery, oil engines, pumps and electrical machinery. In addition the volume contains much useful data — tables, specifications, etc.

BRANCH NEWS

Moncton Branch

Annual Meeting

M. J. Murphy, A.M.E.I.C., Secretary-Treasurer.

The fifth annual meeting of the Moncton Branch was held on May 28th, 1925.

Messrs. A. C. Selig, M.E.I.C., E. G. Evans, M.E.I.C., H. B. Titus, A.M.E.I.C., were appointed scrutineers to count the ballots for the election of officers for 1925-26, and reported the following officers elected:

Chairman	C. S. G. Rogers, A.M.E.I.C.
Vice-Chairman	A. S. Gunn, A.M.E.I.C.
Sec'y-Treasurer	M. J. Murphy, A.M.E.I.C.
Executive Committee	A. F. Stewart, M.E.I.C.
	J. R. Freeman, A.M.E.I.C.
	J. D. McBeath, M.E.I.C.

In addition to the above the following members of the Executive Committee hold office for another year:

F. B. Fripp, A.M.E.I.C.
G. C. Torrens, A.M.E.I.C.
G. E. Smith, A.M.E.I.C.
F. O. Condon, M.E.I.C., (*ex-officio.*)

The fifth annual report and the financial statement were read by the secretary.

Copies of each of these reports are shown below in order that this information may be read by our non-resident members:—

Report of Executive Committee

The fourth annual meeting of Moncton Branch was held on May 15th, 1924.

It is to be regretted that the attendance at our meetings has fallen off considerably during the past year, although the papers read before the branch were most interesting and instructive. The chairman of the Papers Committee, Professor H. W. McKiel, M.E.I.C., is to be congratulated on the choice of speakers who have addressed our meetings.

Papers and Meetings

During the year there were eight meetings of the branch. The Executive Committee held five meetings during the branch year and considerable business was transacted. Papers were read, addresses given and business transacted as follows:—

Oct. 23rd, 1924.—A. C. D. Blanchard, M.E.I.C., hydraulic engineer of the New Brunswick Power Commission, read a paper on "The Construction of the Queenstown-Chippawa Power Development".

Nov. 13th, 1924.—F. A. Bowman, M.E.I.C., vice-president of *The Institute*, presented the Charter to Moncton Branch, and Fraser S. Keith, M.E.I.C., general secretary of *The Institute* gave an address on "The Wembley Exhibition".

Dec. 9th, 1924.—Doctor Trueman, president of Mount Allison University, delivered an address on "Psychology as applied to the Employment of Men".

Jan. 14th, 1925.— Professor Roy Fraser of Mount Allison University, addressed the branch on "Biology and Public Water Supply".

Feb. 18th, 1925.—Doctor Delano of Mount Allison University, gave an address on "Ancient Architecture".

Mar. 5th, 1925.—A meeting was held for the nomination of officers for the ensuing year.

Mar. 12th, 1925.—C. L. Roach, Jr.E.I.C., acting plant engineer, New Brunswick Telephone Company, gave a very interesting address on "Electrolytic Corrosion".

April 20th, 1925.—H. S. Johnson, M.E.I.C., hydraulic engineer of the Nova Scotia Power Commission, delivered an address on "The Sheet Harbour Power Development".

Several of the meetings during the past year were advertised as open to the public and those who attended appeared greatly interested.

Membership

During the past year our membership has increased as shown in statement below:—

		1923-24		1924-25	
Resident,—	Members	10		11	
	Associate Members	26		24	
	Juniors	5		5	
	Students	20		23	
	Affiliates	1	62	1	64
Non-Resident,—	Members	1		2	
	Associate Members	10		10	
	Juniors	4		4	
	Students	2	17	4	20
	Total		79		84

The sincere thanks of the members of Moncton Branch are due to the ladies and gentlemen who so kindly provided entertainment at our supper-meetings.

The financial statement shows a surplus of $130.59 which amount includes balance in bank after all outstanding bills are paid, and rebates for January, February and March due from headquarters.

The thanks of the executive are due Professor McKiel, chairman of the Papers Committee, Messrs. G. E. Smith and J. R. Freeman of the Entertainment Committee, V. C. Blacket, acting associate editor of *The Journal* and L. T. Tingley, official stenographer, who have all performed their duties efficiently and whole-heartedly.

Financial Statement

Receipts		
Balance in bank	$ 51.23	
Rebates from headquarters	141.65	
Bank interest	3.04	
Supper-meetings	39.00	
		$234.92
Expenditures		
Supper-meetings	$ 76.41	
Printing	32.31	
Stamps	5.00	
Bank discount	.60	
Telegraph and telephone	4.86	
Miscellaneous	22.87	
Cash in bank	92.87	
		$234.92
Assets		
Balloptican lantern	$ 50.00	
Attache case	10.00	
Rubber stamp	.50	
Stamps	2.24	
Cash in bank	92.87	
		$155.61
Liabilities		
Bills outstanding:		
Printing	$ 11.56	
Telephone	2.85	
		$ 14.41
Depreciation on Equipment		
Balloptican Lantern	$ 10.00	
Attache case	8.00	
Rubber stamp	.50	
Total depreciation		$ 18.50
Balance in bank	$ 92.87	
Rebates due from headquarters	52.13	
		$145.00
Bills outstanding		14.41
Balance May 6th, 1925		$130.59

Montreal Branch

C. K. McLeod, A.M.E.I.C., Secretary-Treasurer.
Stanley A. Neilson, A.M.E.I.C., Branch News Editor.

Fall Programme

The Papers and Meetings Committee have been busy arranging the fall programme. Among the prominent speakers arranged for the coming session are:—

L. H. Miller, M.A.S.C.E., chief engineer of the American Institute of Steel Construction, who will speak on "Steel Construction".

Fred Newell, M.E.I.C., mechanical engineer, Dominion Bridge Company, Ltd., whose subject will be "Head Gates".

Dr. S. J. McLean, assistant chief commissioner of the Board of Railway Commissioners, Ottawa, will deal with "Rate Making as Applied to Railways".

Wing Commander E. W. Stedman, assistant director, R.C.A.F., who will tell of the relation between aviation and modern engineering practice.

Prof. Heyman's subject will be "The Use of Polarized Light in the Study of Stresses".

C. M. Goodrich, M.E.I.C., designing engineer, Canadian Bridge Company, will tell the branch of the design and construction of "Transmission Towers".

It is also possible that B. E. Norrish, A.M.E.I.C., will consent to speak on the "Motion Picture Industry".

Niagara Peninsula Branch

R. W. Downie, A.M.E.I.C., Secretary-Treasurer.
C. G. Moon, A.M.E.I.C., Branch News Editor.

Branch holds Picnic at "Old Niagara"

The summer picnic at "Old Niagara" is an outstanding event of the year. Unfortunately, the morning of June 27th, was marred with heavy thunder showers and many of our members made other arrangements for the afternoon, under the impression that the picnic would be postponed. However, the weather cleared and those who did attend were well rewarded with the delights of swimming, tennis, golf and an after dinner dance at the Queens Royal hotel. This may be taken as a lesson that it would be as well for us to remember on future occasions.

On July 8th, the branch enjoyed a trip through the Pierce-Arrow automobile works, near Buffalo, N. Y. The Pierce-Arrow is one of the higher priced American cars, although latterly a car costing about $2,900.00, f.o.b., factory is being built. After visiting the plant and noting the grade of materials and the thoroughness with which each part is manufactured, the reason for such prices is plain. Visitors are always welcomed and it would be well worth while for any of the E.I.C., members to take advantage of this fact if they happen to be in the vicinity of Buffalo.

Four classes of steels are used in the Pierce-Arrow product. Plain carbon steels are used for parts not highly stressed; nickel steels for parts moderately stressed; nickel-chrome steels for parts where extreme strength is required, and chrome carbon steels for parts which require great hardness.

All transmission and rear axle gears are made of nickel chrome and case hardened, which gives the proper combination of hardness and toughness. After completion, gears designed to mesh with one another are placed in mesh on a testing machine. They are whirled to determine whether they mesh silently, thin "feeler" gauges being used to ascertain the clearance between each tooth. A delicate gauge, which records measurements of less than five ten-thousandths, reveals whether the gears are absolutely free from eccentricity.

The first Pierce-Arrow automobile produced,—the little 2¾-horse power motorette of 1901,—was made in a factory of 75,000 square feet of floor space devoted mainly to the manufacture of other products. To-day a modern group of reinforced concrete factory buildings, housing 1,400,000 square feet of floor space are devoted solely to the manufacture of Pierce-Arrow passenger cars and trucks. About 5,000 men are employed.

The factory's chemical laboratory makes 400 physical tests and 25,000 chemical determinations every year. To keep the factory in spotless condition, a force of 133 janitors toils constantly. A modern laundry daily launders table linen, napkins and thousands of towels.

With the welfare of its workers in mind, the company provides free individual cakes of soap, individual towels and individual porcelain wash bowls. Five tons of ice are used daily to cool the filtered drinking water. Individual steel lockers are supplied.

Besides two dining rooms, the company maintains at convenient places throughout the factory, lunch counters at which hot coffee, cocoa, milk, sandwiches, ice cream, pies, fresh fruits and other edibles are sold at nominal prices.

Notes of Interest

Daizo Ariyoshi, engineer of the South Manchuria Railroad, with headquarters at Dairen, Manchuria, visited the ship canal on July 3rd, and spent the day studying the various methods of construction being employed on this work. He advised that his railroad have on their construction programme, the building of some 2000 miles of additional line, as well as extensive terminal work, and it is for the purpose of obtaining information as to methods of construction being used on this continent, that Mr. Ariyoshi is spending a period of six months in Canada and the United States before returning to Manchuria.

E. B. Jost, A.M.E.I.C., assistant engineer to the chief engineer, Department of Railways and Canals was in the district from the 8th to the 10th of July, and was a member of the party who visited the Pierce-Arrow plant at Buffalo on the 8th.

The deputy minister of the Department of Railways and Canals, Major Graham Bell and the chief engineer, Colonel A. E. Dubuc, M.E.I.C., made an inspection trip over the Welland Ship Canal from the 14th to the 17th of July. This work is in full swing now; with the exception of section No. 6, contracts covering the whole length of 25 miles have been awarded and the sum of $15,000,000 passed therefor in this year's federal estimates.

With reference to the 1924 Superannuation Act; at the present session of the House, additional legislation has been passed, extending the time for acceptance under the Act to July 19th, 1926. This is the first sign that our small voice has been heard.

Quebec Branch

Louis Beaudry, S.E.I.C., Secretary-Treasurer.

The seventeenth annual meeting of the Quebec Branch was held at the city hall on Monday evening, June 29th, at 8.15 p. m.

Chairman, A. R. Décary, M.E.I.C., presided and the minutes of the previous meeting having been read, Messrs. Hector Cimon, A.M.E.I.C., and Léon Brunet, A.M.E.I.C., were appointed scrutineers for the election of officers for the coming year.

The secretary then read the financial statement for the year which showed very satisfactory progress in the affairs of the branch.

Financial Statement

Receipts		
Balance in bank 4-30-24	$ 95.14	
Rebates from headquarters	179.30	
Branch news	9.84	
Rebates to receive from headquarters for April, May and June 1925	25.60	
To receive for branch news for May 1925	1.58	
Bank interest	1.50	$312.96
Expenditures		
Luncheons and meetings	$ 58.00	
Printing	48.84	
Secretary's expenses 1923-24	75.00	
Postal box	6.00	
Postage, etc	5.41	
	$193.25	
Surplus on June 29, 1925	119.71	
		$312.96

On motion of F. X. Ahern, A.M.E.I.C., and I. E. Vallée, A.M.E.I.C., it was resolved that the incoming executive should make a special study of nominating officers of the branch in order to ascertain if a better method might be devised and if improvement is considered advisable, a general meeting of the members of the branch should be called to consider the question.

The meeting then appointed the following committees:— Legislation committee: Hector Cimon, A.M.E.I.C., L. C. Dupuis, A.M.E.I.C., and T. E. Rousseau, A.M.E.I.C. Nominating committee: A. R. Décary, M.E.I.C., T. E. Rousseau, A.M.E.I.C., and Hector Cimon, A.M.E.I.C.

A resolution was passed thanking His Worship the Mayor of Quebec for his kindness in placing at their disposal a room for their meetings.

The report of the scrutineers was then received as follows:—

Election of Officers

Chairman	A. B. Normandin, A.M.E.I.C.
Vice-Chairman	S. L. de Carteret, A.M.E.I.C.
Secretary-Treasurer	Louis Beaudry, S.E.I.C.
Executive Committee	L. C. Dupuis, A.M.E.I.C.
" "	Hector Cimon, A.M.E.I.C.
In office for another year	T. E. Rousseau, A.M.E.I.C.
" "	Hector Cimon, A.M.E.I.C.

Mr. Décary thanked the members for their interest in the election and assured those present that Mr. Normandin will maintain, by his work, the good standing of the Quebec Branch. He recalled the considerable activities of Mr. Normandin regarding legislation and general interest of engineers for the past twelve years.

Mr. Normandin thanked the members for the honour of being elected chairman of the branch. He said that he had accepted his nomination only after Mr. Décary refused that charge for another year. He expressed the regret of the branch in losing Mr. Décary as chairman after twenty years of work and interest in the affairs of *The Institute*. Mr. Décary was one of the promoters of the Quebec Branch in 1907, and has been elected chairman for the last seven years. He was also one of the most interested in the promotion of the Corporation of Professional Engineers of Quebec.

It was moved by Hector Cimon and unanimously resolved:—

That the members of the Quebec Branch of *The Engineering Institute of Canada*, in acknowledgement of his great interest in the welfare of the branch and his untiring efforts on its behalf since its formation in 1907, and appreciating the services he has rendered to *The Institute* as well as to the profession in general, express to Mr. A. R. Décary, their regret upon his retirement from the chairmanship of the Quebec Branch, and ask him to accept the office of honorary chairman of the branch for life.

Saint John Branch

W. J. Johnston, A.M.E.I.C., Secretary-Treasurer.

Under an existing regulation the forests of New Brunswick are closed to travel during the spring and summer months when danger from forest fires exists, except to a selected list of persons. This regulation does not apply to the actual owners, occupier or licensee of forest lands entered on or to their employees, or to the fire wardens, fire fighters, land surveyors or persons accompanied by registered guides, or to holders of hunting, fishing, guides or mining licenses or leases, clergymen, teachers, pupils accompanied by teachers, scout masters and scouts. The only condition under which other citizens may now enter the forest is by first obtaining a permit good for a certain area and reporting to the district fire warden of this area.

Through the courtesy of G. H. Prince, deputy minister of lands and mines, and L. S. Webb, provincial forester, a permit has been granted to all *Institute* members in the province to enter any wooded area in the province during the entire season. A similar permit has been given to Rotary clubs and other organizations. Thus the value of membership in *The Engineering Institute of Canada* is made apparent in many ways to its members. The letter accompanying the permits from the Forest Service, Department of Lands and Mines, is self explanatory:—

> "In the administration of that regulation of the Forest Fires Act which requires that all persons must register and receive a certificate of registration when travelling in the forest during the period May 1st to November 1st, it has been reported that the more reliable type of citizen who has occasion to go in the forest from time to time and at irregular intervals is sometimes inconvenienced in securing a registration certificate.
>
> "The seasonal registration certificate card has been designed to overcome this difficulty as well as to create a spirit of co-operation in the matter of forest fire prevention, thus increasing the provincial corps of honorary fire wardens, — men who are willing to carry out the conditions as set forth on the cards.
>
> "The Department therefore takes pleasure in extending to you as a New Brunswick member of *The Engineering Institute of Canada* a 1925 Seasonal Registration Certificate Card."

Recent Additions to the Library

Transactions, Proceedings, Etc.

Presented by the Societies:

- Transactions of the Institution of Engineers, Australia, 1922.
- List of Members of the Institution of Engineers, India, 1925.
- Transactions of the Institution of Mechanical Engineers, Great Britain, 1924.
- Transactions of the Society of Naval Architects and Marine Engineers, Great Britain, 1924.
- Proceedings of the Fourth Annual Meeting of the Highway Research Board of the National Research Council, 1924.
- Year Book of the American Engineering Standards Committee, 1925.
- Year Book of the Rochester Engineering Society, 1925.
- Charter, Bye-Laws and List of Members and Associates of the Iron and Steel Institute, England, 1924.
- Transactions of the Institution of Water Engineers, England, 1924.

Reports

Presented by the Department of the Interior, Canada.

- Report of the Commissioner of Canadian National Parks, 1924.

Presented by the Department of Labour, Canada.

- Fourth Report on Organization in Industry, Commerce and the Professions in Canada, 1925.

Technical Books

Presented by Messrs. Chapman & Hall, London.

- The Strength of Materials by Ewart S. Andrews, 1925.
- Marine Engineering Repairs by Engineer-Captain F. J. Drover, R. N. 1925.

Presented by the John Fritz Medal Board of Award.

- Report of the Presentation of the John Fritz Gold Medal to John Frank Stevens, 1925.

New Brunswick Electric Power Commission Annual Report

The annual report of the New Brunswick Electric Power Commission for the year ended October thirty-first, 1924 has recently been issued and contains details of the various systems operated by the commission, together with the progress of construction of works under way during that year. An interesting feature of this report is the reference to the results of the survey carried on by the commission's engineers to ascertain the present and possible future power loads in various towns in New Brunswick.

Superheat Engineering Data

The Superheater Company, Limited, 190 St. James Street, Montreal, have issued a hand-book entitled, "Superheat Engineering Data", dealing with the generation and use of superheated steam. This is the sixth edition of the handbook, which supersedes, "Data Book for Engineers" and contains two hundred and eight pages, with illustrations and diagrams, and sixty-nine tables. It illustrates superheater arrangements in practically all stationary, marine and locomotive type boilers commonly made in America and contains much data of interest to steam power plant engineers and operators.

CORRESPONDENCE

The Dye Industry in Canada

The Engineering Journal,
176 Mansfield Street,
Montreal, Que.

Hope Chambers, Ottawa, Ont.
June 16th, 1925.

Dear Sirs:—

In reply to an article written by Mr. G. Durgin, in your issue of June 1925, on page 262, I wish to say that the last paragraph of his article is not quite representative of facts as they exist to-day in that the Dye and Chemical Company of Canada, have commenced operations within the last two weeks to carry out just such a programme as he had in mind and in case it may be of interest to you, or some of the fellow members of *The Institute,* I am enclosing a résumé of the aims of the Dye and Chemical Company.

Yours very truly,
(Signed) JOHN W. HUGHSON, A.M.E.I.C.

Toronto Graduates plan Gull Lake Reunion

The graduates of civil and mining engineering of the University of Toronto of the years 1920 to 1925, inclusive, have arranged a reunion to take place at Gull Lake Survey Camp which is situated in Haliburton county, about ninety miles north of Toronto. The reunion is to take place over the week end of September 5th to 7th which includes Labour Day. Preparations have been made for the accommodation of about eighty men and all "Gull Lakers" who plan on going or wish further information should communicate at once with the Reunion Secretary, Mr. T. R. Emerson, S.E.I.C., 3 Algonquin Avenue, Toronto.

Effect of Hydrated Lime and Other Powdered Admixtures in Concrete

The Structural Materials Research Laboratory of the Lewis Institute, Chicago, have issued a second edition of Bulletin No. 8 bearing the above title. The paper was originally published in the Proceedings of the American Society for Testing Materials, 1920, and in the present edition the tables and figures have been revised to include the two- and five-year tests which were made subsequent to the original publication of the report.

This investigation was confined to powdered admixtures which are essentially inert in the presence of water and portland cement, as contrasted with liquids or soluble materials. Most of the tests were made with hydrated lime, but seventeen other powders were also used. The effect was studied of admixtures up to fifty per cent of the volume of cement on the compressive and tensile strength, wear, bond and workability of concrete made with sand and pebbles and crushed limestone aggregate of different sizes and gradings, in mixes ranging from 1:2 to 1:9, and a wide range in consistencies. Seven different investigations were made, including more than 20,000 tests at ages of three days to five years.

Equipment Installations of Interest

The installation of the 1,000-k.w. Erste Brunner non-condensing steam turbines, which is contemplated by the Canada Sugar Refining Company at Montreal, of which Chas. W. Burroughs, A.M.E.I.C., is chief engineer, is of interest in that they will be the first high efficiency non-condensing turbines of this type to be installed on the North American Continent. The turbines are designed to take steam at 300 pounds gauge, 100° superheat, exhausting at 90 pounds gauge. They will be manufactured by Messrs. Stork and Company, Hengalo, Holland, and are said to have an efficiency of 75 per cent.

The turbines are being installed in conjunction with a large Ruths accumulator system which the company has recently ordered from the Combustion Engineering Corporation Limited. The accumulator is to have a capacity of 40,000 pounds of steam between a pressure range of 90 to 20 pounds.

Steel Construction

The basic reasons for the development of the standard specification for the fabrication and erection of structural steel, with an increase in the working stresses from 16,000 to 18,000 pounds, were explained by Lee H. Miller, chief engineer of the American Institute of Steel Construction, in an address before the recent session of the American Iron and Steel Institute. Mr. Miller has in the past year addressed a number of the branches of *The Institute* on which occasions he has presented to the members the existing conditions in the structural steel industry and details of the work being done by his organization for the improvement of methods and standards.

Copies of Mr. Miller's address before the American Institute of Steel Construction may be secured on request to that institution's office at 350 Madison avenue, New York.

Preliminary Notice

of Applications for Admission and for Transfer

July 18th, 1925.

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in August 1925.

R. J. DURLEY, Secretary.

*The professional requirements are as follows:—

A Member shall be at least thirty-five years of age, and shall have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office, or a term of instruction in a schoolof engineering recognized by the council. The term of twelve years may, at the discretion of the council, be reduced to ten years in the case of a candidate for election who has graduated from a school of engineering recognized by the council. In every case the candidate shall have held a position in which he had responsible charge for at least five years as an engineer qualified to design, direct or report on engineering projects. The occupancy of a chair as a professor in a faculty of applied science or engineering, after the candidate has attained the age of thirty years, shall be considered as responsible charge.

An Associate Member shall be at least twenty-seven years of age, and shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years. The occupancy of a chair as an assistant professor or associate professor in a faculty of applied science of engineering, after the candidate has attained the age of twenty-seven years, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council, shall be required to pass an examination before a board of examiners appointed by the council. The candidate shall be examined on the theory and practice of engineering with special reference to the branch of engineering in which he has been engaged. This examination may be waived at the discretion of the council if the candidate has held a position of professional responsibility for five or more years.

A Junior shall be at least twenty-one years of age, and shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the council, if the candidate for election has graduated from a school of engineering recognized by the council. He shall not remain in the class of Junior after he has attained the age of thirty-three years.

Every candidate who has not graduated from a school of engineering recognized by the council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects: geography, history, (that of Canada in particular), arithmetic, geometry, euclid (books I, IV and VI), trigonometry, algebra up to and including quadratic equations.

A Student shall be at least seventeen years of age, and shall present a certificate of having passed successfully an examination equivalent to the final examination of a high school or the matriculation of an arts or science course. He shall either be pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall not remain in the class of student for more than two years after graduation; or he shall be receiving a practical training in the profession, in which case he shall pass an examination equal to that prescribed for admission to the grade of Junior in the foregoing section and he shall not remain in the class of Student after he has attained the age of twenty-seven years.

An Affiliate shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience, qualify him to co-operate with engineers in the advancement of professional knowledge.

> The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

CROSS—EDGAR ALGERNON, of 725 May Avenue, Windsor, Ont. Born at Petersfield, Hants., England, April 7th, 1889; Educ., B.Sc., (Engrg.), Birmingham Univ., 1909; Assoc. Member Inst. C.E. 1915; 1910-15, asst. engr., Birmingham Canal Navigations, England; 1915-17, Royal Engrs., B.E.F.; 1917-19, research engr., Royal Arsenal, Woolwich, England; 1919-20, chief asst. engr., Birmingham Canal Navigations, England; 1920 (Mar.-May), reinforced concrete designer with H. D. Best Co., New York City; 1920-22, supt. of constrn. for W. L. Stoddart, architect, New York City; June 1922 to date, struct'l. engr. for Albert Kahn, architect, Detroit, Mich.

References: J. E. Porter, J. C. Keith, O. J. Hein.

POPE—MAURICE ARTHUR, of Camberley, Surrey, England. Born at St. Patrick, Riviere-du-Loup, Que., August 29th, 1889; Educ., B.Sc. in C.E., McGill Univ., 1911; 1911-15, with C.P.R. principally as transitman on Montreal Terminals under divn. engr., eastern divn.; 1915-19, with Can. engrs. in France; June 1919 to date, Major, Royal Canadian Engrs.

References: J. M. R. Fairbairn, H. F. H. Hertzberg, A. C. Caldwell, A. G. L. McNaughton.

PRINTZ—CARL J., of 127 Delaware Avenue, Toronto, Ont. Born at Krohnborg, Nordre Island, Norway, Dec. 31st, 1860. Educ., Mech. Engr., Gottenburg Univ., 1883; 1883-88, professor in maths. Horten Tech. Sch. and dftsman., in Norwegian Navy Yards; 1888-96, dftsman., The Edw. P. Allis Co., Milwaukee, Wis.; 1896-98, dftsman., Geo. F. Blake Co., Boston, Mass.; 1897-1906, chief dftsman., Allis-Chalmers Co., Milwaukee, Wis.; 1906-08, chief of dftg. bureau, Milwaukee Elec. Rly. & Light Co.; 1908-12, i/c of dftg. room, The John Inglis Co., Toronto; 1912-20, inspr. for City of Toronto, The John Inglis Co., & Dominion Shipbldg. Co.; 1920 to date, steel inspr. with H.E.P.C. of Ontario, Toronto, Ont.

References: A. C. D. Blanchard, R. B. Young, G. Kewin, W. Jackson, W. P. Dobson, T. V. McCarthy, E. I. W. Jardine.

RICKEY—JAMES WALTER, of 2400 Oliver Building, Pittsburg, Pa. Born at Dayton, Ohio, Nov. 10th, 1871; Educ., C. E. Renss. Poly. Inst., 1894; 1895, asst. engr., Lake Superior Power Co., Sault Ste Marie, Ont., on constrn. of 10,000 h.p. water power plant for driving a pulp mill; 1896, asst. hydraulic engr., Lake Superior Power Co., Sault Ste Marie, Mich.; 1897-1907, hydraulic engr., St. Anthony Falls Water Power Co., Minneapolis, Minn.; 1907 to date, chief hydraulic engr., Aluminum Company of America, Pittsburg, Pa.

References: D. W. McLachlan, F. A. Gaby, H. Holgate, T. H. Hogg, C. R. Coutlee, S. J. Chapleau, R. S. Lea, H. G. Acres, W. S. Lee, C. D. Sargent.

FOR TRANSFER FROM CLASS OF ASSOCIATE MEMBER TO MEMBER

PEDEN—ALEXANDER, of 161 Strathearn Avenue, Montreal West, Que. Born at Montreal, June 13th, 1881; Educ., Private study. For last six years in charge of Dom. Bridge Co. evening classes and lectures on struct'l. and mech'l. engrg.; From 1901 to date, with the Dominion Bridge Company as follows: three years, dfting; nine years, checker and squad leader; four years, asst. chief dftsman.; three years, production engr. in shops; two years, chief dftsman. i/c of struct'l and bridge drawing office; three years to date, chief dftsman. i/c of mech'l. squad, in addition to clerical staff, etc.

References: F. P. Shearwood, F. S. Keith, P. B. Motley, P. L. Pratley, J. Robertson, J. S. Cameron, C. S. G. Rogers, J. M. Oxley.

SCHEMAN—CARL HENRY, of Bridgeburg, Ont. Born at Des Moines, Iowa, April 8th, 1889; Educ., B.S. in C.E. Iowa State College, 1910. Also professional degree of Civil Engr. June 1918; 1910 (June-Nov.), inspr. on concrete bridge; 1910-12, dftsman to designer, Illinois Central R.R. at Chicago; 1912-17, asst. to President, Iowa State College, in charge of development plans and constrn. of grounds and bldgs. Also executive duties in connection with college management; 1918-19, contracting engr., Chicago Bridge & Iron Works, Chicago, Ill.; 1919-21, gen. sales mgr. at Montreal, 1921-24, gen. mgr. at Bridgeburg, and from July 1924 to date, vice-president and managing director, Horton Steel Works, Ltd., Bridgeburg, Ont.

References: C. H. Mitchell, P. H. Mitchell, R. O. Wynne-Roberts, T. H. Hogg, M. V. Sauer.

WILSON—BARRY, of St. John, N.B. Born at St. John, N.B., Dec. 28th, 1889; Educ., Hamilton School of Technology, Hamilton, Ont. Engrg. apprentice course, Canadian Westinghouse Company, Ltd., Hamilton, Ont.; Installation and constrn. of following hydro-electric plants, Calgary Power Co., Kananaskis Falls, Alta., 1910. City of Winnipeg Power Co., Point du Bois, and city sub-stations, 1910-11; H.E.P.C. of Ontario, Dundas sub-station. Works electrician, Steel Co. of Canada, 1913-18; 1918, city electrician, City of St. John, and from 1922 to date, engr., Power Commission of the City of St. John.

References: G. G. Hare, F. P. Vaughan, G. G. Murdoch, A. Gray, C. C. Kirby.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGH GRADE

LAWRENCE—WILLIAM SEWELL, of Victoria, B.C. Born at Stratford, Ont., Feb. 24th, 1889; Educ., Diploma (Honours), R.M.C., 1909. 1910-12, Sch. of Mil. Engrg., Chatham, England; Granted Commission as Lieut. Royal Can. Engrs., 1909, continuous service to date. Promoted Major, March 1916. At present dist. engr. officer, Mil. Dist. No. 11, Victoria, B.C.

References: A. G. L. McNaughton, J. L. H. Bogart, H. F. H. Hertzberg, J. B. Cochrane.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

DENTITH—FRANCIS WILLIAM HUBERT, of 152 Durocher Street, Montreal, Que. Born at Dartmouth, N.S., July 25th, 1902; Educ., engrg. diploma, Dalhousie Univ. 1923. B.Sc. (Chem.), McGill Univ. 1925; Summer work: 1920-21, with Pickings & Wilson, Halifax, N.S.; 1923, asst. to road contractor, Standards Construction Co., Halifax, N.S.; Aug. 1922 to June 1923, asst. instructor in chemistry and maths., Halifax Academy, Halifax; May 1925 to date, junior chemist, Brandram-Henderson, Ltd., Montreal, Que.

References: H. M. MacKay, F. S. Keith, C. M. McKergow, W. P. Copp, H. B. Pickings, C. St. J. Wilson.

FOLEMSBEE—FRANK, Jr., of 396 Victoria Avenue, Niagara Falls, Ont. Born at Niagara Falls, Feb. 15th, 1902; Educ., I.C.S.; May 1919 to date, with the city engr. of Niagara Falls, at present levelman and dftsman.

References: G. D. O'Connor, D. T. Black, T. S. Scott, J. C. Gardner, S. R. Frost.

KEARNS—JAMES A., of Montreal, Que. Born at Montreal, August 29th, 1891; Educ., B.Sc., McGill Univ., 1912; 1912-14, engrg. dftsman., with various concerns; 1914-16, engr. for MacMullen, Riley & Durley, design and supervision of constrn. of many large bldgs. and power plants; 1917-20, asst. mech. engr., also equipment engr. for the vocational branch, Military Hospital Commn. and D.S.C.R., Ottawa; 1916-17, and 1921-23, engrg. dept., as asst. to chief engr., mech'l. and electr'l. service work, Ross and MacDonald, Montreal; 1923 to date, consulting engr., Montreal, Que.

References: R. J. Durley, W. J. Armstrong, H. W. Fairlie, E. A. Ryan, A. Wilson.

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A

AERIAL PHOTOGRAPHY

Surveys. Aerial Photographs, Surveys and Maps, J. W. Pierce. Can. Engr., vol. 48, no. 19, May 19, 1925, pp. 486-489, 3 figs. Development of aerial photography and its adaptation to survey work and maps; vertical and oblique aerial mapping. Paper read before Ont. Land Surveyors, Toronto.

AERODYNAMICS

Deviation of Air Current by Obstacles. The Upper Limit of Deviation of Air Current by Obstacles (Die obere Begrenzung der abgelenkten Luftströmung an Hindernissem), W. Georgii. Zeit. für Flugtechnik u. Motor luftschiffahrt, vol. 16, no. 4, Feb. 28, 1925, pp. 105-108, 7 figs. Deals with question of height of influence, that is, upper limit of path of vertical wind over an obstacle. See also succeeding article, by R. Benkendorff, entitled Can the Term "Height of Influence" be Maintained? (Kann der Begriff "Einflusshöhe" aufrecht erhalten werden?), pp. 108-109.

Research. Recent Investigations of the Aerodynamic Experimental Institute, Göttingen (Neuere Untersuchungen der Aerodynamischen Versuchsanstalt, Göttingen), J. Ackeret. Zeit. für Flugtechnik u. Motorluftschiffahrt, vol. 16, no. 3, Feb. 14, 1925, pp. 44-52, 18 figs. Systematic investigations of Joukowski profiles; measurements on an airplane model with built-in engine and running propeller; the rotating cylinder (Magnus effect).

AERONAUTICS

Rotor Ship and. The Rotor Ship and Aeronautics, L. Bairstow. Nature (Lond.), vol. 115, no. 2891, Mar. 28, 1925, pp. 462-464, 3 figs. Details of experiments in wind channels from which estimates may be made of forces on rotating cylinders and power needed to drive them.

AIR

Moist, Weight of. A Chart for Determining the Weight of Moist Air, J. E. Younger. Mech. Eng., vol. 47, no. 6, June 1925, pp. 492-494, 1 fig. Presents chart which is perhaps first simple and convenient graphical method to be devised for calculation of such problems; it should be of great value to those having to make calculations on performance of fans, in heating and ventilating problems, and in aerodynamic experimentation in wind tunnel.

AIR COMPRESSORS

Diesel Engines, Operation in. Air Compressor Operation in Diesel Engines (Les incidents de fonctionnement des compresseurs d'air dans les moteurs Diesel), P. Martinet. Technique Moderne, vol. 17, no. 10, May 15, 1925, pp. 289-293, 1 fig. Discusses function of lubrication in air compressors.

Operation and Maintenance. Operation, Care and Maintenance of Air Compressors, A. B. Newell. Oil Engine Power, vol. 3, no. 5, May 1925, pp. 300-302, 3 figs. Methods of assuring efficient and reliable operation.

Turbo, Repairs. Turbo-Air Compressor Repairs, R. L. Irvine. Am. Soc. Nav. Engrs.—Jl., vol. 37, no. 2, May 1925, pp. 306-308, 12 figs. on supp. plates. Repairs undertaken and completed at Puget Sound Navy Yard to two turbo air compressors for U. S. S. Nevada.

AIR CONDITIONING

Brine Spray Refrigeration. Air Conditioning, H. A. Terrell. Refrig. Eng., vol. 11, no. 11, May 1925, pp. 388-391, 6 figs. Deals with development and problems; types of brine spray systems.

Constant-Humidity Room. The Design, Construction, and Use of a Constant Humidity Room, R. G. Parker and D. N. Jackman. Chem. & Industry, vol. 44, no. 20, May 15, 1925, pp. 223T-233T, 13 figs. Methods of controlling humidity; available designs of constant-humidity apparatus; conditions governing design of small constant-humidity room; design and details of construction of room; circulation of air; constant-humidity room in use.

Cooling. The Cooling of Theatres and Public Buildings, H. J. Macintire. Heat. & Vent. Mag., vol. 22, no. 6, June 1925, pp. 49-52, 2 figs. Mechanical refrigeration design, with solution of problem for installing cooling plant in 3000-seat theatre.

Factories. Good Factory Air Pays in Increased Output, A. G. Anderson. Mgmt. & Admin., vol. 9, nos. 5 and 6, May and June, 1925, pp. 439-442 and 531-534, 6 figs. May: Bad effects of poor ventilation; standards of ventilation. June: Shop ventilation as investment; ways in which equipment pays dividends on its costs.

AIR PUMPS

Steam-Jet. Economy of the Steam Jet Air Pump, H. E. Carleton. Power Plant Eng., vol. 29, no. 11, June 1, 1925, p. 595. Convenience of installation often influences auxiliary selection; steam-jet pump replaces mechanical pump.

AIRPLANE ENGINES

Air-Cooled. The Design of Air-Cooled Cylinders, C. F. Taylor. Aviatixn, vol. 18, no. 24, June 15, 1925, pp. 664-667. Remarks on fin design which are applicable not only to cylinder barrel, but to combustion-chamber walls and ports; cylinder stresses; valve ports; factor of safety; handling and lubrication; aluminum and alloys available for construction.

Laboratory for. The Aeronautical Engine Laboratory, Naval Aircraft Factory, Philadelphia, Penna. Am. Soc. Nav. Engrs.—Jl., vol. 38, no. 2, May 1925, pp. 275-305, 10 figs. Sets forth description of laboratory maintained by Bureau of Aeronautics; apparatus and methods employed in making laboratory tests of aviation power-plant material.

AIRPLANES

Airfoils. Air Forces on Airfoils Moving Faster than Sound (Luftkräfte auf Flügel, die mit grösserer als Schallgeschwindigkeit bewegt werden), J. Ackeret. Zeit. für Flugtechnik u. Motorluftschiffahrt, vol. 16, no. 3, Feb. 14, 1925, pp. 72-74, 6 figs.; also (translation) in Nat. Advisory Committee for Aeronautics—Tech. Memorandums, no. 317, June 1925, 8 pp., 6 figs. Computation of air forces on slightly cambered airfoil in absence of friction and with infinite aspect ratio; it is assumed in advance that leading edge is very sharp, and that its tangent lies in direction of motion.

Banking, Stresses in. The Stress of Airplanes When Banking (Die Beanspruchung von Flugzeugen beim Abfangen), R. Fuchs and H. Blenk. Zeit. für Flugtechnik u. Motorluftschiffahrt, vol. 16, no. 3, Feb. 14, 1925, pp. 78-86, 14 figs. Investigation of banking from vertical descending flight and from vertical descent with constant stress.

Light. Some Considerations in the Design of a Light Aeroplane, N. Comper. Roy. Aeronautical Soc.—Jl., vol. 29, no. 173, May 1925, pp. 240-244. Discusses factors governing design; presents tables showing that on light airplanes now in existence in England there is always one weight which can fix designer's total weight estimate.

Loening Amphibian. The Loening Amphibian. Flight, vol. 17, no. 21, May 21, 1925, pp. 302-304, 5 figs. Principal idea in this machine is use of inverted type of aircraft engine, placing propeller thrust at top of body and thus including entire body with engine mount in nose to form a compact unit hull, carrying passengers, load, petrol, and all equipment; 400-hp. inverted "Liberty" engine; span 45 ft., length 34 ft. 1 in., chord 6 ft., wing area 500 sq. ft.

Monoplanes. The Monoplane as a Bearing Eddy Surface (Der Eindecker als tragende Wirbelfläche), H. Blenk. Zeit. für Angewandte Mathematik u. Mechanik, vol. 5, no. 1, Feb. (2d no.), 1925, pp. 36-47, 8 figs. Discusses calculation of flow, profile and resistance for given distribution of circulation, for various types of monoplanes.

Rotor System. A Study of the Rotor Problem (Betrachtungen zum Rotorproblem), A. Pröll. Zeit. für Flugtechnik u. Motorluftschiffahrt, vol. 16, no. 3, Feb. 14, 1925, pp. 66-72, 9 figs. Based partially on results of observations, a simplified theoretical calculation is given for lift and drag in connection with the Magnus effect; comparison of airplanes of standard design with those according to rotor system; it is shown that latter come into consideration only for unusual cases (very low speed).

Seaplanes. *See Seaplanes.*

Tear-Shaped Bodies. Study of Tear-Shaped Bodies (Etude sur les corps lacrymiformes), R. Duhamel. Aérophile, vol. 33, nos. 3-4 and 5-6, Feb. 1-15 and Mar. 1-15, 1925, pp. 49-52 and 77-79, 7 figs. Develops formulas for calculating resistance, etc., of tear-shaped bodies; example of calculation for body 3.1 m. long 0.62 m. wide at a speed of 60 meters per second.

Wind-Tunnel Tests. The Estimation of Airplane Performance from Wind Tunnel Tests on Conventional Airplane Models, E. P. Warner and S. Ober. Nat. Advisory Committee for Aeronautics—Tech. Notes, no. 218, May 1925, 18 pp. Results of series of performance calculations made for series of conventional models which have been tested in past 4 years at wind tunnel of Mass. Inst. Technology; calculated performances were compared with those actually determined for such of airplanes as have been built and put through flight test.

Wings. A Method for Direct Computation of Profile Resistance (Ein Verfahren zur direkten Ermittlung des Profilwiderstandes), A. Betz. Zeit. für Flugtechnik u. motorluftschiffahrt, vol. 16, no. 3, Feb. 14, 1925, pp. 42-44, 3 figs. Describes method of calculating profile resistance direct from energy loss of air.

Some Problems on the Lift and Rolling Moment of Airplane Wings, Jas. B. Scarborough. Nat. Advisory Committee for Aeronautics—Report, no. 200, 1925, 16 pp., 2 figs. Deals with application of airfoil and twisted-wing theory to calculation of lift and rolling moment of airplane wings; most of results arrived at are strictly true only for wings of elliptic plan form.

Transversal and Lateral Moments of a Wing in Straight Flight (Quermomento und Kursmomente eines Tragflügels im geraden Flug), F. N. Scheubel. Zeit. für Flugtechnik u. Motorlurtschiffahrt, vol. 16, no. 7, Apr. 14, 1925, pp. 152-156, 9 figs. Investigates cause of lateral moment occurring when pilot forces a transverse moment on his plane.

AIRSHIPS

Developments. Modern Dirigibles (I moderni dirigibili), R. Giocomelli. Ingegneria, vol. 4, no. 3, Mar. 1925, pp. 101-105, 11 figs. Discusses dirigibles of large volume and part of Italy in their construction and development.

Stability. Stability Equations for Airship Hulls, A. F. Zahm. Nat. Advisory Committee for Aeronautics—Report, no. 12, 1925, 5 pp. Simple formulas are derived for determining directly from data of wind-tunnel tests of model of airship hull, what shall be approximate character of oscillation in pitch or yaw, of full-scale ship when slightly disturbed from steady forward motion.

ALLOYS

Aluminum. *See Aluminum Alloys.*
Die-Casting. Die-Casting Alloys. Foundry Trade Jl., vol. 31, no. 458, May 28, 1925, pp. 460-461. Deals with lead-base, tin-base, zinc-base, aluminum-base and copper-base alloys.
Iron. *See Iron Alloys.*

ALCOHOL

Sources of Industrial. Some Unexploited Sources of Industrial Alcohol, E. T. Ellis. Power Engr., vol. 20, no. 231, June 1925, pp. 232-233. Survey of subject; industrial alcohol from wayside weeds, lichens, rotten potatoes, sawdust and shavings, seaweed, and waste nuts.

ALUMINUM

Electrolytic Refining. High Purity Aluminium. Metallurgist (Supp. to Engineer, vol. 139, no. 3622), May 29, 1925, pp. 77-78. Problem of electrolytic refining of aluminum in fused electrolyte has been solved in America in manner for which commercial operation is claimed; process, as described in paper presented to Am. Electrochem. Soc., by F. C. Frary.

ALUMINUM ALLOYS

Duralumin, Similar to. Alloys Similar to Duralumin Made in Other Countries than Germany, K. L. Meissner. Nat. Advisory Committee for Aeronautics—Tech. Memorandums, no. 314, May 1925, 7 pp. Gives examples of patents which have been issued in other countries on alloys closely resembling the German duralumin in every way. Translated from Zeit. für Metallkunder, 1925, p. 64.

ALUMINUM ALLOYS

Thermal and Electric Conductivities. On the Thermal and Electric Conductivities of Some Aluminium Alloys, H. Masumoto. Tôhoku Imperial Univ.—Science Reports, vol. 13, no. 3, Mar. 1925, pp. 229-242, 3 figs. Details of investigation whose object was to obtain absolute values of thermal and electric conductivities of some aluminum alloys; and to confirm Wiedemann-Franz's law, according to which ratio between thermal and electric conductivity of metals is constant, being independent of nature of materials, in case of aluminum and its alloys.

AMMONIA

Solutions, Vapor Pressures of. The Total and Partial Vapor Pressures of Aqueous Ammonia Solutions, T. A. Wilson. Univ. of Ill. Bul., no. 146, Feb. 1925, 47 pp., 8 figs. Hitherto unsatisfactory state of knowledge of aqua ammonia noted, and desirability of further knowledge shown; apparatus for total and partial pressure measurements of ammonia-water system described; measurements made and experimental values obtained for these pressures, and from these general empirical equations derived on which calculations might be based; tables of total and partial pressures computed, making use of these equations; application of this work to ammonia absorption prices of refrigeration explained.

AMMONIA COMPRESSORS

Operation. Results of Operating Ammonia Compressors Under Single- and Double-State Conditions, T. Shipley. Ice & Cold Storage, vol. 28, nos. 324, 325 and 327, Mar., Apr. and June, 1925, pp. 65-68, 87-91 and 150-152, 10 figs. Compares performance of vertical single-acting uniflow poppet-valve type of compressor with horizontal double-acting rings and strip (feather) plate valve return type of compressor, and shows what duty has been obtained by operating types of these compressors through ranges which are usually met with in practical use, under both single- and double-stage conditions. Abstract of paper read before Nat. Assn. Practical Refrig. Engrs.
Plate Valves in. Plate Valves in Compressors, J. Hepburn. Cold Storage, vol. 28, no. 326, May 21, 1925, pp. 185-186, 6 figs. Aspects of Australian practice. Abstract of paper read before Victorian Inst. Refrigeration.

AMMONIA CONDENSERS

Operation. Operation of Ammonia Condensers, H. J. Halterman. Ice & Refrigeration, vol. 68, no. 6, June 1925, pp. 508-510. Management and operation of condensers, cooling towers, separation of non-condensable gases, etc. Paper read at Perdue-N.A.P.R.E. concention.
Types. Ammonia Condensers, H. J. Macintire. South. Engr., vol. 43, no. 4, June 1925, pp. 59-62, 5 figs. Deals with submerged, double pipe, atmospheric flooded and shell and tube types of condensers.

APPRENTICES, TRAINING OF

Community. Community Apprentice Training, H. A. Frommelt. Machy. (N.Y.), vol. 31, no. 10, June 1925, pp. 801-802. How metalworking concerns in Milwaukee co-operate with view to developing all-around mechanics; features of community or district training; how agreement is made with boys.
Foundry. Cutting To-morrow's Labor Costs, H. A. Frommelt. Iron Age, vol. 115, no. 25, June 18, 1925, pp. 1773-1774. Milwaukee sows seed of careful training in modern foundry practice and reaps more productive labor; presents program of shop and school work, which is schedule for 4-year apprenticeship in foundry.
Railways. How the Milwaukee Road is Training Apprentices, C. G. Juneau. Ry. Rev., vol. 76, no. 23, June 6, 1925, pp. 1013-1017, 7 figs. Outline of method for training apprentices. (Abstract.) Paper presented before West. Ry. Club, Chicago.

ARCHES

Hingeless. The Design of a Symmetrical Hingeless Arch, A. C. Hughes. Surveyor & Mun. & County Engr., vol. 67, nos. 1737 and 1738, May 1 and 8, 1925, pp. 439-440 and 457-458, 5 figs. Gives an example of design of a typical main road bridge; load and bending moments calculation.

AUTOMOBILE ENGINES

Crankcase-Oil Dilution. Better Crank-case Draining Service, C. M. Larson. Indus. & Eng. Chem., vol. 17, no. 5, May 1925, pp. 476-478, 9 figs. Outlines actual facts of dilution of crankcase oil; data were gathered from dynamometer laboratory test work of scientific accuracy and also from actual road performance of automobiles.
Crankcase-Oil Reclamation. Deterioration and Reclamation of Used Automobile Crank-Case Oil, A. E. Flowers, F. H. McBerty and R. Reamer. Indus. & Eng. Chem., vol. 17, no. 5, May 1925, pp. 481-485, 3 figs. Information on nature and rate of accumulation of contaminants; method and apparatus for reclaiming used oils are described and characteristics of recovered oils are compared with those of new oils. Bibliography.
Fan and Water-Pump Unit. New Combination Fan and Water Pump iis Developed. Automotive Industries, vol. 52, no. 25, June 18, 1925, p. 1064, 1 fig. Unusual simplicity characterizes product; internal gear-pump lubrication and automatic belt tightener are among features.
Fuels. *See Automobile Fuels.*
Rating. The Power of Internal Combustion Engines for Motor Cars, D. Clerk. Roy. Soc. Arts—Jl., vol. 73, no. 377, Apr. 10, 1925, pp. 492-505 and (discussion) 505-511, 6 figs. A discussion of rating of automobile motors, making calculations and giving formulas.

Valve Rockers. Valve Rockers, A. Swan. Automobile Engr., vol. 15, no. 202, May 1925, pp. 144-146, 13 figs. Fundamental considerations in designs; cam loading; spring loading; resultant load on rocker bracket.

AUTOMOBILE FUELS

Gasoline. *See Gasoline.*
Tetraethyl Lead. Menace of Tetraethyl Lead to Garage Workers. Monthly Labor Rev., vol. 20, no. 5, May 1925, pp. 174-175. Points out possible danger to garage workers from its use and measures to be taken for prevention of poisoning.

AUTOMOBILES

Center of Gravity of. The Center of Gravity. Autocar, vol. 54, no. 1541, May 1, 1925, pp. 761-765, 13 figs. Prevalent idea that a low center of gravity necessitates a small ground clearance is dispelled, and it is clearly shown that a car which corners fast may also corner safely; to do this its center of gravity must be low. Discusses stability, influence of racing on design, tendency to pitch and roll, effect on passengers' comfort, permission cornering speeds, etc.
Transmissions. Tests Show Practicability of Lavaud Automatic Transmission, W. F. Bradley. Automotive Industries, vol. 52, no. 25, June 18, 1925, pp. 1058-1060, 2 figs. Reduces fuel and oil consumption, increases acceleration and average speed and gives better control in traffic and on hills; to be used on 10-hp. Voisin.

AUTOGENOUS WELDING

Boilers. Proposed Code of Rules to Govern Autogenous Welding on Steam Boilers. Ry. Jl., vol. 31, no. 6, June 1925, pp. 25-28, 1 fig. Committee's recommendations; butt vs. lap-welded joints; summary of tests; plates welded on one side only; conclusions from tests; recommendations covering use of autogenous welding in steam boilers; autogenous welding of firebox. (Abstract.) Report of Committee to Master Boiler-Makers' Assn.

B

BALANCING MACHINES

Krupp. Krupp Combined Dynamic-Static Balancing Machines (Die Kruppschen vereinigten dynamisch-statischen Wuchtmaschinen), H. Hort. Kruppsche Monatshefte, vol. 6, Feb. 1925, pp. 33-40, 7 figs. Discusses introduction of three types, BT, ET, and W, last of which is described in detail, operating without critical speed of revolution or elastic bending through shafts.

BALLAST RESISTORS

Nernst. The Ballast Resistor in Practice, H. A. Jones. Gen. Elec. Rev., vol. 28, no. 5, May 1925, pp. 329-335, 12 figs. A type of resistance used extensively in industrial circuits to maintain a constant current over long periods is called a "ballast resistor" or a "Nernst Ballast". Detailed discussion of fundamental principles of ballast action and design of ballast resistances; results of investigation on characteristics properties of various wires in different gases.

BEAMS

Continuous. Stresses in Continuous Beams Determined Graphically, I. Duberstein. Eng. News-Rec., vol. 94, no. 22, May 28, 1925, pp. 886-888, 3 figs. Simple procedure based on moment-area principle and Maxwell's theorem gives reactions for three or more supports.
Steel Haunched in Concrete. Steel I-Beams Haunched in Concrete, P. Gillespie and R. C. Leslie. Univ. of Toronto, School of Eng. Research, Bul. no. 5, 1925, pp. 27-86, 5 figs. Results of tests on strength of this type of beam; calculation; saving accomplished by haunching; tables giving uniformly distributed safe gross loads for steel beams with standard haunching, and horizontal shear produced by these loads.

BEARINGS

Lubrication of. Modern Technics of Lubricating, Especially of Bearings (Die Bedeutung neuzeitlicher Schmiermitteltechnik für die Energieersparnis), K. Wolf. Sparwirtschaft, no. 5, May 1925, pp. 66-69 (GW). Discusses determination of quality of oils, viscosity curves, selection of oils, etc.

BEARINGS, BALL

Design. General Properties of Ball Bearings, H. Styri. Mech. Eng., vol. 47, no. 6, June 1925, pp. 490-492, 7 figs. Fundamental factors in ball-bearing design; load, life, fatigue and friction torque.

BEARINGS, THRUST

Test Bed for. A Test Bed for Large Axial Thrust Bearings (Ein Versuchstand für grosse Axialdrucklager), E. Feifel. Zeit. des Vereines deutscher Ingenieure, vol. 69, no. 20, May 16, 1925, pp. 679-683, 6 figs. Describes test bed built by firm of Fritz Neumeyer, Munich, for investigation of large axial thrust bearings with vertical shaft, allowing bearing load of 300 tons; gives results of tests with 250-ton segmental bearing with different bearing pressures, and different temperatures and kinds of oil.

BELT DRIVE

Re-arrangement and Adjustment. Rearrangement and Adjustment of Belt Drives, S. R. Stone. Belting, vol. 26, no. 4, Apr. 1925, pp. 38, 40, 44 and 46, 1 fig. Typical examples in machine shops described in detail; many factors to be considered deserving study and skilled application.

BELTING

Leather. Summary of Research on the Application of Leather Belting, R. F. Jones. Nat. Engr., vol. 29, nos. 4, 5 and 6, Apr., May and June, 1925, pp. 176-178, 215-218 and 281-283, 9 figs. Non-technical summary of results determined from research made by Leather Belting Exchange Foundation at Cornell University, covering factors of pulley diameter, pulley ratio, center distance, effect of high belt speeds, gravity idlers, and giving new rating curves and tables for leather belting.

BLOWERS

Turbo. Artificial Draught in Sea and Harbour Tugs. Mar. Engr. & Motorship Bldr., vol. 48, no. 572, May 1925, pp. 186-187, 2 figs. Details of Sureal turbo induced draft system; arrangement consists of inverted cone-shaped inner funnel which, in case of new vessels, takes place of ordinary boiler uptake, but which in case of existing vessels can easily be adapted to fit in with existing uptake.

BOILER FEEDWATER

Concentration Control. The Physical Side of Concentration in Boilers, R. W. Andrews. Engrs. & Eng., vol. 42, no. 5, May 1925, pp. 126-132. Discussion of results from operating standpoint after any and all chemical reactions have taken place; deals with feedwater treatment; priming and foaming; concentration of impurities; impurities carried over with steam; heat savings by decreasing blow-down; results of actual tests and experiences; danger and expense due to carried-over impurities; evaporators. Paper read before Nat. Elec. Light Assn.

Soda-Ash Additions. Three Pounds of Soda Ash Daily Saves Boiler Tubes in New Orleans Plant, P. F. Hoots. Power, vol. 61, no. 23, June 9, 1925, pp. 899-902, 3 figs. States that addition of only three pounds of soda ash to daily boiler feed of 10,000,000 lb. has checked serious tube losses in oil-fired boilers at steam-electric station of New Orleans Public Service, Inc.; analyzes ups and downs of operation, relating troubles encountered with burned-out tubes, remedies and results obtained.

BOILER FIRING

Carbon Losses in Ashes. The Carbon Losses in Ashes of Boiler Fuel, L. M. Marks. Steam Power, vol. 4, no. 2, Mar. 1925, pp. 6 and 14. Causes of loss of carbon.

BOILER FURNACES

Design. Notes on Furnace Design. Iron & Steel of Canada, vol. 8, no. 5, May 1925, pp. 113-114. Notes on correct air supply, protection of structure, water cooling, insulation, ventilation, need of arches and furnace brick work, ignition and heat interchange.

Pulverized-Coal. Boiler Furnaces for Pulverized Coal, H. W. Brooks. Power Plant Eng., vol. 29, no. 12, June 15, 1925, pp. 655-657, 8 figs. Describes new type of furnace with combustion rate of over half million B.t.u. per cu. ft. Paper presented before Am. Soc. Mech. Engrs.

Water-Cooled. Water-Cooled Boiler Furnace Walls, H. D. Savage. Iron Age, vol. 115, no. 23, June 4, 1925, pp. 1642-1643, 1 fig. Discusses use of Murray fin walls at Hell Gate Station of U. S. Elec. Light & Power Co. (Abstract.) Paper presented before Am. Iron & Steel Inst.

BOILER PLANTS

Low-Grade Fuel. Low-Grade and Waste Fuels for Steam Raising, B. C. Kershaw. Colliery Eng., vol. 2, nos. 11, 13, 14 and 15, Jan., Mar., Apr., and May, pp. 4-6, 136-138, 177-180 and 213-218, 17 figs. Describes plants suitable for utilizing refuse fuels in different countries. May: Waste-heat utilization; systems by which economies can be effected in coal-mine power plant.

BOILER PLATE

Elongation. Elongation at Rupture of Thick Boiler Plate (Die Bruchdehnung dicker Kesselbleche), R. Baumann. Zeit. des Bayerischen Revisions-Vereins, vol. 29, nos. 6, 7 and 8, Mar. 31, Apr. 15 and 30, 1925, pp. 55-65, 79-82 and 90-93, 18 figs. Results of testing 24 plates of thickness of 10-61 mm. to determine what rupture elongation is required so as to maintain desired elongation values and not overburden rolling mills; proposals of various sizes of bars for desired values of elongation.

BOILERS

Construction. Boiler Construction in the United States (La construction des chaudières aux Etats-Unis), C. Roszak and M. Veron. Technique Moderne, vol. 17, no. 7, Apr. 1, 1925, pp. 201-210, 4 figs. Rules for construction and acceptance. Discusses A.S.M.E. Code, with equivalent specifications in force in France.

Locomotive. *See Locomotive Boilers.*

BRASS FOUNDING

Methods and Problems. Pouring Temcratures Control the Quality of Brass Castings, F. L. Wolf and Wm. Romanoff. Foundry, vol. 53, no. 11, June 1, 1925, pp. 436-437 and 450. Discussion of brass-shop problems; utilizing scrap materials; use of deoxidizers. Paper presented before Am. Foundrymen's Assn.

Vertical Pouring and Molding. Top Pouring Produces Better Castings, J. L. Sendner. Foundry, vol. 53, no. 11, June 1, 1925, pp. 455-456. Points out that theory regarding draining of eutectic portion of metal downward after crystallization and consequent minute crevices or intercrystalline cavities left in drained portion, is logical and can be substantiated by careful inspection of sound and leaky brass castings; vertical method of molding and pouring large bushings and liners with pop gates, has been made standard practice at Puget Sound Navy Yard.

BRIDGE DESIGN

Problems. Unusual Problems in Design and Construction of Large Bridges, R. Modjeski. Franklin Inst.—Jl., vol. 199, no. 5, May 1925, pp. 597-617, 19 figs. Gives examples of bridge constructions showing of various problems which confront engineer in every phase of work, from location and eesign, on through all work of building.

BRUSHES, ELECTRIC

Physical Characteristics. Mechanical or Physical Characteristics of Brushes. Ry. Elec. Engr., vol. 16, no. 6, June 1925, pp. 186-187, 2 figs. Deals with size of brushes, attachment of shunts, coefficient of friction, hardness, strength, abrasiveness, density and thermal conductivity.

C

CABLES, ELECTRIC

Oil-Filled Terminals for High-Voltage. Oil Filled Terminals for High Voltage Cables, E. D. Eby. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 6, June 1925, pp. 593-600, 15 figs. Standard ratings of terminals are proposed, corresponding to accepted standard ratings for other high-voltage apparatus; four typical designs of high-voltage cable terminals are described, representing carefully worked-out and effective solution of problem; results of experimental installation of 110,000-volt terminals demonstrate safety of design, predicted from calculations and confirmed by laboratory tests.

Supertension, Dielectrics. Super-Tension Cable Dielectrics, A. I. Tracey. Engineer, vol. 139, no. 3621, May 22, 1925, pp. 580-581, 1 fig. Discusses stresses and losses occurring in dielectric of supertension cables and shows how they operate and their effect upon breakdown of dielectric. (Abstract.) Paper read before Elec. Power Engrs.' Assn.

Telephone. Submarine Telephone Cables, M. C. Timms. Elec. Engr., vol. 1, no. 12 and vol. 2, no. 1, Mar. 15 and Apr. 15, 1925, pp. 451-455 and 21-25, 4 figs. Describes means by which it has been made possible to transmit speech across stretches of water that would have deemed insurmountable obstacles 20 years ago. Deals with standard cable, telephonic currents, attenuation and distortion, leakage, pioneer work, loading, coil loaded cables, loading coils, continuous loaded cables, telephonic repeaters, single core cables, etc.

CAR WHEELS

Chilled-Iron. The Unusual Story of the Chilled Iron Wheel, F. K. Vial. Ry. Rev., vol. 76, no. 24, June 13, 1925, pp. 1066-1069. Commercial advantage; properties of metal; rail abrasion; brake-shoe friction; shop appliances; service guarantee.

Rolled-Steel. Valuable Facts to Know about Rolled Steel Wheels, Geo. A. Richardson. Ry. Rev., vol. 76, no. 24, June 13, 1925, pp. 1070-1074, 9 figs. Idea of processes involved in manufacture of rolled-steel wheels; shows how certain changes in buying practice can be of direct benefit to user; methods used in Cambria plant of Bethlehem Steel Co. are given as example.

Tires. Fatigue of Metals in Tires of Railway Wheels (Essai sur la fatigue du métal dans les bandages de roues de chemins de fer), M. Billet. Revue de Métallurgie, vol. 22, nos. 3 and 4, Mar. and Apr., 1925, pp. 154-169 and 207-217, 25 figs. Discusses elasticity of tires, flexibility of wheel centers, fixing of tires; concludes that tired wheels should be replaced by one-piece (monobloc) disk wheels; experimental determination of contraction of wheel body due to shrinking on of tires.

CASE-HARDENING

Carburizing and Heat Treatment. Carburizing and Heat Treatment of Carburized Objects, B. F. Shepherd. Am. Soc. Steel Treating—Trans., vol. 7, no. 6, June 1925, pp. 774-789, 1 fig. Recommendations for carburization and heat treatment of carburized parts; data presented represents average practice in several up-to-date manufacturing plants; action of carburizing compounds and methods of testing to determine suitability of given compound; heating practice, both for carburizing and hardening, and determination of depth of carburized zone.

CAST IRON

Graphite Distribution in. The Distribution of Graphite in Cast Iron and the Influence of Other Elements on Its Strength, M. Hamasumi. Foundry Trade Jl., vol. 31, no. 448, Mar. 19, 1925, pp. 239-244, 11 figs. Investigation of mechanical properties of cast iron in all its bearings, viz., effect of rate of cooling, distribution of graphite, and effect of common impurities, such as silicon, phosphorus, sulphur, manganese, copper, nickel, chromium and tin; it was undertaken to get correct quantitative result, and not qualitative one. Extracted from Sci. Reports of Tohoku Imperial Univ.

Heat Treatment. Heat Treatment of Cast Iron, F. Grotts. Am. Soc. Steel Treating—Trans., vol. 7, no. 6, June 1925, pp. 735-742. Shows that physical properties of cast iron can be very radically modified by suitable heat treatment; also that addition of alloys as well as close chemical control of cupola will give results that are very desirable; discusses possibilities in connection with short-time malleablizing and salvaging of defective castings by means of copper-nickel alloy with electric arc.

CASTINGS

Microscopic Examination of. Recommend Microscope as Control Instrument, J. F. Harper and H. J. Stein. Foundry, vol. 53. no. 12, June 15, 1925, pp. 487-489, and 502, 12 figs. Physical properties will meet specifications if microstructure is satisfactory; explanation of solidification of medium carbon steels; method used by Allis-Chalmers Mfg. Co., Milwaukee. Paper read before Am. Foundrymen's Assn.

Service Possibilities. Defend Use of Castings, E. C. Barringer. Foundry, vol. 53, no. 12, June 15, 1925, pp. 490-491. Foundrymen attending sessions of American Society of Mechanical Engineers emphasize service possibilities of cast products.

CENTRAL STATIONS

Chicago. Crawford Avenue Station of the Commonwealth Edison Company. Power, vol. 61, no. 24, June 16, 1925, pp. 936-944, 9 figs. Initial installation of 750,000-kw. plant in Chicago consists of three units now in operation and fourth going in, with aggregate capacity of 235,000 kw.; steam conditions of 550-lb. gage and 725-deg. fahr. are used as well as reheating, stage bleeding, water and air economizers, vertical condensers, direct drive of auxiliary generators and exciters and motor-driven auxiliaries.

Engineers and Development. The Engineer in Central-Station Development, H. P. Liversidge. Elec. World, vol. 85, no. 23, June 6, 1925, pp. 1199-1203, 5 figs. Early work largely design and construction; developments tending toward refinements in economics of construction and operation; engineers, it is claimed, must direct attention to management problems.

Heating and Ventilation. Heating and Ventilation of a Modern Steam Power Station, D. S. Boyden and A. B. Williams. Am. Soc. Heat. and Vent. Engrs.—Jl., vol. 31, no. 4, Apr. 1925, pp. 231-244 and (discussion) 244-246, 7 figs. Formulation of requirements at new Weymouth Power Station of Edison Elec. Illuminating Co., Boston, Mass., and study of methods used to fulfill them.

Heating and Ventilating Requirements of a Power Station, C. S. Peace. Heat. & Vent. Mag., vol. 22, no. 5, May 1925, pp. 54-60, 5 figs. Details of design for new Hudson Avenue generating station of Brooklyn Edison Co.; ultimate capacity to be over 400,000 kw.

Los Angeles, Cal. Seal Beach Power Station. Power Plant Eng., vol. 29, no. 12, June 15, 1925, pp. 618-630, 18 figs. First unit of 200,000-kw. plant for Los Angeles Gas & Electric Corp.; first installation is rated at 30,000 kw.; oil-fuel system; boiler equipment; electrical system.

Oil- and Gas-Fired. Seal Beach Plant Operating, J. G. Rollow and D. L. Galusha. Elec. World, vol. 85, no. 22, May 30, 1925, pp. 1123-1127, 9 figs. New steam station of Los Angeles Gas & Electric Corp. latest fuel-fired plant in California; designed for oil and gas burning; initial installation consists of 35,000-kw. unit.

Philadelphia, Pa. Philadelphia's New Station. Elec. World, vol. 85, no. 21, May 23, 1925, pp. 1074-1077, 11 figs. Richmond plant of Philadelphia Electric Co. is designed for initial capacity of 100,000 kw.; arrangement and design features of steam and electrical equipment; ultimate plant to be in three sections.

Philo, Ohio. Philo Station Established Record of Economy. Power Plant Eng., vol. 29, no. 11, June 1, 1925, pp. 570-581, 15 figs. Base-load station at Philo, O., equipped with two 40,000-kw. units and so laid out that four more units of same size may be added to it; use of high steam pressure, reheating of steam, stage extraction, and other features to assure high economy.

Reconstruction. The Bow Power Station. Engineer, vol. 139, no. 3620, May 15, 1925, pp. 542-543, 9 figs. partly on p. 546. Reconstruction details of electric generating station, of Charing Cross Electricity Supply Co., which was originally reciprocating-engine station; whole of changes were carried out continuously and without any interruption to supply. See also description in Engineering, vol. 119, no. 3099, May 22, 1925, pp. 635-637 and 640, 8 figs.; and Elec. Times, vol. 67, no. 1752, May 14, 1925, pp. 589-592, 6 figs.

CHAIN DRIVE

Inverted-Tooth. Inverted Tooth Chain Drives, J. M. Seddon. Junior Instn. Engrs.—Jl., vol. 35, part 7, Apr. 1925, pp. 313-319. Advantages of chain driving; rocker-joint chain; life of chains; limits of chain-drive reduction; chain driving and tooth gearing.

CHIMNEYS

Construction. Large Chimneys for Canadian Industries. Contract Rec., vol. 39, no. 21, May 27, 1925, pp. 542-546, 7 figs. Discussion of construction of chimneys of all types with particular reference to those installed in Canada; highest concrete stack on continent is being built in British Columbia.

Notes on Tall Chimney Construction, E. R. Matthews. Surveyor & Mun. & City Engr., vol. 67, no. 1732, Mar. 27, 1925, pp. 343-345, 5 figs. Notes on reinforced-concrete, steel-plate, and brick chimneys, on chimney shafts generally, and on lightning conductors.

Supports for Superimposed Power-Station. Supports for Superimposed Stacks, W. W. Clifford. Boston Soc. Civ. Engrs.—Jl., 12, no. 5, May 1925, pp. 221-231, 8 figs. Describes three ways of carrying flues into superimposed stack; sketches and brief descriptions of four actual stack-support designs.

CHUCKING MACHINES

SINGLE-SPINDLE VERTICAL. New Bullard Machine a Simplification of the Mult-Au-Matic. Automotive Industries, vol. 52, no. 16, Apr. 16, 1925, pp. 708-709, 1 fig. Vert-au-matic is single-spindle, vertical chucking machine for production work; supplementary side head adds to variety of operations which can be performed.

CLUTCHES

DESIGN. A More Exact and Rational Analysis for Modern Clutch Design, F. A. Berger. Wash. Univ. Studies, vol. 12, no. 1, July 1924, pp. 31-44, 6 figs. Discusses analysis of forces acting on a clutch, and develops formulas and curves; determines dimensions of cone clutch to deliver 60 hp. at 1000 r.p.m. as example.

COAL

CARBONIZATION. Low-Temperature Carbonization Developments. Iron & Coal Trades Rev., vol. 110, no. 2983, May 1, 1925, pp. 699-700, 3 figs. Developments in United States; new German low-temperature process.

Low Temperature Carbonization, H. Southern. Fuels & Furnaces, vol. 3, no. 5, May 1925, pp. 475-478. Classification and brief description of various processes; utilization of waste heat.

COMBUSTION AND USE. Coal, C. A. Burton. Am. Soc. Heat. & Vent. Engrs.—Jl., vol. 31, no. 4, Apr. 1925, pp. 247-253. Its formation, composition, combustion and economical use.

IGNITION. An Investigation of the Behaviour of Solid Fuels during Oxidation, B. Mooze and F. S. Sinnatt. Fuel, vol. 4, no. 5, May 1925, pp. 194-198, 6 figs. Method has been elaborated for study of one aspect of tendency of solid fuels to ignite spontaneously, and new characteristic, "ignition factor," has been suggested; suggests possibility of using results to obtain rough measure of "combustible capacity" of solid fuels.

INORGANIC CONSTITUENTS. The Inorganic Constituents of Coal, N. Simpkin and F. S. Sinnatt. Chem. and Industry, vol. 44, no. 18, May 1, 1925, pp. 197T-200T, 1 fig. Melting point of coal ash; influence of atmosphere on melting point; influence of blending coals upon melting point of ash of mixture.

LIME BURNING, FOR. Specifications of Coal for Lime Burning, C. Longenecker. Pit and Quarry, vol. 10, no. 4, May 15, 1925, pp. 51-53. Discussion of varying characteristics of coals and their proper selection.

MOISTURE ABSORPTION. The Absorption of Moisture by Coal and Other Fuels, B. Moore. Chem. and Industry, vol. 44, no. 18, May 1, 1925, pp. 200T-205T, 8 figs. Relation between degree of humidity in air and moisture content of coal and other fuels; influenced of degree of fineness of fuel particles.

STANDARD SPECIFICATIONS. Coal and Coke. Am. Soc. Testing Matls.—Preprint, no. 55, for mtg. June 23-25, 1925, 3 pp. Report of Committee D-5. Proposed revisions of existing standard methods of test; proposed revisions of tentative standards.

VOLATILE CONSTITUENTS. The Volatile Constituents of Coal, M. J. Burgess and R. V. Wheeler. Fuel, vol. 4, no. 5, May 1925, pp. 208-217, 6 figs. Reprint of paper first published in Transactions of Chemical Society in 1910, and dealing with destructive distillation of coal at different temperatures.

COAL HANDLING

CONVEYORS. Belt Conveying of Coal at H. C. Frick Coke Company Mines, Thos. W. Dawson. Am. Inst. Min. and Met. Engrs.—Trans., no. 1456-F, June 1925, 16 pp. Results of power tests on conveyors; characteristics of various conveyors as they were installed; details of motors, lubrication, electrical control, etc.

COAL MINES

POWER-SUPPLY CONNECTION. Interconnection of Colliery Power Supplies, R. E. Neale. Colliery Eng., vol. 2, nos. 13, 14 and 15, Mar., Apr. and May, 1925, pp. 100-102, 149-153, and 222-225, 7 figs. Thesis investigating possibilities of such schemes.

UNDERGROUND TRANSPORTATION. Mining Standardization Correlating Committee. Am. Min. Congress,—Standardization Division Bul., no. 5, 1925, pp. 131-141. Meeting of American Engineering Standards Committee on underground transportation in coal mines; standards for trolley-type locomotives; specifications for mine-car materials.

VENTILATION. Gassy Mine Triply Safeguards Its Ventilation, Chas. M. Schloss. Coal Age, vol. 27, no. 17, Apr. 23, 1925, pp. 607-608, 3 figs. One regular and two emergency drives provided at Empire Coal Mining Co.'s development at Aguilar, Colo.; two motors and gasoline engine make continued stoppage of air current extremely improbable.

COAL STORAGE

FACTORS GOVERNING. Factors Governing the Storage of Coal. Power Plant Eng., vol. 29, no. 10, May 15, 1925, pp. 523-525. Benefits to be derived from coal storage depend upon initiative in movement being taken by purchases; estimate of storage capacity; loading capacities of cranes; underwater coal storage.

COKE

FACTORS INFLUENCING SIZE. Factors Influencing the Size of Coke, R. A. Mott. Gas Engr., vol. 41, no. 589, May 1925, pp. 94-96, 6 figs. Gives examples showing that development of fractures is of great importance in relation to size of coke available at blast furnace or cupola; factors which aid control of these fractures are of great importance and this aspect of coke making is worthy of close study.

TESTING. Coal and Coke Tests with a View to Producing Coke of Given Characteristics. IroE and Coal Trades Rev., vol. 110, no. 2981, Apr. 17, 1925, pp. 615-616, 1 fig. Discusses moisture, ash and sulphur content, caking capacity, coking process, physical characteristics, suiting coals to ovens, specific gravity and porosity, pro-chemical properties, determination of reactivity, etc.

WASTE-HEAT UTILIZATION. Utilization of Waste Heat from Coke Ovens, A. Parker. Gas Jl., vol. 170, no. 3231, Apr. 15, 1925, pp. 180-181. Dry cooling of coke for steam raising, Sulzer process; steam raising by surplus gas; surplus gas and gas engines; exhaust-heated boilers and gas-engine plant; waste gases and steam raising. Extracts from paper read before Coke Oven Mgrs. Assn.

COLUMNS

CONCRETE, FIRE RESISTANCE TESTS OF. Fire Resistance Tests of Concrete Columns, W. A. Hull and S. H. Ingberg. Fire & Water Eng., vol. 77, no. 21, May 27, 1925, pp. 1097-1098 and 1112. Particulars of experiments by U. S. Bur. Standards. Comparative performance with different aggregates; effects from shape, design and size; heat insulative material; fire resistance periods.

COMMUTATORS

SLOTTING. Undercutting or Slotting of Commutators, F. Huskinson. Power, vol. 61, no. 23, June 9, 1925, p. 902. Advantages of slotting commutator; high mica causes chatter; lubricants should not be used.

CONCRETE

AGGREGATES. Suggests One-Day Strength Test for Concrete Aggregate, S. B. Slack and J. E. Boyd. Eng. News-Rec., vol. 94, no. 25, June 18, 1925, pp. 1014-1015. Quick-hardening alumina cement gives results comparable to same sands tested with slower setting portlands.

DISINTEGRATION. The Fundamental Cause of the Disintegration of Concrete, A. H. White. Concrete, vol. 26, no. 5, May 1925, pp. 157-161, 7 figs. Discusses some of the prozrties inherent in portland cement which are not generally recognized by engineers; hardening of portland cement; expansion of cement in water; contraction of cement products in air; alternate expansion and contraction of cement structures with change in moisture; conditions for usefulness and long life of concrete.

PROPORTIONING. Proportioning Concrete for a Specified Strength, R. R. Litehiser. Rock Products, vol. 28, no. 8, Apr. 18, 1925, pp. 42-44, 2 figs. Method of determining actual quantities of moist aggregate required to give dry weights for mixing concrete.

USE OF. High Points of New Joint Committee Report on Concrete, N. M. Stineman. Mun. and County Eng., vol. 68, no. 5, May 1925, pp. 223-227. Deals with working stresses, field control of concrete, aggregates, mixing, placing, protection against heat and cold, and design. Paper presented before 11th annual mtg. Bld. Officials' Conference.

CONDUITS

TELEPHONE, LAYING OF. Laying Underground Conduit, P. K. Higgins. Telephone Engr., vol. 29, no. 5, May 1925, pp. 21-25, 2 figs. Helpful data on planning and construction of underground telephone systems; characteristics of various kinds of conduit; concrete conduit work.

CONNECTING RODS

MACHINING. Cleveland Big End Piston Rod Bearings Are Die in Place. Automotive Industries, vol. 52, no. 20, May 14, 1925, pp. 858-860, 4 figs. Fixture used while boring hubs does not subject rods to either twisting or bending stresses; novel method of facing hub ends; process now being evolved in plant of Cleveland Automobile Co. would eliminate aligning rod by hand.

Making Chrysler Connecting Rods, J. Younger. Am. Mach., vol. 62, no. 23, June 4, 1925, pp. 877-879, 7 figs. Rods are coin-pressed after drop forging; ensuing work divided into 25 operations; details of machine work.

CONVERTERS

ROTARY AND MOTOR. Converting Alternating to Direct Current, E. Johnstone-Taylor. Power House, vol. 18, no. 9, May 5, 1925, pp. 32-33, 2 figs. Of three methods of accomplishing desired results most recent introduction is motor converter, while simple generator is lowest in efficiency.

CONVEYORS

COMBINED GRAVITY BUCKET AND ROPE. Combined Gravity Bucket and Rope Conveyors for Installations of Small Capacities. Indus. Mgmt. (Lond.), vol. 12, no. 5, May 1925, pp. 301-302, 5 figs. Describes mechanical method which can be installed economically for capacities as small as 3 cu. yd. per hr.

PNEUMATIC. Pneumatic Transport Plants, Wm. Cramp. Chem. and Industry, vol. 44, nos. 18 and 19, May 1 and 8, 1925, pp. 207T-210T and 211T-213T, 8 figs. Suggests lines which should be adopted in design of any pneumatic plant; plants for fine and for granular material; motion of particles; connection between velocity of material and air pressure; nozzle characteristics; applications in chemical works.

COPPER METALLURGY

ELECTROLYTIC REFINING. Improvements in the Series System of Electrolytic Copper Refining Recently Developed by the Nichols Copper Co., M. H. Merriss. Am. Inst. Min. and Met. Engrs.—Trans., no. 1467-D, June 1925, 20 pp., 10 figs. Nichols series system; results of practices described, and of improvements, completed and projected, will be to combine with sound basic technical advantages of Nichols system, design and equipment peculiarly fitted to make most of these advantages, and to continue place of this series process in forefront of copper-refining metallurgy.

LEACHING AND EXTRACTION. Technology of Leaching and Extraction, A. W. Allen. Chem. and Met. Eng., vol. 32, no. 12, June 1925, pp. 561-565, 10 figs. Discussion of scope of bulk leaching and fundamental principles underlying successful application to chemical and chemico-metallurgical industries.

CORROSION

WATER WORKS ENGINEERING. The Corrosion Problem in Connection With Water Works Engineering, F. N. Speller. New Eng. Water Wks. Assn., vol. 39, no. 1, Mar. 1925, pp. 90-100, 5 figs. Discusses wastage due to corrosion and cause and theory of corrosion.

COSTS

PRODUCTION. Detailed Calculation of Cost of Production and Estimates (Detaillierte Selbstkosten-berechnung und Voranschlag), O. Stübchen-Kirchner. Sparwirtschaft, no. 2, Feb. 1925, pp. 17-20 (A. W. B.), 9 figs. Discusses methods of calculation by dividing total cost by quantity produced, and by addition of material, wages and percentage for administration; amortization and depreciation, interest charges, etc.

CRANES

STANDARDIZATION. The Standardization of Crane Essentials, E. G. Fiegehen. Engineer, vol. 139, no. 3623, June 5, 1925, pp. 618-619. Enumerates advantages to be secured by standardization; probable scope of classification under following headings; loads, impact, speeds, safety, stresses, workmanship, testing, and definitions.

CUTTING TOOLS

ECONOMICAL FORM OF. Investigations in Turning and Planing, H. Klopstock. Mech. Eng., vol. 47, no. 6, June 1925, pp. 474-479, 20 figs.; also (abstract) in Am. Mach., vol. 62, no. 23, June 4, 1925, pp. 881-883, 1 fig. Account of experiments conducted in machine-tool laboratory of Polytechnic Institute of Berlin; cutting tests proper were preceded by study of lathe and instruments used, to ascertain their behavior under various conditions; in main tests it was aimed to determine influence upon cutting forces of cutting speed, chip section, shape of tool, and characteristics of materials cut; as result of these observations, new form of tool has been designed which, it is claimed, permits higher cutting speed and larger chip section than is practicable with standard tools now used; it is claimed, from results obtained in various German shops, that on average production can be increased 30 per cent by means of new tool. (Abridged.)

D

DIE CASTING

NON-FERROUS METALS. Making Die Castings of Nonferrous Metals, M. Stern. Foundry, vol. 53, no. 10, May 15, 1925, pp. 393-396 and 408, 6 figs. Process is adapted best to alloys of comparatively low fusing points and may be subdivided into tin-base, lead-base, zinc-base and aluminum-base alloys; machining die castings; enameling. Paper presented before Detroit Branch of Soc. Automotive Engrs.

DIES

INTERCHANGEABLE SECTIONS. A Compound Die with Interchangeable Sections, J. Williams. Am. Mach., vol. 62, no. 24, June 11, 1925, pp. 933-934, 3 figs. Dies with symmetrical sections, each of which has two cutting edges; reversal and transposition of sections bring new cutting edges into use.

DIESEL ENGINES

AIRLESS-INJECTION. Features of Airless Injection Engines, H. F. Birnie. Power Plant Eng., vol. 29, no. 12, June 15, 1925, pp. 642-644, 5 figs. Reasons for variation in brake mean effective pressure of different types; calculation of approximate size of spray holes.

DOUBLE-ACTING. A Proposed Solution of the Double Acting Diesel Engine Problem, A. M. Procter. Am. Soc. Nav. Engrs.—Jl., vol. 37, no. 2, May 1925, pp. 309-311, 1 fig. Describes engine which is offered towards solution of problem of designing double-acting 2-cycle engine of large power, suitable for installation in naval vessels.

MAINTENANCE. Diesel Engine Maintenance Pointers. Power Engr., vol. 20, no. 231, June 1925, pp. 230-232. Practical notes, with special reference to periodical overhaul.

OPERATION. Operation of Diesel Engines, R. Hildebrand. Power, vol. 61, nos. 21 and 23, May 26 and June 9, 1925, pp. 831-833 and 906-907, 10 figs. May 26: Keeping piston in condition; cooling piston; lubricating piston and liners. June 9: Why cylinders head break and the remedy.

SUBWAY STANDBY POWER PLANT. Possibilities of Diesel Power for Subway Standby. Oil Engine Power, vol. 3, no. 5, May 1925, pp. 289-290, 3 figs. Madrid's underground railroad has three 1500-b.hp. oil engines as emergency and overload units ready for instant service.

DRILLING

DIAMOND. Diamond Drill Exploration in Canada. Can. Min. Jl., vol. 46, no. 18, May 1, 1925, pp. 448-450, 3 figs. Review of paper by C. H. Hitchcock before Can. Inst. Min. & Metallurgy, giving, account of present practice in diamond-drill exploitation, describing methods of drilling, handling core, sampling, surveying holes, systems of drilling orebody, and methods of reading observations.

DROP FORGING

TURBINE BLADES. Drop Forging Turbine Blades. Forging—Stamping—Heat Treating, vol. 11, no. 5, May 1925, pp. 155-165, 10 figs. Practice at South Philadelphia works of Westinghouse Elec. & Mfg. Co.; manufacturing arrangement; heat treatment of blades; preparing models of dies; types of blades.

DUST

EXPLOSIONS. Elementary Physics of Dust Explosions, D. W. Rees. Colliery Guardian, vol. 129, no. 3355, Apr. 17, 1925, pp. 946-947. Discusses vibratory action of initial explosion, rate of rise of pressure, and physical condition of dust.

E

EDUCATION, ENGINEERING

PROBLEMS. Engineering Instruction in Polytechnic Institutes (Der Technologieunterricht an technischen Lehranstalten), Grunewald. Zeit. des Vereines deutscher Ingenieure, vol. 69, no. 19, May 9, 1925, pp. 664-671, 7 figs., 7 tables. The role of technical institutes in development of mechanical engineering especially from standpoint of industrial engineering; instruction methods should be based on economic production; results of questions addressed to technical academies concerning development of engineering instruction and practical preliminary training of students; educational courses; special trade schools and their importance for machine design and construction.

ELECTRIC DISTRIBUTION SYSTEMS

PROTECTION. The Protection of Alternating Current Systems. Elec. Engr., vol. 1, no. 11, Feb. 15, 1925, pp. 409-413, 3 figs. Outline of methods in use.

ELECTRIC FURNACES

FOUNDRIES. Discussion on Mr. Stobie's Paper, "The Electric Furnace in the Iron Foundry." Foundry Trade Jl., vol. 31, no. 456, May 14, 1925, pp. 418-419. Carbon absorption; change of equilibrium on casting; cost of electric furnaces; chilling of cast iron; cost of small furnace; semi-cast iron; technique of adding aluminum.

The Electric Furnace in the Iron Foundry, V. Stobie. Foundry Trade Jl., vol. 31, no. 455, May 7, 1925, pp. 398-400. Data on manufacture of synthetic pig iron refining of ordinary pig iron, and manufacture of some small and large castings from both kinds of irons.

The Prospects of the Electric Furnace in Iron, Steel and Brass Foundries, H. Etchells. Foundry Trade Jl., vol. 31, no. 455, May 7, 1925, pp. 392-394. Author considers electric furnace ideal instrument for melting steel; acid electric equivalent to acid open-hearth steel.

MELTING. Develop New Furnace for Steel and Iron Foundry Service. Foundry, vol. 53, no. 11, June 1, 1925, pp. 449-450. Latest design of furnace for melting steel and iron, erected in foundry of Bingham & Taylor Co., Buffalo; it is of direct-arc type used for making general run of iron-carbon alloys; alloy steel and metal requiring high melting temperatures; adapted equally to acid or basic melting and may be alternated to make heats of gray iron or steel.

METALS REFINING. Refining Metals Electrically, L. J. Barton. Foundry, vol. 53, nos. 10, 11 and 12, May 15, June 1 and 15, 1925, pp. 397-399, 439-441 and 464, and 493-497, 9 figs. Advantages of melting iron in electric furnace. May 15: Practice followed in melting in acid-lined furnace; limitations of acid process. June 1: Duplexing gray iron; methods of handling slag. June 15: Melting iron on basic hearth; how synthetic iron is made.

ELECTRIC GENERATORS, A. C.

REGULATION. The Regulation of Alternating Current Generators, W. H. Gregory. Elec. Engr., vol. 2, no. 1, Apr. 15, 1925, pp. 26-28, 4 figs. Brief description of methods of determining regulation of alternators from test data; special reference made to synchronous impedance method, and A.K.E.E. method.

SELF-PARALLELING. The Hunt Self-Paralleling Alternator. Engineering, vol. 119, no. 3102, June 12, 1925, pp. 723-725, 5 figs. New type of induction generator which is combination of induction and synchronous generator in single machine, result being an alternator which does not required to be synchronized before connecting in parallel with other machines.

ELECTRIC GENERATORS, D. C.

PARALLEL OPERATION. Parallel Operation of D. C. Generators—Compound-Wound Type, C. Lynn. Power, vol. 61, no. 24, June 16, 1925, pp. 945-947, 5 figs. Characteristics of machines for successful parallel operation; adjustment of voltage; division of load between machines; effects of changing resistance of series-field shunt.

ELECTRIC LOCOMOTIVES

VIRGINIAN RAILWAY. The First Virginian Electric Locomotive, E. I. Staples. Ry. and Locomotiv (Eng., vol. 38, no. 6, June 1925, pp. 157-159, 3 figs. Also Ry. Rev., vol. 76, no. 21, May 23, 1925, pp. 935-937, 2 figs. Locomotives are of split-phase type; single-phase power is changed into 3-phase power by means of main transformer and rotating machine, called phase converter, whence it is fed to main traction motors. Three units coupled, 152 ft. long. weighing 1,276,000 lb., with 277,500 tractive power; under construction by Westinghouse Elec. & Mfg. Co.

ELECTRIC MOTORS, A. C.

SELF-EXCITED SYNCHRONOUS. Self-Excited Synchronous Motors, J. K. Kostko. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 6, June 1925, pp. 604-612, 13 figs. Outline of general theory of subject as basis of comparison of proposed types and starting point for further development work; shows that any combination of exciting circuits is equivalent to one comparatively simple type, and studies two problems in connection with this standard type: (1) determination of performance of given motor, and (2) determination of design constants giving desired performance; it is shown that very high torque can be obtained during synchronizing.

SINGLE-PHASE REPULSION. The Single Phase Repulsion Motor, G. Windred. Elecn., vol. 94, no. 2450, May 1, 1925, pp. 508-509, 4 figs. Discusses its practical adaptability; how commutation may be improved; operating characteristics.

SYNCHRONOUS, FOR CONTINUOUS MILLS. Application of Synchronous Motors to Continuous Mills, F. O. Schnure. Iron and Steel Engr., vol. 2, no. 5, May 1925, pp. 226-227. Deals with standard synchronous motor having special features to give it characteristics necessary for drive on six-stand continuous mill estimated to require 7000-hp. motor.

ELECTRIC RAILWAYS

CARS, NOISE REDUCTION IN OPERATION. Reducing Noise in Car Operation, H. S. Williams. Elec. Ry. Jl., vol. 65, no. 20, May 16, 1925, pp. 765-766, 2 figs. Much can be accomplished by proper design; wear of parts and sound emitted vary approximately as square of clearance; higher standards for fitting parts are desirable to lessen noise.

CATENARY. Canadian National Erects New Catenary. E. B. Walker. Ry. Elec. Engr., vol. 16, no. 5, May 1925, pp. 148-151, 8 figs. Specially developed structural supports and steel-cored aluminum messenger wire mark recent design.

ELECTRIC SWITCHES

OIL. Switch Oil Requirements and Characteristics, C. J. Rodman. Elec. Jl., vol. 22, no. 5, May 1925, pp. 216-219, 5 figs. Notes on moisture; decomposition products of oil by arc.

ELECTRIC TRANSMISSION LINES

ELECTROMAGNETIC INDUCTION. The "K-m" Chart for Computing Electromagnetic Induction Between an Aerial Line and Neighboring Circuits, R. Mitsuda and K. Kasai. Gen. Elec. Rev., vol. 28, no. 5, May 1925, pp. 290-297, 12 figs. Describes new method whereby computation of induced electromotive forces on communication lines is made a matter of simple arithmetic. This chart should prove of great value in all interference problems.

FUTURE PROBLEMS. Transmission Problems of the Future, H. J. Ryan. Elec. World, vol. 85, no. 23, June 6, 1925, pp. 1205-1206. Discusses questions as to whether higher voltages, lower frequencies or continuous current be used for transmitting large blocks of power over long distances; high-voltage wattmeter perfected; addition research planned at new 2,000,000-volt laboratory.

PRACTICES AND DEVELOPMENTS. Transmission Practices and Developments, A. E. Silver. Elec. World, vol. 85, no. 23, June 6, 1925, pp. 1207-1210, 3 figs. Many high-voltage lines in progress; conductors and cable developments; stronger insulators desirable; heavy conductors require strong structures.

ELECTRICAL MACHINERY

PROTECTION. The Design of Electrical Plant, Control Gear and Connections for Protection against Shock, Fire and Faults, H. W. Clothier. Instn. Elec. Engrs. —Jl., vol. 63, no. 341, May 1925, pp. 425-446 and (discussion) 446-473, 40 figs. Sets forth risks to life and plant and discusses means for prevention; relation of interference with telephone service and fault occurrences on power supply systems provides argument in favor of good bonding, earthing neutral and instaneous isolation of faults; mechanical consideration is given to layout of switchgear and to terminal construction of plant, and diagrammatic illustration of alternator main, field, and neutral connections is shown.

EMPLOYMENT MANAGEMENT

SELECTING EMPLOYEES. Selecting the Salaried Employee, E. J. Benge. Indus. Mgmt. (N. Y.), vol. 69, no. 5, May 1925, pp. 279-283, 5 figs. How Atlantic Refining Co. determines qualifications of applicants; forms used and employment procedure in effect.

ENERGY

RESOURCES. Energy Resources, Geo. O. Smith. Engrs. and Eng., vol. 42, no. 4, Apr. 1925, pp. 89-92. Inventories of energy resources; energy expenditures; increasing efficiency of large power plants; points out that coal is in United States coal is chief and future source of power.

F

FEEDWATER HEATERS

EXHAUST STEAM CONDENSED IN. Exhaust Steam Condensed in Open Feed-Water Heaters, L. G. Jones. Power, vol. 61, no. 24, June 16, 1925, p. 951, 2 figs. Quick but approximate method of determining quantity of exhaust steam being condensed in open type of heater.

FERRO-ALLOYS

STANDARD SPECIFICATIONS. Ferro-Alloys. Am. Soc. Testing Matls.—Preprint, no. 13, for mtg. June 23-26, 1925, 13 pp. Proposed tentative specifications for tungsten powder, spiegeleisen, ferro-silicon, ferro-chromium, ferro-manganese, ferro-vanadium and sampling ferro-alloys.

FERRO-TITANIUM. Use of Titanium in the Iron and Steel Industry, A. J. Rossi. Iron & Coal Trades Rev., vol. 110, no. 2987, May 29, 1925, p. 874. Properties and analyses of ferro-titanium alloys; treatment of pig iron; treatment of steel. Translated from Revue de Métallurgie.

FILTRATION PLANTS

SMITH'S FALLS, ONT., CANADA. Dam and Filter Plant at Smith's Falls, E. H. Darling. Can. Engr., vol. 48, no. 18, May 5, 1925, pp. 453-455, 6 figs. Concrete dam with crest 70 ft. long; International mechanical filter has a capacity of two million gallons per day; Bawden centrifugal pump of 1700 g. p. m. capacity driven by a barber water turbine; gasoline standby unit.

FIRE-BRICK

SELECTION TESTS. Selection of Fire Brick by Comparative Tests with Detailed Description of the Method Used to Measure the Temporary Expansion or Contraction of Fire Brick at Various Temperatures, F. A. Kohlmeyer. Am. Ceramic Soc.—Jl., vol. 8, no. 5, May 1925, pp. 313-318. 1 fig. Discusses laboratory tests employed by electric light and power company in selecting several brands of firebrick suitable for use in construction of power plant; method used to measure temporary expansion or contraction of firebrick at various temperatures and procedure followed in inspection of firebrick.

FLOORS

CANTILEVER. Cantilever Floor Construction for Concrete Buildings. Eng. News-Rec., vol. 94, no. 21, May 21, 1925, pp. 845-846, 4 figs. Column heads are connected octagonal cantilever units; floor beams and wall columns eliminated; form design.

MAGNESITE. The Magnesite Floor in Industry, H. B. Kilmer. Indus. Mgmt. (N. Y.), vol. 69, no. 6, June 1925, pp. 368-371, 5 figs. Its advantages and limitations.

FLOW OF FLUIDS

STREAMLINE PROBLEM. Diffusion of Momentum by Air Currents, A. Mallock. Nature (Lond.), vol. 115, no. 2894, Apr. 18, 1925, pp. 567-568, 3 figs. Discussion of streamline problem.

FLOW OF WATER

OPEN CHANNELS. Observations Made during Construction and Operation of Hydraulic Turbines and Research at a Hydraulic Laboratory (Observations faites pendant la construction et l'exploitation d'installations hydrauliques et recherches dans un laboratoire hydraulique), M. H. E. Gruner, Bul. Technique de la Suisse Romande, vol. 51, nos. 7 and 8, Mar. 28 and Apr. 11, 1925, pp. 73-76 and 85-89, 5 figs. Discusses determination of profile of a canal of infinite length and given slope to yield a given volume of water, and formulas and constants in connection therewith; gives various examples of practical application.

Open Channel Chart. Sibley Jl. of Eng., vol. 39, no. 3, Mar. 1925, p. 297. Chart which aids in estimating mean velocity of flow of water in open channels in terms of roughness, slope, and hydraulic radius of channel; typical problem and its solution.

PIPES. Flow of Water in Tulsa 60-In. and 54-In. Concrete Pipe Line, F. C. Scobey. Eng. News-Rec., vol. 94, no. 22, May 28, 1925, pp. 894-897, 5 figs. Results of tests to determine so-called friction coefficients in various formulas for long reaches of new pipe.

Pipe Chart. Sibley Jl. of Eng., vol. 39, no. 3, Mar. 1925, p. 296. Chart which determines size of pipe necessary to permit a given discharge with a given loss in head per unit length, typical problem and its solution.

HYDRAULIC JUMP. Determining the Energy Lost in the Hydraulic Jump, J. C. Stevens. Eng. News-Rec., vol. 94, no. 23, June 4, 1925, pp. 928-929, 1 fig. Analysis deals with mean velocities only; actual losses somewhat greater due to unequal distribution of velocities.

FORESTRY

CANADA. Review of Forest Problem in Canada, R. D. Craig. Can. Engr., vol. 48, no. 17, Apr. 28, 1925, pp. 445-447. Strong appeal for greater support of measures to prevent further depletion of forest resources; forests in relation to industries; survey of forest resources. Paper read before Assn. Dominion Land Surveyors.

FORGE SHOPS

HEAVY WORK. Modern Forge Plant for Heavy Work. Forging—Stamping—Heat Treating, vol. 11, no. 5, May 1925, pp. 180-184, 5 figs. New plant of A. Finkl & Sons, Chicago, combines advantages of modern equipment with efficient arrangement of units; regenerative heating furnaces a feature.

MATERIALS HANDLING. Material Handling in Upset Forge Plant, D. L. Mathias. Forging—Stamping—Heat Treating, vol. 11, no. 5, May 1925, pp. 146-152, 12 figs. Plant of American Forge Co., Chicago, is largest devoted exclusively to manufacture of upset forgings; material-handling facilities.

FORGINGS

MANUFACTURE AND HEAT TREATMENT. The Manufacture and Heat Treatment of Large Forgings, A. O. Schaefer. Am. Soc. Steel Treating—Trans., vol. 7, no. 6, June 1925, pp. 699-717, 16 figs. Discusses melting practice, ingot-mold design, various methods of pouring, hot tops, etc.; heating and forging of large ingots; heat-treatment and testing of forgings; necessity of proper rate of heating and soaking at heat of large forgings is emphasized; testing and inspection of finished forgings.

FOUNDATIONS

PRESSURES ON. Pressures on Foundations, N. L. Wallis. Indus. Mgmt. (Lond.), vol. 12, no. 5, May 1925, pp. 257-265, 7 figs. Deals with case of not unusual occurrence, namely, foundations on which load is so distributed that portion only of base is under stress.

STEAM POWER PLANT. Foundations under Steam Plant Renewed without Shutdown, C. P. Dunn. Eng. News-Rec., vol. 94, no. 22, May 28, 1925, pp. 888-890, 5 figs. Concrete substructure replaces 2500 wood piles, four at a time, without settlement; piles under ashpits badly charred.

FOUNDRIES

LOCATION AND LAYOUT. Illustrating the Modern Foundry, F. D. Chase. Brass World, vol. 21, no. 5, May 1925, pp. 153-157, 5 figs. Points out that need of foundry industry is not more but better foundries; essential factors in beginning of new plant or rehabilitation of old one are plant location and site; examples of foundry layouts.

MALLEABLE-IRON. Material Handling in a Malleable Iron Foundry, A. Murphy. Can. Foundryman, vol. 16, no. 5, May 1925, pp. 9-11, 6 figs. Overhead monorail system is outstanding feature of Ontario Malleable Iron Co.'s plant at Oshawa; how power requirements are met.

MANAGEMENT. Steel Foundry Management, R. A. Bull. Am. Soc. Mech. Engrs.—advance paper, for mtg. May 18-21, 1925, 19 pp.; also Foundry, vol. 53, nos. 11 and 12, June 1 and 15, 1925, pp. 431-433 and 476-479. Discusses problems that, in author's opinion, have greatest general significance; presents brief analysis of industry, explaining its technical and commercial divisions, and significance of each from standpoint of output, for purpose of more clearly indicating nature of industry under consideration; many occupations in steel foundry are listed in order to explain complex nature of operations for which manager is responsible; compensation for workmen and foremen.

SAND-HANDLING EQUIPMENT. Handling Sand to Speed Output. Foundry, vol. 53, no. 10, May 15, 1925, pp. 412-415, 6 figs. Mechanical preparation and distribution of sand used in continuous system for making steel truck wheels.

FOUNDRY EQUIPMENT

HEATING ELEMENT FOR OVEN. Self-Contained Heater for Foundry and Metallurgical Use. Engineering, vol. 119, no. 3101, June 5, 1925, pp. 700-701, 14 figs. Apparatus known as Ochm's patent heating element designed for drying molds and cores, for heating ladles, and other similar work in foundry; also adaptable for smelting, roasting, calcining, heat treatment and annealing.

SAND-RECOVERY PLANT. Foundry Sand Recovery Plant. Engineer, vol. 139, no. 3621, May 22, 1925, p. 572, 1 fig. Plant supplied to foundry in Japan for treating used foundry sand, in order to make it serviceable again, by removing any iron or hard lumps which it may contain.

FUEL ECONOMY

RAILWAYS. Concluding Sessions of Fuel Association Convention. Ry. Rev., vol. 76, no. 23, June 6, 1925, pp. 1007-1012. Abstracts of addresses and committee reports, as follows: Locomotive Development as a Means of Fuel Economy, L. F. Loree; More Intensive Fuel Conservation Essential, C. W. Galloway; How Can Management Effect Fuel Economy? A. R. Ayres; How Can Fuel Economy Be Effected? J. Purcell; Cleaning Locomotive Flues, C. B. Smith; How Can Fuel Purchases Effect Fuel Economy? H. C. Pearce.

Fundamental Fuel Factors, G. M. Basford. Ry. & Locomotive Eng., vol. 38, no. 6, June 1925, pp. 174-180, 4 figs. Discusses factors for fuel efficiency, such as steam-making improvements, steam using or cylinder improvements, machinery, operating, and track-effect improvements, etc.

FUELS

SMOKELESS. Smokeless Fuel and Oil, C. H. Lander. Chem. and Industry, vol. 44, no. 21, May 22, 1925, pp. 521-523 and (discussion) 523-524. Account of experiments on low-temperature carbonization by (British) Fuel Research Board; development of method of blending coking and non-coking coals; experiments with different types of retorts; oil production from coal by processes other than that of carbonization. (Abridgement.)

VAPOR PRESSURES OF MIXTURES. Vapour Pressures of Binary and Ternary Fuel Mixtures, J. S. Lewis. Instn. Petroleum Technologists—Jl., vol. 11, no. 49, Apr. 1925, pp. 152-170 and (discussion) 170-176, 8 figs. Results of vapor-pressure determinations on binary and ternary mixtures are recorded, revealing certain features of theoretical interest and practical bearing.

[*See also Coal; Coke; Oil Fuel; Pulverized Coal.*]

FURNACES, INDUSTRIAL

DESIGN AND OPERATION. Furnace Heating, R. J. Sarjant. Fuel, vol. 4, nos. 1, 3 and 4, Jan., Mara. nd Apr., 1925, pp. 5-14, 4 figs.; 96-110, 12 figs. and 142-152, 8 figs. Exposition of scientific principles underlying design and operation of industrial furnaces, to indicate how developments of modern scientific knowledge may be applied in furnace operation and in what respects problems remain unsolved. Jan.: Selection of furnace; relative suitability of solid, liquid and gaseous fuels; furnace value of fuel. Mar.: Temperatures of combustion; gas burners; combustion of solid fuels; combustion control; losess. Apr.: Combustion control; temperature measurement; transmission of heat; loss of heat from furnace walls.

LOADING AND UNLOADING EQUIPMENT. Labor Saving Appliances, W. Trinks. Fuels and Furnaces, vol. 3, nos. 5 and 6, May and June 1925, pp. 453-462, and 589-592 and 612, 17 figs. May: Equipment for loading and unloading box-type and pit-type furnaces; continuous furnaces classified. June: Equipment for conveying material through pusher-type and roll-over furnaces.

G

GAS PRODUCERS

GERARD. Gas Producer Design. Gas and Oil Power, vol. 20, no. 236, May 7, 1925, pp. 161-162, 3 figs. Influence of pulsations on combustion; details of French gas producer designed by C. Gérard, results of tests.

GAS TURBINES

POSSIBILITIES AND LIMITATIONS. Gas Turbines, L. S. Marks and M. Danilov. Mech. Eng., vol. 47, no. 6, June 1925, pp. 462-468, 2 figs. Statement of brake thermal efficiencies that may be obtained from gas turbines of various types, and discussion of possibilities and limitations of these types of heat engines; calculated performances, with tables of computed values are given for different types; it is stated that review of possibilities of gas turbine does not give much hope of realization of efficiencies such as would encourage attempts to overcome many difficulties with which it is surrounded. (Abstract.)

GASES

WINDAGE LOSSES IN. Windage Losses in Air, Hydrogen, and Carbon Dioxide, C. W. Rice. Gen. Elec. Rev., vol. 28, no. 5, May 1925, pp. 336-341, 7 figs. Presents comparative study of power losses accompanying motion of bodies in several gases, and makes a practical application of fact that these losses vary nearly in proportion to density of gas.

GASOLINE

EVAPORATION IN AIR. Extent of Evaporation of Gasoline and Benzol in Air (Ueber den Verdampfungsgrad des Benzins and Benzols), J. Formánek and J. Zdársky. Chemiker-Zeitung, vol. 49, nos. 31, and 34, Mar. 12 and 19, 1925, pp. 229-232 and 250-253, 6 figs. Determinations of extent to which air becomes saturated with gasoline and benzol vapor, both by free evaporation of liquid into air contained in closed vessels, and by blowing air through liquid; quantity of vapor in air was usually determined indirectly by determinations of oxygen content of air by absorption with alkaline sodium hyposulphite solution; vapor content of air exposed to liquid in closed vessel is practically independent of small changes in pressure, and of percentage of aqueous vapor in air.

GEAR CUTTING

SHAPER CUTTER. The Design and Application of Gear Shaper Cutters. Machy. (Lond.), vols. 25 and 26, nos. 646 and 659, Feb. 12 and May 14, 11 figs. Feb. 12: Design, manufacture and use of cutters. May 14: Method of calculation.

GEARS

MANUFACTURE. Gears and Belt Drives (Zahnräder und Riementriebe). Maschinenbau, vol. 4, no. 8, Apr. 23, 1925. Contains following articles: Critical Remarks on Gear Theory, H. Cranz, 353-359, 14 figs.; The Strength Factor in the Strength Formula for Gears, J. Dalchau, pp. 360-362, 2 figs.; Heat Treatment of Gears, R. Neubert, pp. 363-366, 8 figs.; Calculation of Involute Gears, H. Fischer, pp. 367-372, 11 figs.; New Production Methods for Gears, Dolt, pp. 372-376, 11 figs.; Tests with Wedge-Shaped Belts, W. Kniehahn, pp. 376-383, 19 figs.

METALLURGICAL CONSIDERATIONS. Some Metallurgical Considerations of Gears. Machy. (Lond.), vol. 26, no. 660, May 21, 1925, pp. 240-244, 1 fig. Heat treatment; machineability of gear steels; causes of gear failure; cast-iron gears; nonferrous gears.

GRAIN ELEVATORS

CONCRETE CONSTRUCTION WORK. Moving Forms Used on Framed Concrete Building, J. O. B. Coulling. Eng. News-Rec., vol. 94, no. 23, June 4, 1925, pp. 923-936, 7 figs. Concrete placed in 1-ft. stages on column, beam and girder part of new B. & O. grain elevator recently completed at Locust Point, near Baltimore, Md.; central concreting plant; flexibility in grain-handling equipment.

GYPSUM

STANDARD SPECIFICATIONS. Gypsum. Am. Soc. Testing Matls.—Preprint, no. 34, for mtg. June 23-26, 1925, 18 pp. Report of Committee C-11. Tentative specifications; proposed revisions of standard methods of testing gypsum and gypsum products; proposed standard specifications for gypsum wall board, gypsum plaster board, etc.

H

HARBOR IMPROVEMENTS

TORONTO, CANADA. Review of Toronto Harbor Development. Can. Engr., vol. 48, no. 20, May 19, 1925, pp. 505-507, 1 fig. Abstract of report prepared by consulting engineer of harbor commission; total cost to date and estimated future expenditure; difficulties experienced in financing works; eastern harbor terminal costs; Sunnyside amusement area profitable.

HEAT TRANSMISSION

PROBLEMS. Heat Transmission, A. G. Clausen. Brit. Cold Storage and Ice Assn.—Proc., vol. 21, no. 1, 1924-1925, pp. 65-74 and (discussion) 75-87, 4 figs. on supp. plates. In practice transfer of heat resolves itself in all cases into rate at which heat is transmitted from one fluid to another through dividing wall, and problems met with may be subdivided under two general heads: (1) those cases such as insulation of cold store, ice tank and steam or brine piping where object is to prevent passage of heat, and (2) those which comprise all heating, cooling, condensing, or evaporating apparatus where dividing wall is separating partition only, and object is to pass as great a quantity of heat as possible.

HEATING

INDUSTRIAL. Industrial Heating, T. Lewis. Engrs.' Soc. West. Pa.—Proc., vol. 41, no. 1, Feb. 1925, pp. 1-7 and (discussion) 8-14. Requirements of a heating system for an industrial building; characteristics of the three types of steam-heating systems and consideration of where each should be used.

HEATING, HOT-AIR

INSTALLATION OF. Proper Installation for Warm Air Heating, E. A. Stewart. Agricultural Eng., vol. 6, no. 3, Mar. 1925, pp. 52-56, 10 figs. Disadvantages of poor furnaces and poor installations; merits of warm-air heating; need of regulators; arrangement of registers.

HEATING, HOT-WATER

DEVELOPMENTS. Present-Day Tendencies in Hot Water Heating, T. F. Moffett. Plumbers' Trade Jl., vol. 78, no. 9, May 1, 1925, pp. 841, 844 and 846, 6 figs. Wider application of some principles and a greater recognition of some refinements as well as a tacit disapproval of some details during recent years.

HEATING, STEAM

VACUUM, PUMPS FOR. Motor Driven Return Line Vacuum Heating Pumps, H. M. Wylie and A. D. Harvey. Am. Soc. Heat and Vent. Engrs.—Jl., vol. 31, no. 5, May 1925, pp. 279-296, 14 figs. Component parts of a return-line vacuum system; advantages of a vacuum system; classification of vacuum pumps; description of motor-driven rotary-type vacuum pumps; proportioning return-line vacuum pumps; pump capacity; control of vacuum pumps.

HYDRAULIC DRIVE

INTERNAL-COMBUSTION LOCOMOTIVES. Hydraulic Drives for Oil-Engine Locomotives (Flüssigkeits-getriebe für Oelmotor-Lokomotiven), Th. Müller. Zeit. des Vereines deutscher Ingenieure, vol. 69, nos. 16 and 18, Apr. 18 and May 2, 1925, pp. 499-504 and 595-600, 20 figs. Discusses Schneider gear, design of which is based on practical combination of hydraulic and mechanical working; describes 500-hp. experimental gear; results of acceptance tests show efficiency of 87 to 93 per cent; 500-hp. experimental locomotive and its working conditions.

HYDRAULIC TURBINES

GOVERNORS. New Turbine Governors with Acceleration Control (Neue Turbinenregler mit Beschleunigungssteuerung), Gagg. Elektrotechnische Zeit., vol. 46, no. 15, Apr. 9, 1925, pp. 517-519, 3 figs. Describes design of new gear for turbine governors and shows how, by means thereof, interruption of governing motion is made dependent on acceleration of turbine, resulting in operation which is in full accord with theoretical requirements.

HIGH-HEAD. Recent Hydraulic Turbines for High Heads. Power Plant Eng., vol. 29, no. 12, June 15, 1925, pp. 638-641, 7 figs. Latest designs of hydro-electric plants using both reaction and impulse turbines show how exacting requirements of this service are met.

LARGE. World's Largest Hydraulic Turbines. Power, vol. 61, no. 21, May 26, 1925, pp. 816-821, 13 figs. Three 70,000-hp. units installed by Niagara Falls Power Co. to operate under net effective head of 213-5 ft. at 107.1 r.p.m. are highest-powered prime movers yet installed; each of these machines has carried load of nearly 84,000 hp. Includes following articles: Engineering Considerations in 70,000-hp. Hydraulic-Turbine Design, H. B. Taylor; Structural Features of Turbine for Unit No. 21, Wm. M. White.

MECHANICAL PROBLEMS OF DESIGN. Mechanical Problems of Hydraulic-Turbine Design, Wm. M. White. Mech. Eng., vol. 47, no. 6, June 1925, pp. 469-473, 11 figs. As illustrated by 70,000-hp. unit recently put into operation at plant of Niagara Falls Power Co.

PELTON WHEELS. The Influence of the Angle of Impact in Pelton Wheels (Einfluss des Auftreffwinkels bei Becherturbinen), H. Ludewig. Zeit. des Vereines deutscher Ingenieure, vol. 69, no. 21, May 23, 1925, pp. 723-725, 9 figs. Tests with buckets of certain type show that a position of bucket differing from usual position has a favorable effect on efficiency, namely, when vertical impact of jet is moved from center toward end of full length of admission.

The Oak Grove High-Head-Turbine Development of the Portland Electric Power Company, E. C. Hurchinson. Mech. Eng., vol. 47, no. 6, June 1925, pp. 449-454, 10 figs. Particulars regarding recently installed 35,000-hp. vertical Pelton turbine of Francis type operating under head of 860 ft.

SPEED REGULATION. Regulating the Speed of Hydraulic Turbines (Regulacão da velocidade das Turbinas Hydraulicas), H. Greenwood. Revista Brasileira de Engenharia, vol. 9, no. 1, Jan. 1925, pp. 6-16, 3 figs. Discusses load variations and their effect on speed, increase and decrease in pressure due to them, water hammer, etc.

HYDRO-ELECTRIC DEVELOPMENTS

BAVARIA. Distribution of Electric Power with Special Regard to the Bavarian Works (Verteilung der elektrischen Energie mit besonderer Berücksichtigung des Bayernwerkes), A. Menge. Zeit. des Vereines deutscher Ingenieure, vol. 69, no. 18, May 2, 1925, pp. 577-587, 29 figs. Describes development of Bayernwerk purpose of which is to supply all of Bavaria with electricity as economically as possible; its 110-kv network makes it possible to utilize all of Bavaria's large water powers, and connect existing hydro-electric and steam power plants; details of transmission lines, transformer stations; protective equipment; and organization.

ITALY. The Upper Reno Power Project. Engineer, vol. 139, no. 3622, May 29, 1925, p. 608, 2 figs. Scheme for utilizing power of upper waters of Reno River in Northern Italy, for supplying current to Porrettana Ry. and other lines radiating from Bologna to Florence. Translated and abstracted from Energia Elettrica.

JAPAN. Recent Hydro-Electric Developments in Japan. Power Plant Eng., vol. 29, no. 11, June 1, 1925, pp. 601-603, 4 figs. Increasing popularity of electric power lends impetus to development of great generating and transmission system.

NEWFOUNDLAND. Extensive Hydro-Electric Development and Industrial Project in Newfoundland, A. A. Paoli and F. A. McLean. Contract Rec., vol. 39, no. 20, May 20, 1925, pp. 483-489, 14 figs. Details of construction works in connection with project in Humber River Valley, which involves construction of an 8-mile canal, several miles of new railroad, large concrete and earth dams, 2300 ft. of railway trestle, large power house, transmission lines, 400-ton paper mill, model town and other structures. Immense drag line excavators and other heavy equipment.

HYDRO-ELECTRIC PLANTS

STRUCTURAL-DESIGN-FEATURES. Structural Design Features of a Hydro-electric Development, Wm. D. Henderson. Boston Soc. Civ. Engrs.—Jl., vol. 12, no. 4, Apr. 1925, pp. 169-191, 15 figs. Features of structural design of recently completed plant near Bristol, N. H., on Pemigewasset River, built by Utilities Power Co. of Meredith, N. H.

SURGE TANKS. Types of Surge Tanks for Hydro-electric Plants [Alcuni ti pi particolari di camere di oscillazione per impianti idroelettrici (differenziali, multiple, ecc.)], G. Ferro. Energia Elettrica, vol. 2, no. 3, Mar. 1925, pp. 231-245, 22 figs. Discusses simple, differential and multiple surge tanks, their calculation, design, construction and operation.

I

ICE MANUFACTURE

WATER, INFLUENCE OF. Influence of Water in Making Quality Ice, D. K. French. Refrigeration, vol. 36, no. 4, Apr. 1925, pp. 50-51. Discusses more important problems in which water bears a part.

IMPACT TESTING

MACHINES FOR. Universal Endurance Impact Testing Machine. Engineering, vol. 119, no. 3098, May 15, 1925, pp. 604-605, 6 figs. partly on p. 608. Machine placed on market by A. J. Amsler & Co., Schaffhausen, Switzerland, designed for making either tension impact, compression impact, or transverse bending impact fatigue tests.

INDUSTRIAL MANAGEMENT

TEXTILE MILLS. Visible Management Methods Increase Output, J. M. Cronin and H. F. Van Wye. Textile Wld., vol. 67, no. 21, May 23, 1925, pp. 35-37, 4 figs. Planning methods used in a tapestry mill to give maximum output, minimum waste and prompt deliveries; principles can be adapted to mills making other fabrics; plant conditions that eat into profits and destroy good will; control of weaving and auxiliary processes.

TIME STUDY. *See Time Study.*

INDUSTRIAL PLANTS

LOCATION. Scientific versus Haphazard Plant Location, J. A. Piquet. Indus. Mgmt. (N. Y.), vol. 69, no. 6, June 1925, pp. 330-335, 7 figs. How factors of market, transportation, power, water and labor affect profit margin.

RAILWAYS. Track Maintenance in a Manufacturing Plant, F. H. Ryan. Can. Machy, vol. 33, no. 23, June 4, 1925, pp. 22-24, 4 figs. Construction of new frogs and diamonds of special design often necessary on account of curves being much sharper than found in regular railway work.

INDUSTRIAL RELATIONS

CO-OPERATIVE PLANS. Co-operation—A Constructive Force, R. V. Wright. Ry. Age, vol. 78, no. 24, May 16, 1925, pp. 1210-1218. Lehigh Valley Railroad maintains intimate contacts between officers and employees; personnel representatives, their qualifications and what they do; employee representation; foreman training; dealing with public; other factors which induce co-operation.

HUMAN FACTOR IN INDUSTRY. The Human Factor in British Industry, Jas. F. Whiteford. Indus. Mgmt. (N. Y.), vol. 69, no. 6, June 1925, pp. 349-353, 3 figs. Discusses present working and living standards, of British labor; welfare and recreational activities; educational developments.

INSULATION, HEAT

ECONOMY. Heat Insulation Economy, L. B. McMillan. Steam Power, vol. 4, no. 2, Mar. 1925, pp. 5, 10 and 12, 6 figs. Calls attention to some of the elements in problem of economical utilization of heat whose importance is not fully realized.

INSULATING MATERIALS, ELECTRIC

STANDARDS. Electrical Insulating Materials. Am. Soc. Testing Matls.—Preprint, no. 57, for mtg., June 23-26, 1925, 24 pp., 3 figs. Report of Committee D-9. Existing and tentative standards; proposed new tentative standard. Appendix, by E. A. Snyder and D. C. Cox, on life test for transformer oils. Proposed tentative methods of testing laminated sheet insulating materials.

STRENGTH-THICKNESS RELATION. Dielectric-strength-thickness Relation in Fibrous Insulation, F. M. Clark and V. M. Montsinger. Gen. Elec. Rev., vol. 28, no. 5, May 1925, pp. 286-290, 6 figs. Shows how measurement of dielectric strength of cloth and paper may vary differing conditions of test.

INSULATORS, ELECTRIC

MECHANICAL STRENGTH. Mechanical Strength of Insulators, A. O. Austin. Elec. World, vol. 85, no. 24, June 18, 1925, pp. 1253-1255. Well-designed insulator compromise between working load, ultimate test strength and thermal stress; discussion of modern insulator problems.

INTERNAL-COMBUSTION ENGINES

CRANKLESS. The Crankless Engine. Gas and Oil Power, vol. 20, no. 236, May 7, 1925, pp. 159-160, 1 fig. Crankless engines and gas compressors constructed in Melbourne, Australia, from designs of A. G. M. Michell.

RAIL TRACTION. Traction on Rails by Internal-Combustion Engines, E. Brillié. Engineering, vol. 119, nos. 3094, 3095, 3096, 3097 and 3100, Apr. 17, 24, May 1, 8 and 29, 1925, pp. 491-493, 525-527, 558-560, 620-622 and 684-687, 95 figs. Advantages of internal-combustion over steam engine as method of propulsion; problems arising with use of internal-combustion engine for traction; mechanica methods of transmission. Paper read before Brit. Section of Société des Ingénieurs Civils de France.

[*See also Airplane Engines; Automobile Engines; Diesel Engines; Oil Engines.*]

IRON ALLOYS

IRON-CARBON. The Iron-Carbon Diagram, J. H. Andrew. Roy. Tech. College—Jl., no. 1, Dec. 1924, pp. 41-47, 5 figs. Arguments are put forward to show that carbide of iron must exist as such when in solution in gamma iron; that eutectoid occurring at 0.89 per cent of carbon theoretically should be regarded as eutectoid of iron and solid solution containing about 2 per cent of carbon; etc.

IRON-NICKEL. A New Alloy of Iron and Nickel of High Magnetic Permeability (Un nouvel alliage de fer et de nickel à perméabilité magnétique élevée), E. M. Deloraine. Journal de Physique et le Radium, vol. 6, no. 1, Jan. 1925, pp. 20-28, 9 figs. Discusses permalloy, containing 80 per cent iron and 20 per cent nickel; production, physical properties, uses, heat treatment, magnetic properties, etc.

IRON AND STEEL

CORROSION. Corrosion of Iron and Steel. Am. Soc. Testing Matls.—Preprint, no. 11, for mtg. June 23-26, 1925, 23 pp., 4 figs. Report of Committee A-5. Inspection of Fort Sheridan, Pittsburgh, and Annapolis tests; subcommittee reports on total immersion tests, and specifications for metallic-coated products; proposed requirements for zinc-coated or galvanized wire; tests of metallic-coated products.

CHEMISTRY. The Chemistry of Iron and Steel, F. T. Sisco. Am. Soc. Steel Treating—Trans., vol. 7, no. 5, May 1925, pp. 640-656. Chemistry of wrought iron and crucible steel; defects in iron and steel; solid non-metallic inclusions from reaction products introduced in melting and refining; occluded or dissolved gas; defects introduced into iron during melting, and into metal at some stage of casting or hot working; segregation; other defects in steel.

IRON CASTINGS

CHILLED. The Manufacture of Chilled Castings. Foundry Trade Jl., vol. 31, no. 458, May 28, 1925, pp. 456-457, 3 figs. Difficulties encountered in making cbilled castings; construction and thickness of cbills; preparation of mold for chilled roll; difficulty encountered in casting wagon wbeels; making chilled railway wheels.

STEAM-TURBINE. Adopt Skeleton Pattern Plan for Turbine Casting, W. B. Kresge. Foundry, vol. 53, no. 11, June 1, 1925, pp. 434-435 and 456, 12 figs. Pattern-maker and molder display ingenuity in method involving minimum expense; method adopted at plant of Jas. Howden & Co., Wellsville, N. Y., in producing steam-turhine exhaust-end casing for 2500-kva. direct-connected generator condensing machine designed to operate under 29-in. vacuum.

IRON, PIG

ELECTRIC, MANUFACTURE. Electric Pig Iron Manufacture in Sweden, J. A. Leffler. Can. Min. Jl., vol. 46, no. 21, May 22, 1925, pp. 529-532. Also Foundry Trade Jl., vol. 35, no. 458, May 28, 1925, pp. 465-466. Sbort descriptions of plants at Hagfors. Domnarfvet, Soderfors. Porjus and Trollhattan; chemical and pbysical properties of ores used and of reducing agent; pig iron and its composition; furnace gas and its use; temperature; economics of electric sbaft furnace. Extract from lecture before Swedish Engrs. Soc.

SELECTION BY FRACTURE AND CHEMICAL ANALYSIS. The Selection of Iron hy Fracture and Cbemical Analysis. Foundry Trade Jl., vol. 31, no. 457, May 21, 1925, pp. 437-438. Discussion beld by West Yorkshore Metallurgical Society.

L

LACQUERS

SOLVENTS, LATENT HEAT OF. Latent Heat of Vaporization of Lacquer Solvents, H. A. Gardner and H. C. Parks. Paint Mfrs.' Assn. of U. S., Circular No. 236, Apr. 1925, pp. 275-281, 3 figs. Results of study made on reduction of temperature caused by evaporation of various solvents used in manufacture of pyroxlin lacquer coatings.

SOLVENTS, VAPOR PRESSURE OF. Vapor Pressure of Lacquer Solvents, H. C. Parks and H. A. Gardner. Paint Mfrs.' Assn. of U. S., Circular No. 237, Apr. 1925, pp. 282-288, 5 figs. Discusses the two metbods hy which vapor pressure of a liquid at a given temperature may he determined, viz., statical and dynamical.

LAPPING

IMPORTANCE OF. The Importance of Lapping, O. C. Kavle. Machy. (N. Y.), vol. 31, no. 10, June 1925, pp. 1925, pp. 817-818, 1 fig. Why more attention sbould he paid to lapping; cylinder lapping; lap for sizing and smootbing cylindrical bores.

LATHES

CAR-WHEEL. Heavy Carwheel Lathe. Iron Age, vol. 115, no. 23, June 4, 1925, p. 1638, 1 fig. Improved features permit of increased power; new turret tool post.

TURRET. Heavy Turret Lathe Work. Machy. (Lond.), vol. 26, no. 661, May 28, 1925, pp. 257-259, 8 figs. Finishing locomotive power-reverse cylinders and large worm quill forgings on turret latbes.

WHEEL TURNING. Tbe Turning of Driving Wheels. Ry. & Locomotive Eng., vol. 38, no. 6, June 1925, pp. 168-169, 2 figs. Present drawing made hy Wm. Sellers Co., Philadelphia, embodying complete dimensions of cutting tools to he used and method of using them.

LIGHT

STRUCTURE. The Structure of Light, J. J. Thomson. Engineering, vol. 119, no. 3098, May 15, 1925, pp. 602-604, 6 figs. On view put forward by autbor, ligbt did not consist of one constituent but of two, the ring of electric force and its accompaniment of Maxwell waves.

LIGNITE

BOILER FIRING. Cost of Production of Pulverized Lignite and Limits of Its Application in Boiler Plants (Herstellungskosten von Braunkoblenstaub und Grenzen seiner Verwendung bei Kesselanlagen), K. Deimler. Braunkoble, vol. 24, no. 6, May 9, 1925, pp. 129-136, 1 fig. Discusses calorific value, water content, etc., gives diagram showing variation of lignite consumption with water content, and makes calculations.

Present Status of Lignite Firing (Der gegenwärtige Stand der Braunkohlenfeuerungen), Berner. Braunkohle, vol. 24, nos. 4 and 5, Apr. 25 and May 2, 1925, pp. 89-93 and 109-115, 17 figs. Discusses use of extension furnaces, step grates and mechanical feeding, trough grates, technical superiority of mecbanical stoking, preliminary drying, pulverizing, etc.

LOCOMOTIVE BOILERS

FEEDWATER TREATMENT. Chemical Water Purification on the Paris-Lyons-Mediterranean Line (L'épuration chimique de l'eau sur le réseau de la Compagnie Paris-Lyon-Méditerranée), M. H. Vignal. Revue Générale des Chemins de Fer, vol. 44, no. 5, May 1925, pp. 363-376, 3 figs. Discusses principles of purification and apparatus used; analysis, alkalimetry, consumption of reagents; results of three years' working.

LOCOMOTIVES

AERO-STEAM. The Dunlop Superbeated "Aero-Steam" Locomotive. Ry. Engr., vol. 46, no. 544, May 1925, pp. 162-163, 2 figs. Describes engine wbich is claimed to provide satisfactory and economical alternative to steam locomotive, inasmuch as bigber percentage of effective tractive effort tban usual is obtained from given quantity of fuel.

BOOSTER MAINTENANCE. Booster Inspection and Maintenance. Ry. Mech. Engr., vol. 99, no. 5, May 1925, pp. 290-292, 3 figs. Instruction of enginemen in handling boosters and close attention to lubrication are important maintenance factors.

CONSTRUCTION DEVELOPMENTS. Developments in Locomotive Construction, W. W. Baxter. Ry. Rev., vol. 76, no. 24, June 13, 1925, pp. 1056-1061, 18 figs. Review of new developments.

DIESEL-ENGINED. Diesel Locomotive Design in Germany. Engineer, vol. 139, no. 3621, May 22, 1925, pp. 578-579, 2 figs. Account of papers dealing witb various aspects of design, read and discussed at meeting of Verein deutscher Ingenieure. Abstracted and translated from Zeit. des Vereines deutscber Ingenieure, May 9, 1925.

Oil Engined Locomotives for Steam Railroads, E. B. Katte. Oil Engine Power, vol. 3, no. 5, May 1925, pp. 309-310, 1 fig. Résumé of present situation from aspect of American railway engineer. Read before A.S.M.E. Oil & Gas Power Week Mtg.

EFFICIENCY. Increasing Efficiency of tbe Steam Locomotive (De quelques moyens d'améliorer le rendement de la locomotive à vapeur), M. Roy. Annales des Mines, vol. 7, no. 1, 1925, pp. 5-104, 10 figs. Discusses effective work of locomotive; feedwater heating by steam, and by flue gases; condensers; heating air of combustion; draft; feedwater injectors; exhaust-steam utilization; etc.

ELECTRIC. *See Electric Locomotives.*

INDUSTRIAL. Industrial Locomotives in Germany. Ry. Gaz., vol. 42, no. 21, May 22, 1925, p. 712, 2 figs. Describes 0-4-0-4-type locomotive fitted with smoke-box prebeater, and 3-ft.-gage locomotive specially designed for working in confined spaces, hoth constructed hy firm of Arnold Jung.

INTERNAL-COMBUSTION. *See Hydraulic Drive.*

MAINTENANCE. The Economies of Shopping Steam Locomotives, L. K. Sillcox. Can. Machy., vol. 33, no. 23, June 4, 1925, pp. 25-28 and 51, 2 figs. Sbows facility witb which modern machine tools can be operated.

PATENTS. Locomotives and Tramway, Traction, Portable, and Semi-portahle Engines. Abridgments of Specifications, Period 1916-20, Class 79 (i), 1925, 139 pp. Patents for inventions.

THREE-CYLINDER. Three-Cylinder Locomotives on American Railroads. Ry. Age, vol. 78, no. 24, May 16, 1925, pp. 1197-1202, 7 figs. Road service tests show ability to handle increased tonnage, ease in starting beavy trains and economy in fuel consumption.

2-8-4. High Power 2-8-4 Type Locomotive. Ry. Mech. Engr., vol. 99, no. 5, May 1925, pp. 266-273, 14 figs. Has 100 sq. ft. of grate, 4-wheel trailer truck and 60 per cent maximum cutoff; tractive force witb booster, 82,600 lb.; huilt hy Lima Locomotive Works for Boston & Albany R. R. See also description in Ry. & Locomotive Eng., vol. 38, no. 5, May 1925, pp. 129-136, 17 figs.

LUBRICATING OILS

COMPOSITION OF CONSTITUENTS. Studies on Lubricating Oils, W. J. Wilson and B. C. Allihone. Instn. Petroleum Tecbnologists—Jl., vol. 11, no. 49, Apr. 1925, pp. 177-190, 1 fig. Methods of valuation of lubricating oils; investigation of composition of lubricating-oil constituents of petroleum hefore and after distillation; composition of lubricating oil constituents of bardstoft crude oil.

LUBRICATION

BOUNDARY. Boundary Luhrication—Plane Surfaces and the Limitations of Amontons' Law, Wm. Hardy and I. Bircumshaw. Roy. Soc.—Proc., vol. 108, no. A745, May 1, 1925, pp. 1-27, 3 figs. Deals with experiments in wbich face of slider was plane.

M

MACHINE TOOLS

BORING, DRILLING AND MILLING MACHINE. A Versatile Tool for Locomotive Repair Shops, L. R. Gurley. Ry. Mech. Engr., vol. 99, no. 5, May 1925, pp. 294-299, 19 figs. Horizontal boring, drilling and milling machine handles wide range of work; serves as halancing medium in sbops.

MAGNETIC FIELDS

RADIATING ATOMS, INFLUENCE ON. Radiating Atoms in Magnetic Fields, P. Zeeman. Franklin Inst.—Jl., vol. 199, no. 5, May 1925, pp. 585-596, 15 figs. Study of various effects makes it possihle for us to examine in detail hehavior of intro-atomic processes under magnetic forces; points out profound influence of magnetic field on atomic edifice.

MAGNETISM

THEORY. The Tbeory of Magnetism, Chas. G. Darwin. Engineering, vol. 119, no. 3101, June 5, 1925, pp. 693-694. (Abstract.) Address before Roy. Instn.

MALLEABLE CASTINGS

ECONOMICAL PRODUCTION. Saving Money on Malleahle Castings, H. A. Schwartz. Iron Age, vol. 115, no. 24, June 11, 1925, pp. 1727-1728. Study of specifications, attention to simplicity of design and common sense in rejecting can net real profits; question of shrinks. (Abstract.) Paper presented hefore Nat. Assn. Purchasing Agents.

STANDARD SPECIFICATIONS. Malleahle Castings. Am. Soc. Testing Matls.—Preprint, no. 12, for mtg. June 23-26, 1925, 1 p. Report of Committee A-7, recommending revision of standard specifications on minimum yield point.

MATERIALS HANDLING

FLOUR MILL. New Plant Eliminates Hand Lahor, A. P. Walker. Mgmt. and Admin., vol. 9, no. 6, June 1925, pp. 513-518, 11 figs. Standard Milling Co. installs complete material-handling system in new plant in Jersey City; along nortb side of building are 6 tray elevators for bandling individual sacks of incoming flour and 4 electric freigbt elevators for handling sacks which are stacked on platforms to be moved by lift trucks.

METALLURGY

FERROUS METALS. Principles of Metallurgy of Ferrous Metals for Mecbanical Engineers, L. Cammen. Mech. Eng., vol. 47, no. 6, June 1925, pp. 479-484, 6 figs. Crystalline structure of ferrous metals, and practical applications of this knowledge; solid solutions; structure of actual metals; amorpbous-metal hypothesis; intercrystalline cement; recrystallization; plastic strain in metals; Widmanstaetten figures. Bihliograpby.

METALLOGRAPHY

MICRO-HARDNESS. Metallography. Am. Soc. Testing Matls.—Preprint, no. 18, for mtg. June 23-26, 1925, 6 pp. Report of committee E-4. Report of suhcommittee on micro-hardness; proposed tentative recommended practice for tbermal analysis of steel.

METALS

FATIGUE OF. The Growtb of Modern Theories of Fatigue Failure, H. C. Dews. Metal Industry (Lond.), vol. 26, no. 23, June 5, 1925, pp. 531-533. Refers to early work of Wöbler and others, and toucbes on old idea of crystallization; discusses modern tbeory as expounded hy Rosenbain and bypotbesis upon whicb it is hased; recent investigations of Merrils and fatigue theory evolved by bim in opposition to tbat of Rosenhain.

MINE HOISTING

ELECTRIC DRIVES. Modern Tendencies in Mine Hoisting, F. L. Stone. Min. Congress Jl., vol. 11, no. 5, May 1925, pp. 217-222, 7 figs. Discusses question of dividing line hetween d.c. motor with Ward Leonard control and induction motor with rheostatic control; emphasizes importance of drum sbapes and drive systems.

MINE SHAFTS

LINING. An Improved Device for Progressively Lining Shafts With Concrete Witbout Interfering With Sinking Operations, E. M. Roherts. Instn. Min. Engrs.—Trans., vol. 69, Pt. 1, Mar. 1925, pp. 117-121 and (discussion) 121-122, 7 figs. Effective in permanent and efficient sbaft sinking and in lining of sbafts with concrete.

MINE TIMBERING

TIMBER PRESERVATION. Mine Timbering. Am. Min. Congress—Standardization Division Bul., no. 5, 1925, pp. 105-111. Report on timber preservation. See also contribution, by J. L. Hyde, entitled, Open Tank Treating Plant at the Atbens Mine, Negaunee, Micbigan, for Treatment of Round Mine Timhers for Underground Use, pp. 112-124, 6 figs.

Economic Utilization, Bibliography on. Bibliography on Economic Utilization of Mine Timber, H. E. Tufft and R. R. Hornor. U. S. Bur. Mines, Reports of Investigations, Serial No. 2685, Apr. 1925, 11 pp. Covers consumption, costs, supply, selection, preparation, storage, preservatives and methods of treatment, protection against fire, salvaging, etc.

MINING

Loading Machinery Underground. Mechanical Leading Underground. Am. Min. Congress—Standardization Division Bul., no. 5, 1925, pp. 68-75. Committee report on recommendations for standardization of loading machinery.

MINING INDUSTRY

Power Available in Canada. Available Power in Mining Industry of Canada. Power House, vol. 18, no. 10, May 20, 1925, p. 25. Over half a million horsepower is used in industry, of which 54 per cent is water power, 44.6 per cent steam power, and 1.4 per cent is developed by internal-combustion engines. Compiled by Dominion Water Power and Reclamation Service, Department of Interior, Ottawa.

MOLDING MACHINES

Pattern Plates for Jarring Machines. Production of Pattern Plates for Jarring Machines (Modell-plattenberstellung für Rüttelformmaschinen), P. Frech. Stahl u. Eisen, vol. 45, no. 18, Apr. 30, 1925, pp. 658-659, 3 figs. Describes methods employed in molding patterns on jarring machines.

MOLDING METHODS

Worm Wheels. Molds Emergency Worm Wheel, Jas. Edgar. Foundry, vol. 53, no. 11, June 1, 1925, pp. 454-455, 11 figs. Necessity for delivering castings at earliest possible moment was responsible for casting wheel in green sand from limited pattern equipment.

MOLDS

Gates and Risers. Gates and Risers, F. C. Edwards. Foundry Trade Jl., vol. 31, nos. 454 and 455, Apr. 30 and May 7, 1925, pp. 365-368 and 395-397, 17 figs. Fundamental principles; downgates; impact effect of metal on mold; direct gating; combined top and bottom gating; tangential gating; how gating may cause or correct camber.

Venting. Importance of Venting with Special Reference to Defective Castings, E. Longden. Foundry Trade Jl., vol. 31, nos. 458 and 471-474, May 28 and June 4, 1925, pp. 449-452 and 471-474, 13 figs. Information with view to focusing attention on effect of gases, especially those given off from mold during pouring, on soundness of gray iron castings; defects attributable to gases; venting green sand, dry sand and loam; experiments to eliminate cavities and porosity. Discussion.

MOLYBDENUM

Separation from Vanadium. A Critical Study of the Separation of Molybdenum from Vanadium as Sulphide, A. E. Stoppel, C. F. Sidener and P. H. M. P. Brinton. Chem. News, vol. 130, no. 3339, June 5, 1925, pp. 353-355. Separation of molybdenum from vanadium as sulphide is more satisfactorily accomplished by precipitation with hydrogen sulphide in acid solution in a pressure flask than by acidfying ammoniacal solution which has been saturated with hydrogen sulphide.

MORTARS

Strength Tests. The Significance of the Common Test Methods for Determining the Strength of Mortars, J. W. Gowen and H. Walter Leavitt. Am. Soc. Testing Matls.—Preprint, no. 38, for mtg., June 23-26, 1925, 10 pp., 6 figs. Outlines some of chief functions of tests in general and establishes significance of standard tension test, standard compression test, and new abrasion test upon portland-cement mortars; describes application of correlation method to study of above-mentioned tests in relation to three general functions named.

MOTOR BUSES

Gasoline-Electric. Eight-Wheeled Bus with Gas-Electric Drive Is Developed. Automotive Industries, vol. 52, no. 16, Apr. 16, 1925, pp. 700-702, 5 figs. Experimental chassis of Versare Corp. has two 4-wheeled trucks; knuckle and fifth-wheel steering are combined; engine develops full power at low bus speed.

MOTOR TRUCKS

Hauling Heavy Apparatus. Hauling Heavy Apparatus, A. N. Cartwright. Elec. Jl., vol. 22, no. 5, May 1925, pp. 222-224, 4 figs. Describes 5-ton trucks with heavy springs and broad rear tires, together with semi-trailer, designed and built by West Penn Power Co. for transportation of equipment over poor roads to substation.

Springs. Springing of Business Vehicles. T. H. Sanders. Motor Transport (Lond.), vol. 40, no. 1056, May 25, 1925, pp. 603-606, 6 figs. A study of what goes to make a sound spring, what causes failures and how they may best be a avoided.

N

NICKEL ALLOYS

Endurance Properties. Endurance Properties of Alloys of Nickel and of Copper, D. J. McAdam, Jr. Am. Soc. Steel Treating—Trans., vol. 7, no. 5, May 1925, pp. 581-617, 19 figs. Results of investigation of effect of several degrees of cold working on rotating-cantilever endurance properties of nickel; graphs showing effects of cold working and annealing on endurance and other physical properties of nickel and some of its alloys, also effect of degree of cold working on endurance properties; stress-cycle graphs give additional evidence that rotating-cantilever endurance limits of alloys of nickel and copper are as definite as endurance limits for steel.

NICKEL PLATING

Rust Resistance. Rust Resistance of Plated Articles by Heavier Deposits of Nickel, E. M. Baker. Brass World, vol. 21, no. 5, May 1925, pp. 161-163, 4 figs. In connection with investigation of rust resistance of nickel-plated samples, author has devised method for rating and comparing specimens in test which has been in practical use for two years, and which appears to yield numerical results directly parallel with those of actual service tests; values for salt-spray ratings; effect on rust resistance of thickness of nickel plate.

NON-FERROUS METALS

Fatigue Tests. Some Fatigue Tests on Non-Ferrous Metals, R. R. Moore. Am. Soc. Testing Matls.—Preprint, no. 22, for mtg. June 23-26, 1925, 18 pp., 7 figs. Results of endurance tests on pure magnesium, aluminum, forged and cast magnesium-aluminum alloy, and naval brass; describes improved type of rotating beam machine of wide range of use; special attention is given to endurance weight efficiency and comparisons are drawn between light non-ferrous metals and alloy steels; effect of notch upon endurance limit and effect of ductility upon notch effect.

Standard Specifications. Non-Ferrous Metals and Alloys. Am. Soc. Testing Matls.—Preprint, no. 15, for mtg. June 23-26, 1925, 22 pp., 4 figs. Report of Committee B-2. Subcommittee reports on pure metals in ingot form; wrought non-ferrous metals, sand-cast metals and alloys, white metals, non-ferrous metals for railway equipment, methods of chemical analysis, aluminum alloys, and methods of testing. Review of Antimony Situation, H. K. Masters. Proposed tentative specifications for Muntz metal condenser-tube plates.

NOZZLES

Steam, Pipe Loss in. The Pipe Loss in Steam Nozzles, A. L. Mellanby and W. Kerr. Roy. Tech. College—Jl., no. 1, Dec. 1924, pp. 67-102, 17 figs. Study of loss values; law of energy loss; loss function from nozzle results; comparison with pipe flow; influence of surface condition; trend of efficiency curve; methods of calculation.

O

OIL ENGINES

Cold-Starting. Tests on a Blackstone Spring Injection Cold-Starting Oil Engine. Engineering, vol. 119, no. 3095, Apr. 24, 1925, p. 528. Results of tests carried out on two of these engines showing favorable results.

Solid Injection for High-Speed. Some Considerations on Solid Injection for High Speed Engines, R. Matthews. Power, vol. 61, no. 22, June 2, 1925, pp. 862-863, 3 figs. Use of primary introduces two problems: pressure necessary, and type of primary pump; compared with calculated values, pressures actually required at high engine r.p.m. to drive fuel through small orifices, seem much out of proportion to average velocity of liquid; gives tentative explanation of cause of this seemingly excessive required pressure; unsatisfactory pump designs.

Trial Results, Code for. Codes for Recording Heavy-Oil Engine Trials. Engineering, vol. 119, no. 3098, May 15, 1925, pp. 611-612. Review of discussion which took place at meeting held in Institution building of Instn. Civ. Engrs. by special committee appointed to deal specifically with tabulation of results of heat-engine trials.

Two-Stroke. Some Tests on a Two-Stroke Cycle Oil-Engine, E. A. Allcut. Engineering, vol. 119, nos. 3100 and 3101, May 29 and June 5, 1925, pp. 681-683 and 713-716, 22 figs. Tests made to investigate behavior of 2-cycle engine under different loads, to ascertain extent of various heat losses and various efficiencies. (Abridged.) Paper read before Instn. Mech. Engrs. See also Engineer, vol. 139, no. 3622, May 29, 1925, pp. 593-594, including discussion.

OIL FUEL

Burning. Auxiliary Equipment for Oil Burning, K. Miller. Fuels and Furnaces, vol. 3, no. 5, May 1925, pp. 465-470 and 492, 10 figs. Deals with reciprocating oil pumps, strainers and air filters.

What Happens when We Burn Oil, J. L. Breese, Jr. Heat. and Vent. Mag., vol. 22, no. 6, June 1925, pp. 54-56 and 62. 1 fig. Importance of oil-flame analysis and significance of blue and yellow flames. Paper read before Nat. Assn. Oil Burner Mfrs.

Commercial Buildings. Fuel Oil in the Commercial Buildings of New York, A. M. Coyle. Mech. Eng., vol. 47, no. 6, June 1925, pp. 487-489. Classification of oil-burning methods; rating of boilers; typical installations and results; question at issue in oil burning; prospect of fuel supply. (Abridged.)

OPEN-HEARTH FURNACES

Design. Performance and Efficiency as Fundamentals in the Design and Calculation of Open-Hearth Furnaces (Leistung und Wirkungsgrad als Unterlagen für Bau und Berechnung der Siemens-Martin-Oefen), H. Bansen. Stahl u. Eisen, vol. 45, nos. 19, 20 and 21, May 7, 14 and 21, 1925, pp. 702-714, 748-756 and 789-799, 22 figs. Working conditions for temperature drop; heat circulation (regenerative system; relations of fuel supply and preheating to furnace performance and fuel consumption; special means of influencing temperature drop; combustion, temperature conditions and heat transmission in furnace room; heat storage; movement of gases through furnace system; waste-heat utilization; influence of working conditions and operation on efficiency; means of increasing efficiency. May 21: Discussion.

Heat Losses. Recovery of Heat Lost in an Open-Hearth Furnace (Récupération des chaleurs perdues dans un four Martin), P. Kersten. Revue Universelle des Mines, vol. 6, no. 3, May 1, 1925, pp. 144-159, 4 figs. Discusses heat balance; heat lost by radiation, convection, and in flue gases; selection of boiler; results of tests.

ORE DRESSING

Milling. Discussion of the Milling Methods Papers Presented at the New York Meeting, February, 1925. Am. Inst. Min. and Met. Engrs.—Trans., no. 1469-B, June 1925, 6 pp.

ORE TREATMENT

Complex Lead-Zinc Ores. Beneficiation of Complex Lead-Zinc Ores, A. J. Thompson and T. Varley. Univ. of Utah-Bul., Eng. Exper. Sta. Bul. No. 15, Jan. 1925, pp. 47-56, 2 figs. Present milling practice in Park City district (Utah); physical and chemical properties and characteristics of ore; flotation tests, including Hellstrand and Sheridan processes; etc.

OXYACETYLENE WELDING

Cast Iron. Phenomena Occurring in Welding of Gray Iron Castings by Means of Acetylene Torch (Beiträge zur Kenntnis der Vorgänge bei der Schmelz-schweissung von Grauguss mittels Azetylens), Fr. Politz. Stahl u. Eisen, vol. 45, no. 18, Apr. 30, 1925, pp. 653-658, 6 figs. Thermal phenomena in connection with welding; graphic reproduction of heating and cooling phenomena; advantages of poor heat conductor as base; changes in material with correct and faulty work; material testing.

Gasoline Heat Exchangers. Heat Exchangers Used in Connection with Gasoline Extraction Plants. Acetylene Jl., vol. 26, no. 11, May 1925, pp. 533-534 and 548, 6 figs. Describes heat exchanger which is used in gasoline extraction plants for saving or utilizing a portion of heat of hot oil as it leaves still, and its construction by oxyacetylene welding.

P

PAINTS

Structural Materials. Preservative Coatings for Structural Materials. Am. Soc. Testing Matls. — Preprint, no. 44, for mtg., June 23-26, 1925, 67 pp., 2 figs. Reports on testing of paint vehicles; definitions of terms used in paint specifications; varnish; preparation of iron and steel surfaces for painting; physical properties of paint materials; application of paint by spraying; proposed tentative methods of routine analysis of white linseed oil paints; proposed tentative specifications for dry bleached shellac and for testing shellac varnish; other proposed tentative specifications.

Zinc and Aluminum Powder Paints. Zinc and Aluminum Powder Paint Tests, H. A. Gardner. Paint Mfrs.' Assn. of U. S., Circular No. 231, Apr. 1925, pp. 222-247, 6 figs. Details of tests on their use as metal protective and as primers for refractory woods, and on use of small amounts of metal powders in white paints to defer weathering effects.

PAPER MANUFACTURE

Filter Mass Manufacture. Filter Mass, G. Bonnet. Paper Trade Jl., vol. 80, no. 22, May 28, 1925, pp. 47-48. Properties, cooking, washing and defibering, bleaching, making into sheets and drying, and testing. Translated from Papier, vol. 27, Oct. 1924, pp. 1167-1170.

Newsprint. Technical Features of High-Speed Newsprint Manufacture, C. W. Morden. Mech. Eng., vol. 47, no. 6, June 1925, pp. 495-496. Capacity of large newsprint machines; stock and its preparation; flow of stock through machine; formation of sheet; removing water from sheet; individual motor drive for each section of machine.

Pulp, Oxycetylene Determination of. A Modified Method for the Determination of the Copper Number (Oxycellulose) of Bleached Pulps, P. D. Bray and P. C. Liu. Paper Trade Jl., vol. 80, no. 22, May 28, 1925, pp. 49-53, 6 figs. Describes work whose purpose was to study Schwalbe method for determination of copper number of a wood pulp, and to so modify method that it would give more satisfactory results. References.

Straw Paper. Straw Board and Straw Paper, H. G. Funsett. Paper Trade Jl., vol. 80, no. 23, June 4, 1925, pp. 58-60. Possible future; geographical distribution of straw mills; present uses of straw paper; preparation of straw pulp; cooking, washing and beating; press rolls; stream pollution problems; etc. Paper read before Am. Pulp & Paper Mill Supts. Assn.

PAPER MACHINERY

Manufacture. Building Thousand-Ton Paper Making Machine, H. Kay. Can Foundryman, vol. 16, no. 5, May 1925, pp. 18-20 and 29, 5 figs. Describes making of paper and 300-ft.-long machines which Chas. Walmsley & Co. build for its manufacture. See also Can. Machy., vol. 33, no. 18, Apr., 30, 1925, pp. 13-16, 5 figs.

PAPER MILLS

By-Product Power for. Figuring the Low Cost of By-Product Power, M. D. Church. Power House, vol. 18, no. 8, Apr. 20, 1925, pp. 37-38, 1 fig. Turbine drive for paper machines a success on basis of both reliability and economy; comparison of costs with hydro-electric power.

Power Plants. Economics of Paper Mill Power Plants, A. F. Sheehan. Nat. Engr., vol. 29, no. 6, June 1925, pp. 278-280. Suggestions regarding efficient design of paper-mill power plants.

PATTERNS

Classification. New System Brings Order from Chaos. Foundry, vol. 53, no. 12, June 15, 1925, pp. 473-475, 3 figs. Patterns accumulated through many years classified under simple plan; numbering patterns; under present system practically any ordinary laborer may be trusted to convey castings from cleaning room and deposit them in proper receptacle.

Marking. Marking Patterns Carefully, W. C. Ewalt. Foundry, vol. 53, no. 12, June 15, 1925, pp. 492 and 501, 2 figs. Letters and figures serve to identify patterns; various methods now in use for placing nameplates and other lettering on patterns.

PHOTOELASTICITY

Stress Determination by. How Stress Distribution Is Determined by Photoelastic Method, A. L. Kimball, Jr. Automotive Industries, vol. 52, no. 24, June 11, 1925, pp. 1021-1024, 11 figs. Circularly polarized light when passed through model of part to be investigated, made of transparent material and similarly loaded, is modified, producing color bands indicative of stress. (Abstract.) Paper read before Am. Gear Mfrs. Assn.

PILES

Driving. A Rational Pile-Driving Formula and Its Application in Piling Practice Explained, A. Hiley. Engineering, vol. 119, nos. 3100 and 3102, May 29 and June 12, 1925, pp. 657-658 and 721-722, 2 figs. Refers to articles published in same journal in June 1922, entitled The Efficiency of the Hammer Blow, in which author deduced rational formula for general application of pile-driving problems; in present article he provides fuller explanation as to how formula should be applied to determine resistance overcome for any given case.

PIPE, CAST-IRON

Bronze-Welded Joints. Welded Joints in Cast-Iron Pipe, C. H. S. Tupholme. Foundry Trade Jl., vol. 31, no. 458, May 28, 1925, pp. 458-459. Notes on bronze welding of joints; welding process; flexibility of bronze-welded pipe.

Manufacture. Sandspun Pipe, C. R. Wood. New Eng. Water Wks. Assn., vol. 39, no. 1, Mar. 1925, pp. 85-87 and (discussion) 87-89. Outline of things which have been accomplished during 1924 at experimental plant operated by R. D. Wood & Co., Phila., Pa., and associates at works of Am. Cast Iron Pipe Co. at their plant in Birmingham, looking toward development of spinning cast-iron pipe in a sand mold.

POLES, CONCRETE

Operating Experiences. Operating Experience with Concrete Poles, J. M. Brown. Elec. World, vol. 85, no. 21, May 23, 1925, pp. 1081-1083. Experience of Oklahoma Gas & Elec. Co.; solid square poles adopted; it was found they could be made as cheaply as hollow poles and were much stronger.

POLES, WOODEN

Calculation. Power Transmission Lines, W. T. Taylor. Elec. Rev., vol. 96, no. 2480, June 5, 1925, pp. 888-889, 1 fig. Calculations for size of wooden poles.

Preservation. Modern Pole-Treating Plant Fills Entire Need, D. P. Mason. Jl. Electricity, vol. 54, no. 9, May 1, 1925, pp. 324-326, 5 figs. Economical treatment of all poles used on system effected at new plant of San Joaquin Corp.

PORTS

Montreal. Construction Methods in Connection with the Harbor Works of Montreal, F. A. McLean. Contract Rec., vol. 39, no. 19, May 13, 1925, pp. 454-460 and 471-472, 15 figs. Some of the extensive operations on which air driven equipment has proven advantageous to contractors; outstanding features of largest grain handling port in world.

POWER

Relation to American Progress. Power and Its Relation to American Progress, Wm. F. Durand, Engrs. and Eng., vol. 42, no. 5, May 1925, pp. 115-119. Meaning and influence of power; power developed from interest or principal; power load; oil and coal as sources of power; important reasons for conserving petroleum; development of hydro-electric power; obligations to future generations.

POWER TRANSMISSION

Individual Motors and Silent Chains. Some Details of Power Drives with Individual Motors and Silent Chains, D. W. Taylor. Indus. Engr., vol. 83, no. 5, May 1925, pp. 214-218, 14 figs. Shows how plant of Red Wing Sewer Pipe Co. was modernized by application of individual motor drive through silent chain to all equipment, and describes various production operations.

PULVERIZED COAL

Boiler Firing. Pulverized Fuel and Low-Temperature Carbonization, D. Brownlie. Iron and Coal Trades Rev., vol. 110, no. 2985, May 15, 1925, p. 808. Gives, more particularly from point of view of mining industries, brief description of most recent developments of pulverized-fuel firing, as applied to steam generation, and bearing of this matter on subject of low-temperature carbonization. From paper read before Manchester Min. & Geol. Soc. See also Colliery Guardian, vol. 129, no. 3359, May 15, 1925, pp. 1199-1200.

Melting Furnaces. Secures Uniformity in Ladle Iron, H. R. Simonds. Foundry, vol. 53, no. 12, June 15, 1925, pp. 480-482, 5 figs. In plant of Hunt-Spiller Mfg. Co., South Boston, waste-heat boiler and reverberatory-type melting furnaces are equipped with pulverized-coal system; operating advantages are gained.

Well-Type Burner. Well-Type Burner for Pulverized Coal, H. W. Brooks. Power, vol. 61, no. 23, June 9, 1925, pp. 926-927, 5 figs. It is felt that well-type burner has successfully employed principle of turbulent flow and thus made possible efficient burning of pulverized coal in combustion volumes as small as those previously employed for stokers. Discussion of paper before A.S.M.E. Spring Mtg.

PUMPING STATIONS

Oil-Engined. Oil-Driven Pumping Plant at Chipstead. Engineer, vol. 139, no. 3623, June 5, 1925, p. 632, 2 figs. on p. 626. Plant comprises 2 heavy-oil engines of twin-cylinder horizontal type, each capable of output of 170 b.hp. as constant normal load; deep-well pump lifts water from well to tank and, after treatment, water passes forward to high-lift pump and is then delivered to either or both of two reservoirs.

Steam. Efficient Operation of Steam Pumping Plants, F. Johnstone-Taylor. Fire and Water Eng., vol. 77, no. 16, Apr. 22, 1925, pp. 799-800, 843 and 866-867. Suggestions looking toward economy in plants utilizing steam for motive power.

PUMPS

Boiler-Feed. Automatic Control for Boiler Feed Pumps, L. W. Smith and W. C. Plumer. Power Plant Eng., vol. 29, no. 11, June 1, 1925, pp. 598-599, 2 figs. Boiler-feed-pump installation at new Peoria station is provided with new automatic control.

PYROMETERS

Oil-Engined Power Plants. Exhaust Temperature Records and Their Importance, A. C. Hanson. Oil Engine Power, vol. 3, no. 5, May 1925, pp. 294-296, 5 figs. Economy of installing thermoelectric pyrometers in oil-engined plants and taking regular readings.

R

RADIOTELEGRAPHY

Wave Meters. An Improved Type of Wave Meter Resonance Indicator, M. S. Strock. U. S. Bur. Standards, Sci. Papers, no. 502, Mar. 6, 1925, pp. 111-118, 7 figs. Describes a resonance indicator for a portable wave meter which can be used in place of thermogalvanometer; method employs a sensitive milliammeter and a crystal detector connected in such a manner that a combination of capacitive and inductive coupling is obtained with respect to wave meter circuit. Method of application, and results obtained.

RAILWAY MOTOR CARS

Gasoline-Electric. Gas-Electric Car for the New Haven. Ry. Elec. Engr., vol. 16, no. 6, June 1925, pp. 173-175, 5 figs. Arrangement of control permits gas engine to operate under most favorable conditions.

Steam. A New Steam Rail Car. Ry. Gaz., vol. 42, no. 19, May 8, 1925, pp. 638-640, 4 figs. Clayton steam rail car designed for handling light passenger traffic on New Zealand Government railways. See also description in Engineer, vol. 139, no. 3621, May 22, 1925, pp. 570-571, 4 figs.; and Ry. Engr., vol. 31, no. 6, June 1925, pp. 195-198, 5 figs.

RAILWAY REPAIR SHOPS

Locomotive. Locomotive Shop Practices on Canadian Railways, W. W. Baxter. Ry. Rev., vol. 76, no. 24, June 13, 1925, pp. 1097-1103, 25 figs. Methods of performing various operations, and general arrangement of shops, machine-tool equipment and other facilities for maintaining locomotives in serviceable condition on Canadian National and Canadian Pacific railways.

RAILWAY CONSTRUCTION

Canadian Troops in World War. Work of Canadian Railway Troops in the Great War, 1914-1919, A. C. Garner. Eng. Jl., vol. 8, no. 6, June 1925, pp. 249-253, 1 fig. Outline of organization and work of Canadian railway troops.

RAILWAY ELECTRIFICATION

Status and Problems. Railroad Electrification. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 6, June 1925, pp. 663-672. Contains abstracts of following addresses delivered at annual meeting of A. I. E. E.: Electric Railroad Standardization, H. Hoover; Electrification of Railroads, G. Swope; Standardization in Electric Transportation Equipment, P. S. Clapp; The Future of Railway Electrification, E. M. Herr; The Executive's Standpoint, C. H. Markham; The Railroad Company's View of the Electrification Problem, R. J. Cary.

RAILWAYS

Fuel Economy. Final Sessions of Fuel Convention. Ry. Age, vol. 78, no. 27, June 6, 1925, pp. 1387-1395, 1 fig. Addresses and reports on mechanical subjects before Int. Ry. Fuel Assn., as follows: Fundamental Fuel Factors, G. M. Basford; How Can a Mechanical Officer Effect Fuel Economy? J. Purcell; Report on Grates with Restricted Air Openings; Report on Boiler Feed Water Heaters; Report of Committee on Fuel Stations.

Quebec, Projected Line. Proposed Abitibi Southern Ry. Opens New Territory, H. W. Wicksteed. Ry. Rev., vol. 76, no. 23, June 6, 1925, pp. 1003-1006, 5 figs. Projected line would open area of vergin white pine and bring clay belt nearer Montreal and Ottawa.

RAINFALL

Run-Off and. Consideration of Rainfall and Run-Off in Connection with Sewer Design in the Montreal District, J. G. Caron. Eng. Jl., vol. 8, no. 6, June 1925, pp. 237-244, 11 figs. Presents tabulation of rainfalls giving registered readings as compared with stick tests; McGill Observatory rainfall record of Montreal district; run-off factor.

REACTORS

Protective. Eight Years Experience with Protective Reactors, J. Lyman, L. L. Perry and A. M. Rossman. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 6, June 1925, pp. 601-603, 3 figs. Brief accounts of 16 accidents on buses or feeders of three large power stations; in each case reactors effectually kept power concentration within such limits that damage was localized, and no troubles were experienced from mechanical displacement of conductors and insulators elsewhere.

RECLAMATION

PEAT LAND. Cultivation of Crops on Peat or Muck Land, G. R. B. Elliott. Am. Peat Soc.—Jl., vol. 28, no. 2, Apr. 1925, pp. 25-35, 5 figs. Water consumption of crops; upland and lowland bogs; root development in peat; effect of drainage.

REDUCTION GEARS

INFINITELY VARIABLE. Infinitely Variable Reduction Gear. Machy. (Lond.), vol. 26, no. 658, May 7, 1925, pp. 175-177, 3 figs. Describes positive-drive infinitely variable-speed gear that appears to overcome successfully major difficulties that have been encountered in previous designs; results of tests.

REFRACTORIES

REGENERATORS, FOR. Refractories for Use In Regenerators, S. M. Phelps. Fuels and Furnaces, vol. 3, no. 5, May 1925, pp. 507-508, 1 fig. Relation of structure and composition to thermal efficiency of refractories. Abstract of paper read before Am. Refractories Inst.

REFRIGERATING PLANTS

OIL ENGINES IN. The Oil Engine in Refrigerating Practice, G. M. Kleucker. Refrigeration, vol. 36, no. 5, May 1925, pp. 46-50, 3 figs. Notes on development of oil engine in refrigerating plants; cost data.

Type "Y" Oil Engines, G. H. Corlette. Refrigeration, vol. 36, no. 2, Feb. 1925, pp. 48C-48H, 2 figs. Importance laid upon material which goes into make-up of engines; comparisons of cost of operating ice plants by steam, electricity and oil.

SMALL. Small Refrigerating Plants and the Thermo-dynamical Properties of Refrigerating Liquids, E. Griffiths and J. H. Awbrey. Ice and Cold Storage, vol. 28, no. 326, May 1925, pp. 118-119 and (discussion) 119-120. Describes the less generally used fluids of butane and isobutane; general considerations regarding small machines. Abstract of paper read before Brit. Cold Storage and Ice Assn.

REFRIGERATION

RESEARCH. Recent Developments in Refrigeration Research, E. Griffiths. Brit. Cold Storage and Ice Assn.—Proc., vol. 21, no. 1, 1924-1925, pp. 37-56 and (discussion) 57-62, 14 figs. on supp. plates. Study of heat-insulating materials; tests of refrigerating machinery; investigation of working of cold stores; transport.

RESERVOIRS

IMPOUNDING. The Impounding Reservoir, Its Troubles and the Remedies, H. L. Shaner. Am. Water Wks. Assn.—Jl., vol. 13, no. 5, May 1925, pp. 531-539 and (discussion) 539-543. Discusses stagnation, algae growths, carbonic acid gas, remedies, and aeration.

WALLS. Reinforced Concrete Reservoir Walls, P. Gillespie and W. B. Dunbar. Univ. of Toronto, School of Eng. Research, Bul. no. 5, 1925, pp. 87-118, 26 figs. Particulars of study which consisted in determining from plans of reservoir walls in actual existence, quantities of materials required per average foot of length; and in working out a series of designs in reinforced concrete for both plain and counterfort walls, determining quantities of materials necessary therefore per lineal foot.

RIVERS

GAUGING. The Gauging of Rivers and Tidal Currents. Engineering, vol. 119, nos. 3098 and 3099, May 15 and 22, 1925, pp. 598-600 and 631-633, 10 figs. Review of reports of committee appointed by Research Department and of its technical officer, M. A. Hogan, on experimental work carried out by Committee; conclusion is arrived at that available means are adequate to gaging both small and large rivers under practically all conditions of flow and for enabling hydrometric survey of Great Britain to be carried out; defines limits of accuracy and circumstances affecting application of various current meters and methods of using them.

ROAD MATERIALS

TEST SPECIFICATIONS. Road and Paving Materials. Am. Soc. Testing Matls.—Preprint, no. 46, for mtg., June 23-26, 1925, 9 pp., 2 figs. Report of Committee D-4. Proposed revisions of existing standard methods of test and of tentative specifications and methods of test; new method of test submitted as tentative; proposed tentative field method for determining moisture equivalent of subgrade soils.

ROADS, CONCRETE

GRIP OF TIRES ON SURFACE. The Destructive Forces in Pavements, S. B. Moore and F. A. Tondorf. Military Engr., vol. 17, no. 92, Mar.-Apr. 1925, pp. 158-159, 3 figs. Vibration set up in concrete pavements by vehicles are, for most part, at right angles to line of travel of vehicle; intensities of vibrations are function not of weight of vehicle but what may be called torsion set up in concrete by grip of tires on surface; wide tires are more destructive to surfaces that those of lesser dimensions; surfacing of roads indicates efficient breaking of grip of tires on surface and therefore reduces strains within slabs or base.

ROLLING MILLS

MAIN-ROLL DRIVES. Factors Involved in the Selection of Direct-Connected and Geared Main Roll Drives, E. A. Hurme. Iron and Steel Engr., vol. 2, no. 5, May 1925, pp. 189-211 and (discussion) 211-222, 65 figs. Sets forth collectively main fundamental factors which should be given consideration in studying subject of steel-mill main-roll drives and states briefly significance of each of these factors.

ROOFS

INSULATION. The Insulation of Roofs to Prevent Heat Loss and Condensation, W. L. Miller. Heat. and Vent. Mag., vol. 22, nos. 1 and 2, Jan. and Feb. 1925, pp. 49-51 and 67, and p. 67, 1 fig. Determination of proper thickness of insulation on any roof to prevent condensation. Gives chart for calculating, in one operation, required roof resistance for any humidity to prevent condensation, hitherto requiring separate psychrometric chart.

ROOFS

ASPHALT MATERIALS, SPECIFICATIONS. Bituminous Waterproofing and Roofing Materials. Am. Soc. Testing Matls.—Preprint, no. 47, for mtg., June 23-26, 1925, 27 pp. Report of Committee D-8. Proposed revisions of tentative methods of test; new specifications and methods of test submitted as tentative; proposed tentative specifications for acid-resisting asphalt mastic, for smooth-surfaced asphalt roll roofing, slate-surfaced asphalt roll roofing and slate-surfaced asphalt shingles; asphalt-saturated roofing felt for use in waterproofing, coal-tar saturated roofing felt, etc.; proposed methods of testing asphalt roll and asphalt shingles.

S

SCREW THREADS

MEASURING INSTRUMENTS. Zeiss Thread-Measuring Instruments. Am. Mach., vol. 62, no. 22, May 28, 1925, pp. 861-862, 5 figs. Describes several thread-measuring devices, including screw-thread micrometer caliper, thread-profile gage, optical thread caliper and toolmaker's microscope.

SEAPLANES

BLACKBURN TWIN-FLOAT. The Blackburn Twin-Float Seaplane. Flight, vol. 17, no. 19, May 7, 1925, pp. 269-272, 14 figs. Describes Blackburn "Dart" seaplane, having Napier "Lion" engine; overall length 40 ft. 2½ in., span 45 ft. 7 in., main planes 630 sq. ft.

SEMI-STEEL

CARBON ABSORPTION. Semi-Steel, J. Grennan. Foundry Trade Jl., vol. 31, no. 457, May 21, 1925, p. 426, 3 figs. Reply to paper by H. Field, published in same journal, Apr. 9, 1925, in which he refers to paper by present writer delivered before Am. Foundrymen's Assn. in 1924, disaggreeing with results found in writer's investigations.

SEWAGE DISPOSAL

ACTIVATED SLUDGE. Disposal of Excess Activated Sludge by Digestion, K. Imhoff. Eng. News-Rec., vol. 94, no. 23, June 4, 1925, pp. 936-937, 4 figs. Experiments in Ruhr district indicate return of excess sludge to preliminary 2-story tank for digestion. (Abstract.) Paper read before Am. Soc. Civ. Engrs.

SEWERS

DESIGN, CANADA. Problems of Sewer Design in Canada, A. G. Dalzell. Can. Engr., vol. 48, no. 19, May 12, 1925, pp. 475-477, 5 figs. Character of settlement of population must be studied carefully; some cities have subdivided areas too large for population; settlement follows transportation routes; engineers should direct settlement so that economical utilities may be provided.

SHAFTS

CRITICAL FREQUENCIES. Critical Frequencies in Shafts Due to Elasticity of Oil Film in Bearing (Kritische Wellenströrung infolge der Nachgiebigkeit des Oelpolsters im Lager), A. Stodola. Schweizerische Bauzeitung, vol. 85, no. 21, May 23, 1925, pp. 265-266, 2 figs. Discusses theory of semi-circular bearing, using Gümbel's results, and develops formulas for calculating critical frequency, critical number of revolutions, etc.

SLAG

OPEN-HEARTH-FURNACE. The Petrological and Chemical Examination of Slag and Metal Samples from a Basic Open-Hearth Furnace, J. H. Andrew and J. Hyslop. Roy. Tech. College — Jl., no. 1, Dec. 1924, pp. 59-66, 7 figs. Slag and metal samples, taken from basic open-hearth steel furnace working with pig and scrap process, were analyzed and slag samples examined petrologically by reflected and transmitted light.

SLATE

TESTING. Slate. Am. Soc. Testing Matls.—Preprint, no. 61, for mtg., June 23-25, 1925, 8 pp. 1 fig. Report of Committee D-16. Proposed tentative method of test for water absorption of slate, and of flexure testing of slate.

SPRINGS

HELICAL. Investigations of Bending Oscillations of Helical Springs (Untersuchung der Biegungsschwingungen von Schraubenfedern), W. Birnbaum. Zeit. für Flugtechnik u. Motorluftschiffahrt, vol. 16, no. 3, Feb. 14, 1925, pp. 74-78, 2 figs. Theory of transversal oscillations of helical springs of round-drawn or flat steel; results of experimental investigation of theory.

LEAF. Development in the Design of Automotive and Railway Leaf Springs, Jos. K. Wood. Am. Mach., vol. 62, no. 24, June 11, 1925, pp. 923-928, 13 figs. Types of failures that occur in leaf-spring practice; design defects; calculation of band stresses; various plan views and development in "nozzle" plan.

STEAM

HIGH-PRESSURE. New Method of Generating High Pressure Steam, C. Commentz. Power Plant Eng., vol. 29, no. 12, June 15, 1925, p. 644. Describes new system made public by Prof. Loeffler in Vienna; consists essentially of evaporator, which is independent of combustion chamber, and superheater which is located in combustion chamber; it is claimed system may be applied favorably not only to large power plants but also to small and medium-sized plants.

STEAM ENGINES

BLEEDER TYPE. Extraction Engines for Industrial Power Plants, F. Johnstone-Taylor. Power Plant Eng., vol. 29, no. 10, May 15, 1925, pp. 525-528, 5 figs. How considerable economy may be effected by judicious combination of power and heating loads; British extraction engines; Sulzers system; saving in fuel.

TESTING. Testing Steam Engines by Heat Balance Method, E. Ogur. Power Plant Eng., vol. 29, no. 11, June 1, 1925, pp. 591-594, 2 figs. Water rate of reciprocating engines equipped with jet condensers can be determined in few minutes.

UNIFLOW. Improvements in Uniflow Engine Design. Iron & Coal Trades Rev., vol. 110, no. 2985, May 15, 1925, pp. 796-797, 4 figs. Particulars of latest design of central-exhaust steam engine of Cole Marchant & Morley, Ltd., Bradford England.

STEAM PIPES

EXPANSION JOINTS. Expansion Joints Absorb Pipe Movement. Power Plant Eng., vol. 29, no. 11, June 1, 1925, pp. 586-589, 8 figs. Numerous conditions arise in piping work where it is advantageous to use expansion joint rather than pipe bends.

STEAM POWER PLANTS

ECONOMICAL DESIGN. Design of Steam Power Plants for Economy. Jas. A. Powell. Power Plant Eng., vol. 29, no. 12, June 15, 1925, pp. 630-633, 6 figs. Business considerations govern to great extent increased capital and fixed charges accompanying higher efficiency and greater fuel economy; study of boiler and economizer; determining proper size of economizer.

OIL REFINERY. An Oil Refinery's Power Plant. Power Engr., vol. 20, no. 231, June 1925, pp. 222-229, 15 figs. Describes system in operation at Grange-mouth "Topping" plant of Scottish Oils, Ltd.; details of boiler house and main generating sets.

POWER-PRODUCTION CONTROL. The Control of Power Production, Chas. L. Hubbard. Factory, vol. 34, no. 6, June 1925, pp. 934-938, 970, 972 and 974, 14 figs. Review of measuring sticks for management.

PULVERIZED-BONE-BURNING. Mine Plant Generates Power from Pulverized Bone, F. H. Kneeland. Coal Age, vol. 27, no. 24, June 11, 1925, pp. 865-868. 6 figs. Uses unsalable high-ash refuse with ease at power plant of U. S. Coal & Coke Co., Gary, W. Va.; obtains better results than stokers; no difficulty suffered from slagging of furnace walls or bottom.

STEAM TURBINES

BACK-PRESSURE. High Back-Pressure Turbine. Power, vol. 61, no. 21, May 26, 1925, pp. 825-826, 1 fig. Describes non-condensing turbine exhausting steam at 100-lb. pressure.

BLADES. The Design and Manufacture of Blading for Steam Turbines, L. L. Smith. Elec. Jl., vol. 22, no. 5, May 1925, pp. 202-210, 29 figs. With special reference to methods used at South Philadelphia works.

Non-Condensing. Installing Non-Condensing Turbine Lowers Factory Power Costs, F. A. Westhrook. Power, vol. 61, no. 23, June 9, 1925, pp. 896-898, 3 figs. Tells how factory conditions were analyzed and then improved by substituting 500-kw. non-condensing turbine set in place of small engine unit with purchased power and process steam direct from boiler.

Resuperheating in. The Increase in Thermal Efficiency Due to Resuperheating in Steam Turbines, W. E. Blowney and G. B. Warren. Mech. Eng., vol. 47, no. 6, June 1925, pp. 455-460 and (discussion) 460-461, 18 figs. Results of large number of tests on turbines at different superheats have been analyzed to form basis for calculating gain in thermal efficiency due to resuperheating; they show that heat consumption of turbine installation may be decreased from 6 to 7 per cent as result of resuperheating steam; effect of resuperheating upon exhaust conditions and capacity of turbine. (Abridged.)

Types. Steam Turbines for Southern Industries. South. Engr., vol. 43, no. 4, June 1925, pp. 35-52, 50 figs. Large and small turbines, kinds of turbines and their application, points pertaining to their operation and general information regarding them.

Wheel Friction. On Turbine Wheel Friction, W. Kerr. Roy. Tech. College—Jl., no. 1, Dec. 1924, pp. 103-126, 10 figs. Results of series of tests on steam friction of single-row impulse wheel, undertaken originally as preliminary to power tests.

STEEL

Carburizing. Specific Effect of Alkalies in Carburizing Compounds, H. Rodman. Am. Soc. Steel Treating—Trans., vol. 7, no. 5, May 1925, pp. 635-639, 2 figs. Results of certain laboratory tests made on various compositions of carburizing materials.

Metallurgy. Fundamentalism in Ferrous Metallurgy, B. Saklatwalla. Chem. and Industry, vol. 44, no. 21, May 22, 1925, pp. 524-527. Principle of equilibrium; ingot of steel; surface tension; alloy steels; rustless steels.

Stainless. Stainless Iron, H. S. Primrose. Metallurgist (Supp. to Engineer, vol. 139, no. 3622), May 29, 1925, pp. 74-77, 3 figs. Methods of manufacture; Hamilton-Evans process; effect of chromium on steel; physical properties; resistance to corrosion; rolling and forging; annealing; further treatment; uses; castings in mild stainless steel are being produced on commercial scale, and when descaled by sand blasting and pickling they are rustless without any polishing.

Saintless Steels for Locomotives. Ry. Engr., vol. 46, no. 544, May 1925, pp. 174-175. Advantages of stainless steel, how it is manipulated, and its utilization in locomotive service.

Standard Specifications. Steel. Am. Soc. Testing Matls.—Preprint, no. 7, for mtg. June 23-26, 1925, 21 pp., 2 figs. Recommendations affecting standards and tentative standards; structural steel for bridges, buildings and rolling stock; steel forgings and billets; tubing and pipe and pipe flanges and fittings; proposed specifications for carbon-steel car and tender axles, structural silicon steel, carbon-steel castings for valves, flanges and fittings for high-temperature service.

Static and Fatigue Tests. Typical Static and Fatigue Tests on Steel at Elevated Temperatures, T. McLean Jasper. Am. Soc. Testing Matls.—Preprint, no. 20, for mtg. June 23-26, 1925, 6 pp., 3 figs. Typical results of investigations carried out for purpose of obtaining better knowledge of factors governing static and fatigue properties of wrought ferrous metals; sustaining effect of alloying materials on strength of wrought ferrous metals at elevated temperatures is indicated; explanation giving reason for increase of ultimate strength at bluing temperature of normalized steel.

STEEL, HEAT TREATMENT OF

Carburized Objects. Heat Treatment of Iron and Steel. Am. Soc. Testing Matls. —Preprint, no. 10, for mtg. June 23-26, 1925, 7 pp., 1 fig. Proposed tentative recommended practice for carburizing and heat treatment of carburized objects.

Facts and Principles. Facts and Principles Concerning Steel and Heat Treatment, H. B. Knowlton. Am. Soc. Steel Treating—Trans., vol. 7, no. 6, June 1925, pp. 743-773, 10 figs. Explains structures and properties produced by cooling plain carbon tool steel at different speeds from above critical point; discusses different quenching media; practical advice concerning heating and quenching; process of tempering or drawing; effects of different tempering temperatures.

Gage Steel. The Heat-Treatment of Gauge Steel, F. A. Livermore. Automobile Engr., vol. 15, no. 202, May 1925, pp. 142-143, 3 figs. Account of investigation and results; deals with type of furnace, heat treatment, rate of cooling.

High-Speed Steel Dies. Heat Treatment of High Speed Steel Dies, C. B. Swander. Am. Soc. Steel Treating—Trans., vol. 7, no. 6, June 1925, pp. 727-734. Describes in detail method for hardening high-speed steel dies and circular form tools, without scaling, blistering or distorting to any marked degree; author uses tightly sealed graphite crucibles, with small amount of silica sand and charcoal in bottom, and normal hardening temperatures for high-speed steel.

Low-Carbon. Some Physical Properties of Low Carbon Steel, R. H. Smith. Am. Soc. Steel Treating—Trans., vol. 7, no. 5, May 1925, pp. 569-580, 19 figs. Tabulates and describes practical results obtained by heat treatment of low-carbon steel with accurate control of heating temperature and media of quenching; results show that tensile strength per square inch and other physical properties such as elongation, reduction of area and hardness may be accurately controlled in their relationship to each other, and may be varied over wide range by suitable quenching.

Tool Steel. The Heat Treatment of Tool Steel. Metallurgist (Supp. to Engineer, vol. 139, no. 3622), May 29, 1925, pp. 73-74, 1 fig. Review of paper by S. W. Brayshaw, read before Liverpool Eng. Soc., describing long series of experiments on heat treatment of tool steel undertaken with object of explaining variations in samples of same tool steel.

STOKERS

Chain-Grate. A New Multi-Stage Traveling Grate (Der Kaskadenrost, ein neuer, mechanisch bewegter Rost), F. Wilcke. Brennstoff- u. Wärmewirtschaft, vol. 7, no. 1, Jan. (1st no.), 1925, pp. 1-4, 3 figs. Describes a multi-stage forced draft grate with mechanical stoking for very low-grade fuels, including refuse, and also economical for higher-grade fuels.

Stoker Operation Improved by Simple Changes. Power Plant Eng., vol. 29, no. 10, May 15, 1925, pp. 529-531, 6 figs. Chain-grate stokers present problems in air and fuel distribution, arch and waterback arrangement.

Development. Higher Thermal Results in the Boiler Room, and the Relation between Efficiency and Economic Values, J. G. Worker. Engrs.' Soc. West. Pa.—Proc., vol. 41, no. 2, Mar. 1925, pp. 33-55 and (discussion), 56-80, 13 figs. Development of pulverized coal in cement industry; definite development of mechanical stoker; improvement in performance of mechanical stoker; heat losses and heat recovery; modern stoker performance curves; comparison of tests of stoker and pulverized-coal equipment.

STREET RAILWAYS

Track. Electric Railway Track Construction, H. W. Tate. Can. Engr., vol. 48, no. 17, Apr. 28, 1925, pp. 441-444, 4 figs. Methods employed by Toronto Transportation Commission in rehabilitation and new construction of street railway system. From paper read before Ont. Land Surveyors' Assn.

Ticless Track Laid in Hot Springs, Ark., G. J. Gauthier. Elec. Ry. Jl., vol. 65, no. 16, Apr. 18, 1925, pp. 615-618, 12 figs. Describes standard type of track construction adopted by Federal Light & Traction Co., using longitudinal supports for rails and monolithic concrete for subgrade and paving; maintenance costs have been reduced materially.

STRESSES

Secondary. Should We Consider Secondary Stresses? E. Godfrey. Can. Engr., vol. 48, no. 20, May 19, 1925, pp. 495-498, 2 figs. Shows that consideration and calculation of secondary stresses are needless refinements of no practical value in spite of great volume of engineering literature that is taken up with discussion of secondary stresses and extremely complex and laborious methods that are recommended and advocated for determination of these stresses.

STRUCTURAL STEEL

British and American Design. British and American Practice in Structural Steel Design, R. Fleming. Engineering, vol. 119, no. 3101, June 5, 1925, pp. 707-709. Reviews British and American practice in structural engineering from American standpoint.

SUBSTATIONS

Automatic Control of Apparatus. Automatic Control for Substation Apparatus, W. H. Millan. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 6, June 1925, pp. 588-591. Outlines some of more important problems being encountered in automatic development such as need for automatic fire protection in stations, necessary future development of thermal protective devices, voltage-regulating devices, etc. See also Power Plant Eng., vol. 29, no. 10, May 15, 1925, pp. 543-546, 3 figs.

T

TELEPHONY

Receivers. Some Acoustic Experiments with Telephone Receivers. E. Mallett and G. F. Dutton. Instn. Elec. Engrs.—Jl., vol. 63, no. 341, May 1925, pp. 502-516, 24 figs. Rayleigh disk is used to find resonant frequency and decay factor of telephone receiver under different circumstances as regards diaphragm clamping and air cavity behind diaphragm; field of sound in front of resonator tube and telephone receiver is investigated by Rayleigh disk and by device for measuring sound pressures, and direct measurements are made of overall acoustical-electrical efficiency of telephone receiver.

Transmission Maintenance. Telephone Transmission Maintenance Practices, Wm. H. Capen. Elec. Communication, vol. 3, no. 4, Apr. 1925, pp. 246-266, 22 figs. Considers principal factors which are detrimental to telephone transmission, including their causes and effects and discusses some typical testing methods which have been developed to locate defects; describes testing apparatus designed for use with these methods, and method of operation; points out necessity for economic consideration of application of these methods, and includes brief discussion of factors involved. References.

Transmission Unit. Telephone Transmission Unit. F. B. Jewett. Elecn., vol. 94, no. 2452, May 15, 1925, pp. 562-563. What units are must first be determined; difference in "conventions"; experience with *TU* satisfactory.

TERMINALS, LOCOMOTIVE

Running Repair Practice. Assignment of Locomotives for Enginehouse Repairs. Ry. Mech. Engr., vol. 99, no. 6, June 1925, pp. 325-330, 11 figs. Reorganized forces and co-operation increase efficiency of Lehigh Valley engine terminals; enginehouse organization; terminal inspection and maintenance records; scheduling heavy repairs; employee relations.

Turntables. Simple Change Converts Turntable to Three-Point Type, David J. Jones. Ry. Age, vol. 78, no. 25, May 23, 1925, pp. 1273-1274, 3 figs. Changes made in order to handle mountain-type locomotives in satisfactory manner; principal feature of plan was provision for use of high-duty roller bearings.

TESTS AND TESTING

Methods. Methods of Testing. Am. Soc. Testing Matls.—Preprint, no. 3, for mtg. June 23-26, 1925, 43 pp., 17 figs. Report of Committee E-1. Subcommittee reports on mechanical testing, classification of material according to size, impact testing, water determination; proposed methods of flexure testing of metallic materials; torsion tests to determine mechanical properties of metallic materials under shearing stress; etc.

THERMOCOUPLES

Small-Plant Temperature Measurement. Thermocouple Easily Made for Small Plant Temperature Measurement, Chas. E. Colhorn. Power, vol. 61, no. 22, June 2, 1925, pp. pp. 873-874, 2 figs. Determinations of superheat temperatures in smaller plants are seldom made regularly because of difficulties and cost connected with average temperature-measuring equipment; describes comparatively cheap, easily made and accurate device.

TIDAL POWER

Utilization. Tidal Power (La houille bleue), A. de Rouville. Revue Industrielle, vol. 55, nos. 2187, 2188 and 2189, Feb., Mar. and Apr., 1925, pp. 49-58, 107-115 and 150-153, 8 figs. Discusses various methods of utilizing power of waves and tides; practical possibilities appear to be limited to development of tidal power by installations of basin type; details of Aber Vrac'h tidal-power station; Decœur cycle of working; refers to number and complexity of tables and charts which must be prepared before it is possible to determine working conditions and practical utility of tidal-power development; most favorable sites for stations in France.

TIME STUDY

Installing Systems of. Installing Time Study Systems, A. Caddie. Can. Machy., vol. 33, nos. 17 and 18, Apr. 23 and 30, 1925, pp. 13-16, and 16-17 and 40-42, 6 figs. Time Study Division of Int. Harvester Co. advances solution to problem of reducing production cost and satisfying labor's demands.

TOLERANCES

Unilateral and Bilateral. Unilateral and Bilateral Tolerances as Applied to Interchangeable Manufacture, H. W. Bearce. Mech. Eng., vol. 47, no. 6, June 1925, pp. 485-487, 1 fig. Discusses two-tolerance systems and their application to standard-hole and standard-shaft practices.

TRANSFORMERS

Calculation. The Calculation of Transformers, H. Bohle. Electrician, vol. 94, nos. 2448, 2449 and 2450, Apr. 17, 24 and May 1, 1925, pp. 448-449 and 459; 478-479 and 487; and 512-513; 8 figs. A compromise between mathematics and engineering; describes a "short road" method.

Operation. Operation of Converting Apparatus, V. E. Johnson. Power Plant Eng., vol. 29, nos. 3, 5, 7 and 10, Feb. 1, Mar. 1, Apr. 1 and May 15, 1925, pp. 193-195, 9 figs.; 285-290, 10 figs.; 390-394, 23 figs.; and 541-543, 3 figs. Feb. 1 and Mar. 1: Transformers, their theory, operation, method of connecting, and regulation. Apr. 1: Principle of auto-transformer; methods of connecting to circuits used in commercial practice. May 15: Changing frequency of alternating currents.

TUBES

Brass and Copper, Manufacture. The Manufacture of Brass and Copper Tubes, G. Evans. Metal Industry (Lond.), vol. 26, no. 21, May 22, 1925, pp. 503-505, 3 figs. Various points in general managerial organization of works, including such problems as works layout.

TUNNELS

WINDSOR-DETROIT. Proposed Windsor-Detroit Traffic Tunnel. Can. Engr., vol. 48, no. 23, June 9, 1925, pp. 559-560, 3 figs. Notes on scheme for tunnel under Detroit River, proposed by Gore, Nasmith & Storrie, Toronto, which includes provision for two tubes and spiral roadways at each end for motor cars; tunnel avoids long approaches and costs less to build than bridge.

TURBO-ALTERNATORS

BALANCING. Static and Dynamic Balancing of Alternator Rotors, C. Sylvester. Elec. Times, vol. 67, no. 1751, May 7, 1925, p. 559, 3 figs. Points out defects of static method and describes rough and ready method of dynamic balancing on site.

TURBO-GENERATORS

COOLER PERFORMANCE. Numerical Determination of Rotary Cooler Operation in Turbo-Generators (Rechnerische Erfassung des Ringlaufkühlerbetriebes bei Turbogeneratoren), G. Kleiner. Elektrotechnische Zeit., vol. 46, no. 14, Apr. 2, 1925, pp. 491-498, 2 figs. Numerical calculation of recooling of hot air from turbo-generators; develops new formulas which permit comparison of cooler performances as well as accurate calculation of temperatures with change of operating conditions.

V

VALVES

REDUCING. The Thermodin Reducing Valve. Engineering, vol. 119, no. 3097, May 8, 1925' p. 568, 2 figs. With valve designed by G. Dikkers & Co., Holland, it is claimed that considerable variation in steam consumption can take place without appreciable variation in pressure, and that, at same time this valve will respond to very small pressure differences.

VARNISHES

TESTS. Tests for Hardness, Gloss, Color and Levelling of Varnishes, A. H. Pfund. Am. Soc. Testing Matls.—Preprint, no. 48, for mtg., June 23-25, 1925, 11 pp., 5 figs. Describes instruments for testing varnishes.

VENTILATION

HOT INDUSTRIES. Ventilation in Hot Industries, C. P. Yagloglou. Fuels and Furnaces, vol. 3, no. 6, June 1925, pp. 569-575, 1 fig. Deals with ventilation in hot industrial operations, such as are encountered in foundries, steel mills, and tin and glass works. Results of investigations made by Research Lab. of Am. Soc. Heat. and Vent. Engrs. in co-operation with U. S. Bur. Mines and U. S. Pub. Health Service, and extent to which laboratory findings can be applied in solution of actual ventilation problems, with practical illustrations.

W

WAGES

INTERNATIONAL COMPARISON OF. An International Comparison of Engineering Wages. Engineering, vol. 119, nos. 3096 and 3097, May 1 and 8, 1925, pp. 351 and 564-565. Comparison of purchase power of wages in engineering industries, competitive value of wages.

MINIMUM-WAGE LAWS. The Minimum Wage, T. Brauer. Int. Labour Rev., vol. 11, no. 5, May 1925, pp. 682-700. Different types are classified according as their object is to secure minimum subsistence, minimum of need, or minimum of comfort; distinguishes between two methods of establishing minimum wages: direct method—fixing by law, and indirect method—fixing by agreement which is subsequently given force of law.

WATER METERS

TESTING. Practical Suggestions for Testing Water Meters, J. L. Ford. Fire and Water Eng., vol. 77, no. 16, Apr. 22, 1925, pp. 797-798 and 866-867, 4 figs. Two general methods are employed; advisable to test meter under at least two rates of flow; tested singly or in series.

WATER PIPES

CAST IRON. Why Do Cast Iron Water Mains Break? Contract Rec., vol. 39, no. 20, May 20, 1925, pp. 493-494. Of the several reasons for failure of iron pipe, vibration from street traffic is most prevalent; rarely is any inherent defect in pipe responsible for break.

WATER POWER

CANADA. Available Water Power Resources of Dominion. Power House, vol. 18, no. 8, Apr. 20, 1925, pp. 34-36. Information based on systematically collated data from federal, provincial and private sources, figures representing minimum possibilities.

COST AFFECTED BY RATE OF INTEREST. How Cost of Money Increases Cost of Power, H. E. M. Kensit. Power House, vol. 18, no. 9, May 5, 1925, pp. 23-24. Explains why advance of 1 per cent in rate of interest increases cost of power at switchboard 17.2 per cent.

MUSCLE SHOALS POSSIBILITIES. Power Possibilities at Muscle Shoals, Alabama, S. S. Wyer. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 6, June 1925, pp. 571-578, 3 figs. Presents basic facts pertaining to whole Muscle Shoals situation in a way that layman can make his own evaluation of what Muscle Shoals is, and what has and can be done.

WATER SUPPLY

METERING. Save Millions of Gallons of Water Each Day, C. Bradshaw. Power House, vol. 18, no. 8, Apr. 20, 1925, pp. 23-26. Analysis of benefits of metering water supplies and their relation to huge expenditures at present confronting Toronto and other cities in Dominion for plant extensions; cities with 100-per cent metered services report phenomenally low per capita consumption.

WEIRS

FLOW OVER. The Flow Over a Weir (Der Ueberfall über ein Wehr), A. Lauck. Zeit. für Angewandte Mathematik u. Mechanik, vol. 5, no. 1, Feb. (2d no.), 1925, pp. 1-16, 16 figs. Discusses mathematical treatment of calculation of flow, solutions hitherto attempted, and gives new method of calculation.

WELDING

AUTOGENOUS. *See Autogenous Welding.*

OXYACETYLENE. *See Oxyacetylene Welding.*

WIND POWER

PLANTS. Wind Power Plants (Om Vindkraftanlaeg), I. F. Johansen. Tekniske Forenings Tidsskrift, vol. 49, no. 5, May 1, 1925, pp. 81-91, 6 figs. Methods of using wind power; wind as driving power of sailing ships; wind mills, their construction and application in electric power production.

WIND TUNNELS

VARIABLE-DENSITY. The Comparison of Well-Known and New Wing Sections Tested in the Variable Density Wind Tunnel, Geo. J. Higgins. Nat. Advisory Committee for Aeronautics—Tech. Notes, no. 219, May 1925, 13 pp., 20 figs. on supp. plates. Tests on three groups of airfoils in Variable Density Wind Tunnel of Nat Advisory Committee for Aeronautics; representation and discussion of results, which show great value of this type of wind tunnel for gaining information about wing sections valuable for use in aeronautical practice.

WINDING ENGINES

ELECTRIC. An Electrically-Driven Colliery Winding Plant. Elec. Rev., vol. 96, no. 2477, May 15, 1925, pp. 779-781, 8 figs. Fife Coal Co.'s Mary pit.

STEAM. Steam Winding Equipment. Colliery Eng., vol. 2, no. 15, May 1925, pp. 219-221, 3 figs. New winding engine of Wigan Coal & Iron Co., West Lehigh, Eng., is of horizontal cross-coupled type, with Galloway-Pilling patent drop-piston valves for both steam and exhaust; designed to raise 4 tons of coal per wind from depth of 650 yd. in 48 sec.

WINDOWS

FACTORY, DESIGN AND CONSTRUCTION. Windows: Tools of Production, K. D. Hamilton. Factory, vol. 34, no. 6, June 1925, pp. 920-924, 958, 960 and 962, 11 figs. What plant engineering for 11 "Walkover" factories has proven as to design, choice of materials, and construction.

WIRE

COPPER, TWIST TEST. Some Notes on the Twist Test, C. Blazey. Metal Industry (Lond.), vol. 26, no. 22, May 29, 1925, pp. 529-531, 21 figs. Discusses nature of grain distortion produced by twist test common for copper wire, and presents observations showing how this special type of distortion can be revealed by etching.

STEEL. Theory and Practice of Steel-Wire Manufacture (Aus Theorie und Praxis der Stahldraht-Herstellung), A. Pomp. Stahl u. Eisen, vol. 45, no. 21, May 21, 1925, pp. 777-785 and (discussion) 785-786, 26 figs. partly on supp. plates. Historical review; "soft" steel wires, their properties, workability and structure, hardening capacity and defects; hard steel wires, their properties and structure, influence of furnace temperature, lead-bath temperature, etc.; defects and their detection.

WIRE DRAWING

MACHINES. Compact Wire-Drawing. Iron Age. vol. 115, no. 23, June 4, 1925, p. 1645, 2 figs. Self-contained machine with individual motor drive and safety-stop device.

WOODWORKING MACHINERY

LUBRICATION. Automatic Lubrication in Wood-working Machines (Le graissage automatique dans les machines à bois), P. Martinet. Revue Industrielle, vol. 55, no. 2189, Apr. 1925, pp. 160-164, 4 figs. Application of lubrication system to log-cutting saws.

WORKMEN'S COMPENSATION

DEFERRED PENSIONS. Compensation for Disablement by Deferred Pensions, F. Hool. Int. Labour Rev., vol. 11, no. 5, May 1925, pp. 659-664. Author suggests that in cases where disablement is less than 15 per cent, lump-sum compensation should be treated as single premium for deferred pension payable to disabled man at age of 50, or to his heirs if he dies before this age.

LEGISLATION. A Review of Workmen's Compensation, L. Frost. Colliery Guardian, vol. 129, nos. 3354 and 3355, Apr. 9 and 17, 1925, pp. 886, and 947-948, 2 figs. Evolution of present British law; fatal accidents; total and partial incapacity; insurance and premiums; comparisons of German, French and Belgian legislation; bearing of compensation on accidents; prevention of accident; industrial disease. Paper read before East of Scotland Min. Students' Assn.

WROUGHT IRON

STANDARD SPECIFICATIONS. Wrought Iron. Am. Soc. Testing Matls.—Preprint, no. 8, for mtg. June 23-26, 1925, 7 pp. Subcommittee reports on tubes and pipe, staybolt and engine-bolt iron, methods of chemical analysis, and research.

X

X-RAYS

HOT-CATHODE TUBES. Modern X-Ray Tube Development, Wm. D. Coolidge. Franklin Inst.—Jl., vol. 199, no. 5, May 1925, pp. 619-648, 16 figs. Deals principally with physical principles involved in hot-cathode (Coolidge) type of X-ray tube and with factors which most strongly influence characteristics and behavior of such tubes.

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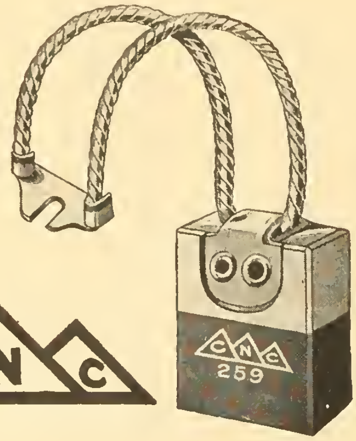

C N C

UNIFORMITY

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Control specifications developed in our Research Laboratory for the manufacture, testing and inspection of National Grade 259 make this uniformity a guaranteed certainty.

Unceasing vigilance in the selection of material and in every manufacturing process is exercised to maintain this high degree of control.

A demonstration will convince you that C. N. C. Brush Grade 259 is unsurpassed for every purpose where such a brush can be used

National Pyramid Brushes

CANADIAN NATIONAL CARBON COMPANY LIMITED

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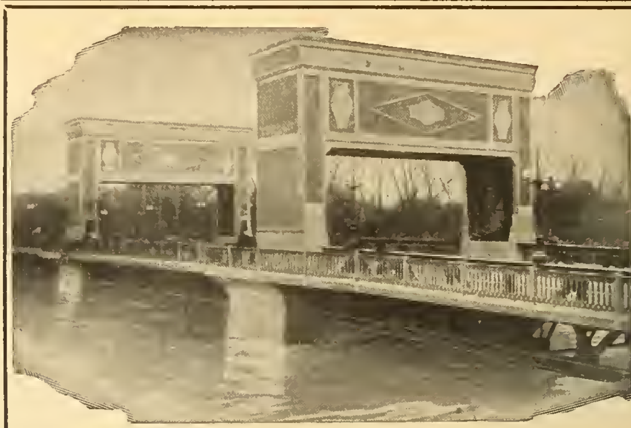
Warehouses: Toronto, St. Boniface, Man., Montreal.



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COUNTERWEIGHTS CONCEALED
OSBORNE ST. BRIDGE, WINNIPEG.

Strauss Bridges have been developed for every requirement of navigation and land traffic, as evidenced in scores of **Strauss** bridges built in **Canada,** the **United States** and **Abroad.**

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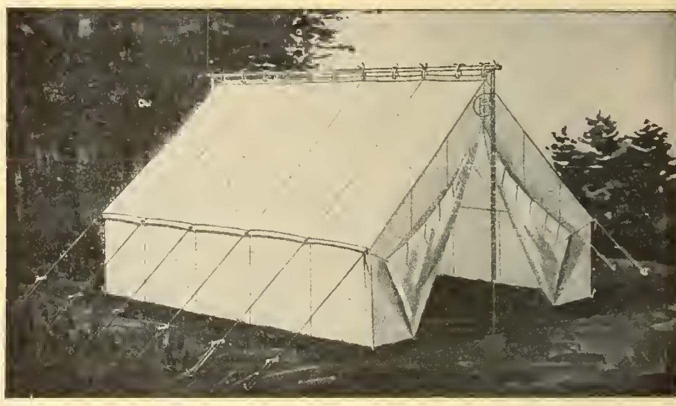
GRANT, HOLDEN, GRAHAM, Ltd.



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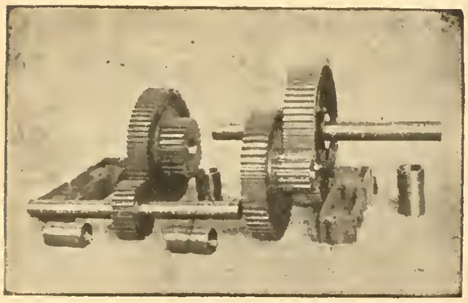
Hardened Steel Cut Gears



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Hamilton Gear & Machine Co.
76 Van Horne St. TORONTO

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- Snow Plows for attaching to Motor Trucks.
- Municipal Castings (Iron and Brass)
- Structural Steel
- Boilers and Steel Plate Work
- Iron and Steel Forgings
- Steel Tanks of every description
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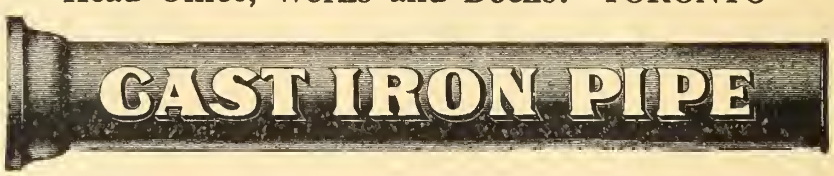
The Vulcan Iron Works, Limited,
WINNIPEG, MAN.

NATIONAL IRON CORPORATION, Limited

Head Office, Works and Docks:—TORONTO



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HAMILTON, CANADA

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PONT-A-MOUSSON


NATURE'S POWER FOR INDUSTRY


CAST IRON PIPE

Purchaser's Classified Directory

A Selected List of Equipment, Apparatus and Supplies

For Alphabetical List of Advertisers see page 62

A

Acetylene:
Dominion Oxygen Co., Ltd.

Acids:
Nichols Chemical Co., Ltd.

Acid Towers:
Horton Steel Works Ltd.

Agitators:
Horton Steel Works Ltd.

Air Brakes:
Canadian General Electric Co., Ltd.

Air Compressors:
Lancashire Dynamo and Motor Co. of Can. Ltd.

Air Coolers:
Laurie and Lamb.

Air Hose Clamps:
Knox Mfg. Co.

Air Hose Couplings:
Knox Mfg. Co.

Air Receivers:
Horton Steel Works Ltd

Air Valves, Throttle:
Knox Mfg. Co.

Alumina Sulphate:
Nichols Chemical Co., Ltd.

Ammonia Controlled Water Regulators:
Riley Engineering & Supply Co. Ltd.

Ammonia Valves and Fittings
Crane Ltd.

Anchorage Equipment:
Canadian Line Materials, Ltd

Angle Bars:
British Empire Steel Corp., Ltd.

Angles:
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.

Arches, Flat Suspended:
Combustion Engineering Corp., Ltd.
Riley Engineering and Supply Co., Ltd.

Asbestos Products:
Canadian Johns-Manville Co., Ltd.

Asphalt:
Imperial Oil Ltd.

Asphalt Flooring:
Geo. W. Reed & Company

Ash Handling Equipment:
Combustion Engineering Corp., Ltd.
Link-Belt Ltd.

Automatic Air Valves:
Jenkins Bros., Ltd.

Automatic Underfeed Stokers:
Combustion Engineering Corp., Ltd.
Riley Engineering and Supply Co., Ltd.
Taylor Stoker Co., Ltd.

B

Baffle Walls:
Canadian Johns-Manville Co., Ltd.

Bale Ties:
British Empire Steel Corp., Ltd.

Balls, Chromang Grinding:
William Kennedy & Sons, Ltd.

Balls, Steel:
Openshaw & Bennet Ltd.

Barbed Wire:
British Empire Steel Corp., Ltd.

Barking Drums:
Horton Steel Works Ltd.

Bars, Reinforcing:
Algoma Steel Corp., Ltd.
British Empire Steel Corp., Ltd.
Burlington Steel Co., Ltd.
Steel Co., of Canada, Ltd.

Bars, Steel & Iron:
Burlington Steel Co., Ltd.
Steel Co., of Canada Ltd.

Beams:
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.

Bearings, Ball:
Openshaw & Bennet, Ltd.
N. Slater Co., Ltd.

Belting:
Jones and Glassco, Regd.

Bending Machines:
John Bertram & Sons Co., Ltd.,

Billets, Blooms and Slabs:
British Empire Steel Corp., Ltd.

Bins:
Horton Steel Works Ltd.

Blankets:
Grant-Holden-Graham, Ltd.

Blowers, Centrifugal:
De Laval Steam Turbine Co.

Blue Print Machinery:
Montreal Blue Print Co.

Boiler Feed Water Controllers:
Riley Engineering and Supply Co., Ltd.

Boilers:
Combustion Engineering Corp., Ltd.
Wm. Hamilton Co. Ltd.
E. Leonard & Sons, Ltd.
Mussens Limited.

Boilers, Electric:
Dominion Engineering Works, Ltd.

Boilers, Heating:
Combustion Engineering Corp., Ltd.
E. Leonard & Sons, Ltd.
Taylor Stoker Co., Ltd.

Boilers, Marine:
Combustion Engineering, Corp., Ltd.

Boilers, Portable:
E. Leonard & Sons, Ltd.

Boilers, Return Tubular:
Babcock-Wilcox & Goldie-McCulloch Ltd.
E. Leonard & Sons, Ltd.

Bolts:
British Empire Steel Corp., Ltd
N. Slater Co., Ltd.
Steel Co., of Canada, Ltd.

Bonds, Rail:
Dominion Insulator & Mfg. Co., Ltd.

Boring and Turning Mills:
John Bertram & Sons Co., Ltd.,

Boxes, Valve:
Jenkins Bros., Ltd.

Brass, Sheets, Rods, Tubes:
Openshaw & Bennet Ltd.

Brick Calcine:
Canadian Johns-Manville Co., Ltd.

Bridge Designs and Engineering Services:
Strauss Bascule Bridge Co.

Bridges, Steel:
Canadian Bridge Co., Ltd.
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.

Broadcasting Equipment:
Northern Electric Co., Ltd.

Buckets, Clamshell:
F. H. Hopkins & Co., Ltd

Buckets, Grab:
F. H. Hopkins & Co., Ltd.

Buckets, Orange-peel:
F. H. Hopkins & Co., Ltd.

Bucket Loaders:
Link-Belt Ltd.
Mussens Ltd.

Builders Supplies:
Jno. E. Russell Co., Ltd.

Building Papers:
Barrett Co., Ltd.

Buildings, Steel:
Canadian Bridge Co., Ltd.
Combustion Engineering Corp., Ltd.
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.

Bus-Supports:
Canadian Line Materials, Ltd.

C

Canvas Goods:
Grant-Holden-Graham, Ltd.

Car Dumpers:
Link-Belt Ltd.

Car Equipment Specialties:
Dominion Insulator & Mfg. Co. Ltd.

Car Pullers:
Link-Belt Ltd.

Car Steps, Safety:
Irving Iron Works Co.

Car Wheels, Chilled Iron.
Canada Iron Foundries, Ltd.

Cars, Dump:
Clare Osborn Ltd.
F. H. Hopkins & Co., Ltd.
Mussens Ltd.

Casements, Steel:
Can. Metal Window & Steel Products, Ltd.
Trussed Concrete Steel Co., of Canada, Ltd.

Castings:
Babcock-Wilcox & Goldie-McCulloch Ltd.
William Kennedy & Sons, Ltd.

Castings, Brass:
N. Slater Co., Ltd.
Superheater Co., Ltd.

Castings, Iron:
Canada Iron Foundries, Ltd.
Dominion Engineering Works, Ltd.
Gartshore-Thomson Pipe and Foundry Co., Ltd.
Wm. Hamilton Co. Ltd.
E. Leonard & Sons, Ltd.
Superheater Co., Ltd.

Catenary Materials:
Canadian Line Materials, Ltd.
Dominion Insulator & Mfg., Co. Ltd.
N. Slater Co., Ltd.

Cement, Dealers:
Jno. E. Russell Co., Ltd.

Cement, High Temperature:
Canadian Johns-Manville Co., Ltd.

Cement, Manufacturers:
Canada Cement Co., Ltd.

Chain Grate Stokers:
Babcock-Wilcox & Goldie-McCulloch Co., Ltd.
Riley Engineering and Supply Co., Ltd.

Chains:
Link-Belt, Ltd.

Chains, Silent:
Jones and Glassco, Regd.
Link-Belt Ltd.

Channels:
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co., Ltd.

Chemist, Industrial:
Milton Hersey Co., Ltd.

Chimneys:
Combustion Engineering Corp., Ltd.
Horton Steel Works, Ltd.

Chip Tanks:
Horton Steel Works, Ltd.

Circuit Breakers:
Dominion Engineering Agency, Ltd.

Clamps, Double Bolt:
Knox Mfg. Co.

Clamps, High Pressure Hose:
Knox Mfg. Co.

Clamps, Rock Drill:
Knox Mfg. Co.

Clamps, Sectional:
Knox Mfg. Co.

Clamps, Single Bolt:
Knox Mfg. Co.

Coal:
British Empire Steel Corp., Ltd.

Coal Handling Equipment:
Combustion Engineering Corp., Ltd.
Dominion Bridge Co. Ltd.
Link-Belt, Ltd.
Mussens Limited.

Coke:
British Empire Steel Corp., Ltd.

Combustion Control System:
Riley Engineering and Supply Co., Ltd.

Compressors:
Babcock-Wilcox & Goldie-McCulloch Co., Ltd.
Combustion Engineering Corp., Ltd.
General Supply Co., of Canada, Ltd

Compressors, Air:
Canadian Westinghouse, Co., Ltd
Lancashire Dynamo and Motor Co. of Can. Ltd.
Mussens Limited.

Compressors, Ammonia:
Taylor Stoker Co., Ltd.

Compressors, Centrifugal.
De Laval Steam Turbine Co.

Concrete Armouring, Surface:
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Concrete Mixers:
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General Supply Co., of Canada, Ltd.
F. H. Hopkins & Co., Ltd.
Mussens Ltd.

Condensers, Synchronous & Static:
Canadian General Electric Co., Ltd.
Griswold & Co., Ltd.
Lancashire Dynamo and Motor Co. of Can. Ltd.

Conduit, Telephone Cable:
Pacific Coast Pipe Co. Ltd.

Conduit, Underground Fibre:
Canadian Johns-Manville Co., Ltd.

Conduit, Underfloor Duct:
Canadian Johns-Manville Co., Ltd.

Connecting Rods:
British Empire Steel Corp., Ltd.

Construction Material Electrical:
Northern Electric Co., Ltd.
N. Slater Co., Ltd.

Contractors:
E. G. M. Cape & Co.
Randolph MacDonald Co., Ltd.
D. P. Robinson & Co. Inc.

Contractors' Plant and Supplies:
Clare Osborn, Ltd.
F. H. Hopkins & Co., Ltd.
Mussens Limited.

Contractors' Pumps:
De Laval Steam Turbine Co.

Controllers, Electric:
Canadian Westinghouse Co. Ltd.

Conveyors:
Combustion Engineering Corp., Ltd.
Link-Belt Ltd.

Conveyors, Portable Belt:
Link-Belt Ltd.
Mussens Ltd.

Copper, Sheets, Rods, Tubes:
Openshaw & Bennet, Ltd.

Couplings, Air Hose:
Knox Mfg. Co.

Couplings, High Pressure Hose:
Knox Mfg. Co.

Couplings, Rock Drill:
Knox Mfg. Co.

Couplings, Steam Hose:
Knox Mfg. Co.

Couplings, Suction Hose:
Knox Mfg. Co.

Cranes:
Babcock-Wilcox & Goldie-McCulloch Ltd.
Combustion Engineering Corp., Ltd.
F. H. Hopkins & Co., Ltd.
Link-Belt Ltd

Cranes, Locomotives:
Clare Osborn, Ltd.
F. H. Hopkins & Co., Ltd.
Link-Belt, Ltd.
Mussens Ltd.

Cranes, Travelling:
Dominion Bridge Co., Ltd.

Creosote Oils:
Barrett Co., Ltd.

Cross Arm Braces:
Burlington Steel Co., Ltd.
N. Slater Co., Ltd.

Crushed Stones:
Jno. E. Russell Co., Ltd.

Crushers, Jaw, Gyratory, Stone:
Combustion Engineering Corp., Ltd.
F. H. Hopkins & Co., Ltd.

Culvert Pipe:
Gartshore-Thomson Pipe and Foundry Co., Ltd.
Jno. E. Russell Co., Ltd.

Cutters, Milling:
Pratt & Whitney Company of Canada, Ltd.

Cutting off Machines:
John Bertram & Sons Co., Ltd

D

Damper Regulation:
Riley Engineering & Supply Co. Ltd.

Dampproof Coating:
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Derricks:
F. H. Hopkins & Co., Ltd.
Mussens Ltd.

Die Screw Plates:
Pratt & Whitney Company of Canada, Ltd.

Dies:
Pratt & Whitney Co., of Canada, Ltd.
N. Slater Co., Ltd.

Digesters:
Horton Steel Works, Ltd.

Doors, Fireproof:
Mussens Limited.
N. Slater Co., Ltd.

Dredges:
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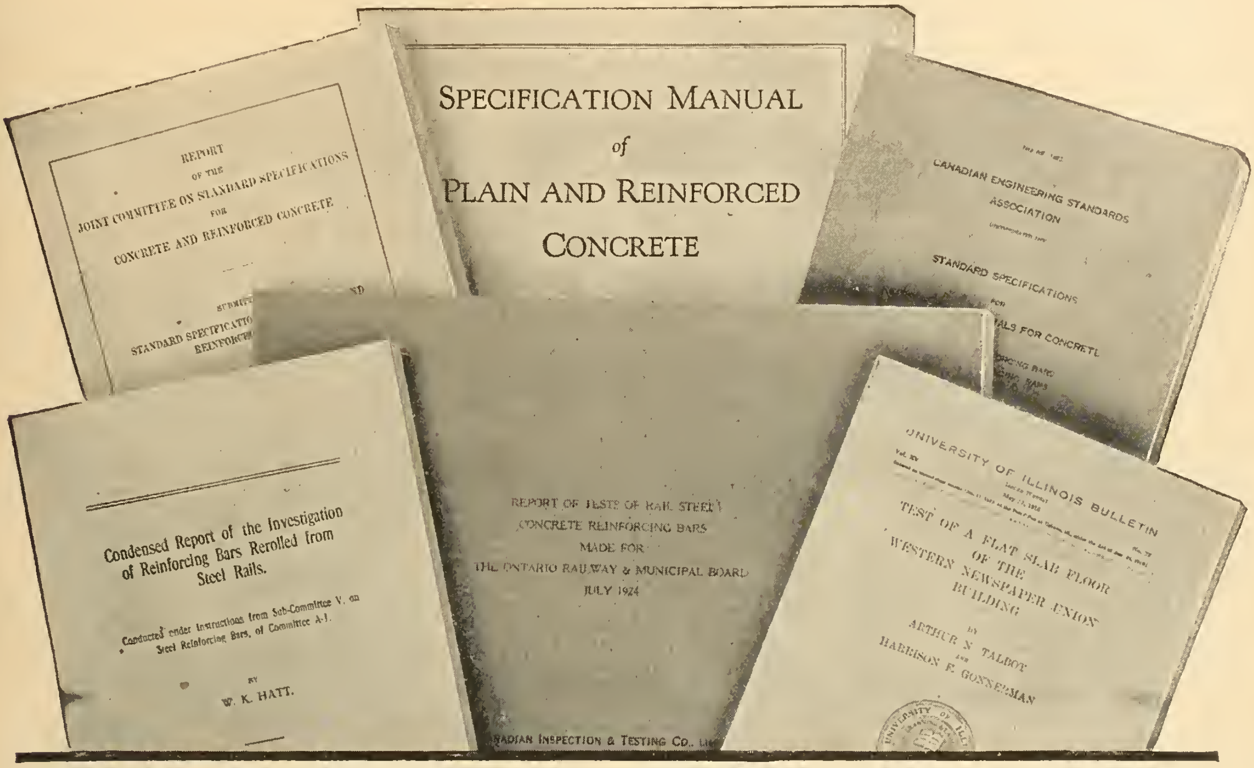
F. H. Hopkins & Co., Ltd.

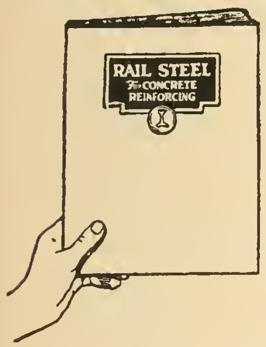
Drills:
Pratt & Whitney Company of Canada, Ltd.

Drilling Machines, Metal:
John Bertram & Sons Co., Ltd

Drill Sharpeners:
Lancashire Dynamo and Motor Co. of Can. Ltd.

BURLINGTON STEEL COMPANY LTD.
HAMILTON, Canada





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E

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- Combustion Engineering Corp., Ltd.
- General Supply Co., of Canada

Electric Control Gear:
- George Ellison.

Electric Motors:
- Lincoln Electric Co., of Canada, Ltd.

Electric Switch Gear:
- George Ellison.

Electric Welders:
- Lincoln Electric Co., of Canada, Ltd.

Electrical Appliances:
- Northern Electric Co. Ltd.

Electric Railway Car Couplers:
- Dominion Insulator & Mfg. Co., Ltd.

Electrical Supplies:
- Northern Electric Co., Ltd.

Enamels, Acid & Fume Resisting:
- Dominion Paint Works, Ltd.

Enamels, Industrial Lighting:
- Dominion Paint Works, Ltd.

End Mills:
- Pratt & Whitney Company of Canada, Ltd.

Engines, Gas and Oil:
- Canadian Fairbanks-Morse Co. Ltd.
- Combustion Engineering Corp., Ltd.

Engines, Steam:
- Babcock-Wilcox & Goldie-McCulloch Ltd.
- Combustion Engineering Corp., Ltd.
- Laurie and Lamb.
- E. Leonard & Sons, Ltd.
- Riley Engineering and Supply Co., Ltd.

Excavators:
- Mussens Limited.
- F. H. Hopkins & Co., Ltd.

Excavators, Dragline:
- F. H. Hopkins & Co., Ltd.
- Link-Belt Ltd.

Exhaust Steam Injectors, Locomotive:
- Superheater Co., Ltd.

F

Fan Engine Regulators:
- Riley Engineering & Supply Co. Ltd.

Feed-Water Heaters, Locomotive:
- Superheater Co., Ltd.

Fence Posts, Steel:
- Burlington Steel Co., Ltd.

Files:
- Simonds Canada Saw Co. Ltd.

Fillers, Wood and Metal:
- Dominion Paint Works, Ltd.

Fire Alarm Apparatus:
- Northern Electric Co., Ltd.

Fire-Doors:
- Geo. W. Reed & Company

Floor Stands:
- Jenkins Bros., Ltd.

Flange Couplings:
- Cumberland Steel Co.

Flanges, Companion:
- Jenkins Bros., Ltd.

Files, Valve:
- Jenkins Bros., Ltd.

Flooring, Fireproof:
- Irving Iron Works Co.

Flooring, Open Steel:
- Irving Iron Works Co.

Flooring, Steel:
- Irving Iron Works Co.

Flooring, Non-Slipping:
- Irving Iron Works Co.

Flooring, Ventilating:
- Irving Iron Works Co.

Floors, Monolithic:
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- British Empire Steel Corp., Ltd.
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- N. Slater Co., Ltd.

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Furnaces, Automatic:
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G

Galvanizing, Hot Dip:
- N. Slater Co., Ltd.

Gasoline:
- Imperial Oil, Ltd.

Gasoline Storage Tanks:
- Horton Steel Works, Ltd.

Gauges:
- Pratt & Whitney Co., of Canada, Ltd.

Gear Reductions:
- Hamilton Gear & Machine Co.

Gears:
- Combustion Engineering Corp., Ltd.
- Hamilton Gear & Machine Co.
- Link-Belt, Ltd.

Gears, Machine Cut:
- Jones and Glassco, Regd

Gears, Double Helical:
- De Laval Steam Turbine Co.

Gears Reduction:
- De Laval Steam Turbine Co.

Generators:
- Canadian General Electric Co., Ltd.
- Canadian Westinghouse Co.Ltd.
- Griswold & Co., Ltd.
- Lancashire Dynamo and Motor Co. of Can. Ltd.

Gold pans:
- Horton Steel Works, Ltd.

Grab Buckets:
- Link-Belt Ltd.
- Mussens Limited.

Grating, Steel:
- Irving Iron Works Co.

Gratings, Area, Sidewalk:
- Irving Iron Works Co.

Grease Extractors:
- Riley Engineering and Supply Co., Ltd.

Ground Joints Unions:
- Dart Union Co., Ltd.

Ground Shafting:
- Cumberland Steel Co.

Gauges — Draft:
- Riley Engineering and Supply Co., Ltd.

Guards, Truck Radiator:
- Irving Iron Works Co.

H

Hammers, Steam:
- John Bertram & Sons Co., Ltd.,

Hangers:
- Link-Belt Ltd.

Hangers, Door:
- N. Slater Co., Ltd.

Headlights, Electric Railway:
- Dominion Insulator & Mfg. Co., Ltd.

Heat Exchangers:
- Riley Engineering and Supply Co., Ltd.

Heaters, Boiler Feed-Water:
- Babcock-Wilcox & Goldie-McCulloch Ltd.
- Combustion Engineering Corp., Ltd.
- Riley Engineering and Supply Co., Ltd.

Heating Material:
- Crane Ltd.

Hobs:
- Pratt & Whitney Company of Canada Ltd.

Hoisting Engines:
- Clare Osborn, Ltd.
- F. H. Hopkins & Co., Ltd.
- Lancashire Dynamo and Motor Co. of Can. Ltd.
- Mussens Ltd.

Hoists, Electric:
- Lancashire Dynamo and Motor Co. of Can. Ltd.
- Link-Belt Ltd.
- Taylor Stoker Co., Ltd.

Hoists, Hydraulic:
- Combustion Engineering Corp., Ltd.

Hoists, Mono-Rail:
- Link-Belt Ltd.
- Taylor Stoker Co., Ltd.

Hose Couplings, High Pressure:
- Knox Mfg. Co.

Hydraulic Press Control Systems:
- Taylor Stoker Co., Ltd.

Hydraulic Turbines:
- Boving Hydraulic & Engineering Co.
- Dominion Engineering Works, Ltd.
- General Supply Co., of Can. Ltd.
- Wm. Hamilton Co. Ltd.

I

Industrial Electric Control:
- Canadian General Electric Co., Ltd.
- Dominion Engineering Agency, Ltd.

Insulated Rail Joints, Continuous:
- Rail Joint Co., of Canada, Ltd.

Insulation, Steam Pipe Casing:
- Pacific Coast Pipe Co. Ltd.

Insulation, Underground Systems:
- Canadian Johns-Manville Co Ltd.

Insulators, Porcelain:
- Dominion Insulator & Mfg., Co. Ltd.

J

Joints, Filler Paving:
- Barrett Co., Ltd.

K

Kerosene:
- Imperial Oil Ltd.

L

Ladder Steps, Steel:
- Irving Iron Works Co.

Lathes:
- John Bertram & Sons Co., Ltd.,

Lightning Arrestors:
- Canadian General Electric Co., Ltd.
- Dominion Engineering Agency, Ltd.

Lighting Equipment, Industrial and Street:
- Canadian General Electric Co., Ltd.

Line Materials:
- Dominion Insulator & Mfg. Co., Ltd.
- N. Slater Co., Ltd.

Locomotives:
- Clare Osborn, Ltd.
- F. H Hopkins & Co., Ltd.
- Mussens Ltd.

Locomotives, Electric:
- Canadian General Electric Co., Ltd.
- Canadian Westinghouse Co.,Ltd

Lubricating Oils & Greases:
- Imperial Oil Ltd.

Lumber, Asbestos:
- Canadian Johns-Manville Co., Ltd.

M

Machine Knives:
- Simonds Canada Saw Co. Ltd.

Machine Tools:
- John Bertram & Sons Co., Ltd.

Machinery:
- Canadian Fairbanks-Morse Co., Ltd.
- Dominion Engineering Works, Ltd.

Mackinaw Clothing:
- Grant-Holden-Graham, Ltd.

Mandrels:
- Pratt & Whitney Company of Canada, Ltd.

Marine-Machinery:
- William Kennedy & Sons, Ltd.

Material Handling Plants:
- Combustion Engineering Corp., Ltd.
- Link-Belt Ltd.
- Mussens Limited.

Menders, High Pressure Hose:
- Knox Mfg. Co.

Men's Furnishings:
- Grant-Holden-Graham, Ltd.

Merchant Bars:
- British Empire Steel Corp., Ltd.

Metal Lath:
- Trussed Concrete Steel Co. of Canada, Ltd.

Metal work, heavy plates:
- Horton Steel Works, Ltd.

Meters:
- Ferranti Meter & Transformer Mfg., Co., Ltd.

Milling Cutters:
- Pratt & Whitney Co., of Canada, Ltd.

Milling Machines:
- John Bertram & Sons Co., Ltd.

Mine Hoists, Steam and Electric:
- Lancashire Dynamo and Motor Co. of Can. Ltd.

Mining Machinery:
- Wm. Hamilton Co. Ltd.
- William Kennedy & Sons, Ltd.

Motors:
- Canadian Fairbanks-Morse Co., Ltd.
- Dominion Engineering Agency Ltd.
- Lancashire Dynamo and Motor Co. of Can. Ltd.

Motors, Electric:
- Canadian General Electric Co., Ltd.
- Canadian Westinghouse Co., Ltd
- Ferranti Meter & Transformer Mfg., Co., Ltd.
- Lancashire Dynamo and Motor Co. of Can. Ltd.
- Lincoln Electric Co., of Canada Ltd.

Motor Oils:
- Imperial Oil Ltd.

N

Nails:
- British Empire Steel Corp., Ltd.

Nipples, High Pressure Hose:
- Knox Mfg. Co.

Nipples, Pneumatic Hose:
- Knox Mfg. Co.

Nipples, Rock Drill:
- Knox Mfg. Co.

Nozzles, Malleable Iron:
- Knox Mfg. Co.

Nuts:
- British Empire Steel Corp., Ltd,

Oil Storage Tanks:
- Horton Steel Works, Ltd.

O

Oil Burning Equipment:
- Combustion Engineering Corp., Ltd.

Oil Purifiers, Centrifugal:
- De Laval Steam Turbine Co.

Oil Storage Tanks:
- Horton Steel Works, Ltd.

Oxy-Acetylene Welding & Cutting Apparatus and Supplies:
- Dominion Oxygen Co., Ltd.

Oxygen:
- Dominion Oxygen Co., Ltd.

P

Packings, Asbestos Sheet:
- Canadian Johns-Manville Co., Ltd.

Packings, Rod and Plunger:
- Canadian Johns-Manville Co., Ltd.

Paints, Metal Protectives:
- Barrett Co., Ltd.

Paper Mill Machinery:
- Dominion Engineering Works, Ltd.

Paving Contractors:
- Standard Paving Ltd.

Pencils:
- American Lead Pencil Co.

Penstocks:
- Wm. Hamilton Co. Ltd.
- Horton Steel Works, Ltd.
- Pacific Coast Pipe Co., Ltd.

Pinions:
- Hamilton Gear & Machine Co.
- Jones & Glassco, Reg'd.

Pipe Coils:
- Superheater Co., Ltd.

Pipe, Concrete:
- Jno. E. Russell Co., Ltd.

Pipe Couplings, Union:
- Dart Union Co., Ltd.

Pipe Cutting and Threading Machinery:
- Riley Engineering and Supply Co., Ltd.

Pipe Fittings:
- Crane Ltd.

Pipe, Lead:
- Steel Co. of Canada, Ltd.

Pipes, Cast Iron:
- Canada Iron Foundries, Ltd.
- Gartshore-Thomson Pipe and Foundry Co., Ltd.
- Kennedy & Company, Ltd.
- National Iron Corp., Ltd.

Pipe Insulations:
- Canadian Johns-Manville Co., Ltd.

Pipe riveted:
- Horton Steel Works, Ltd.

Pipe, Wood Stave:
- Pacific Coast Pipe Co., Ltd.

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Department of Railways and Canals,
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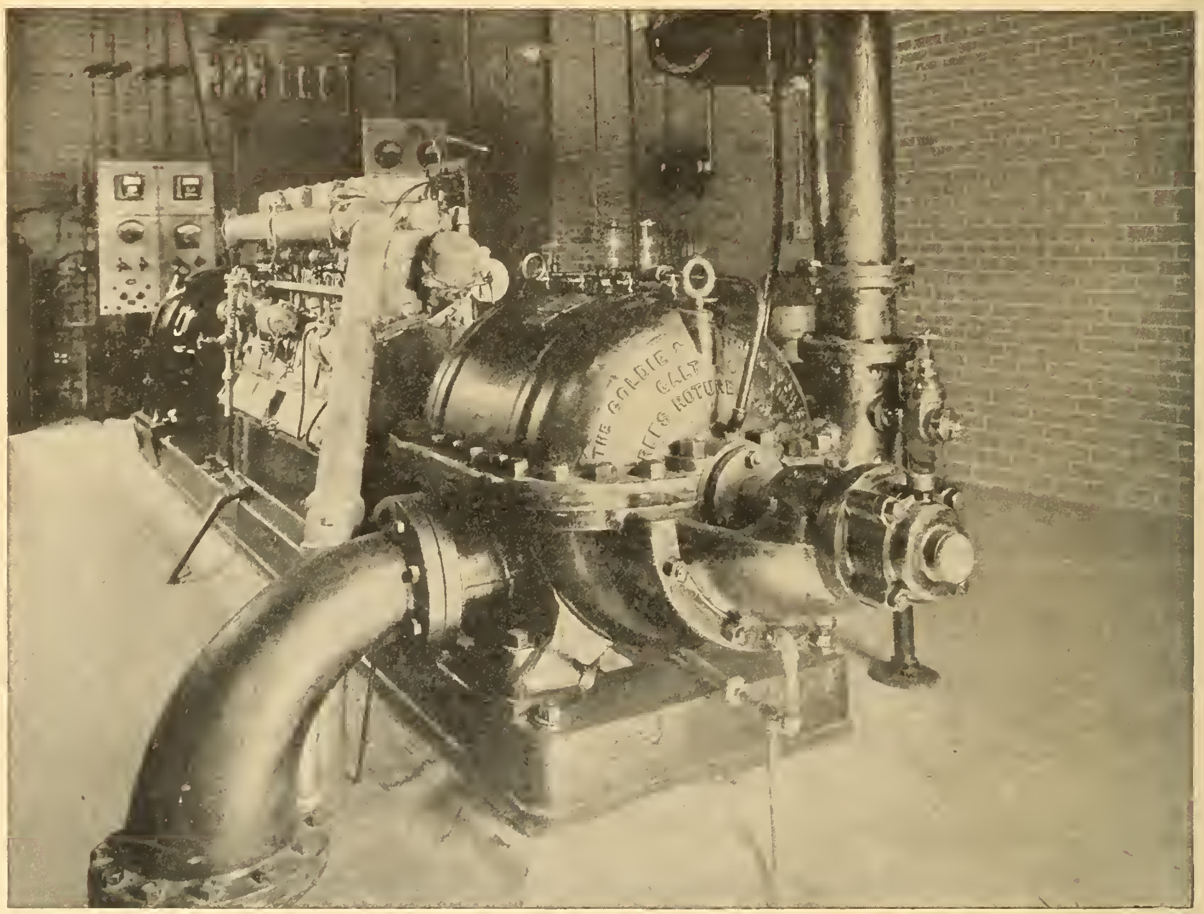

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SEPTEMBER 1925

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AT 176 MANSFIELD STREET, MONTREAL

Vol. VIII No. 9

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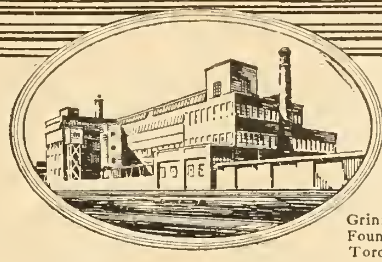

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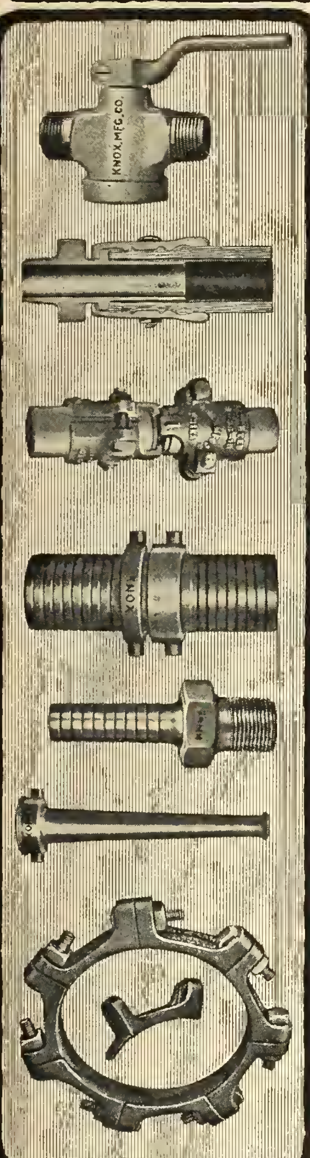

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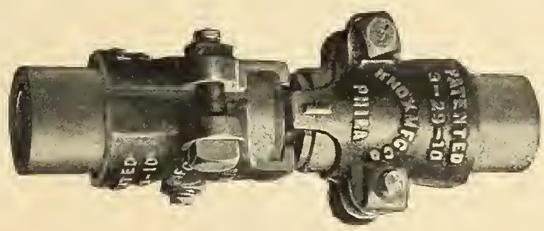

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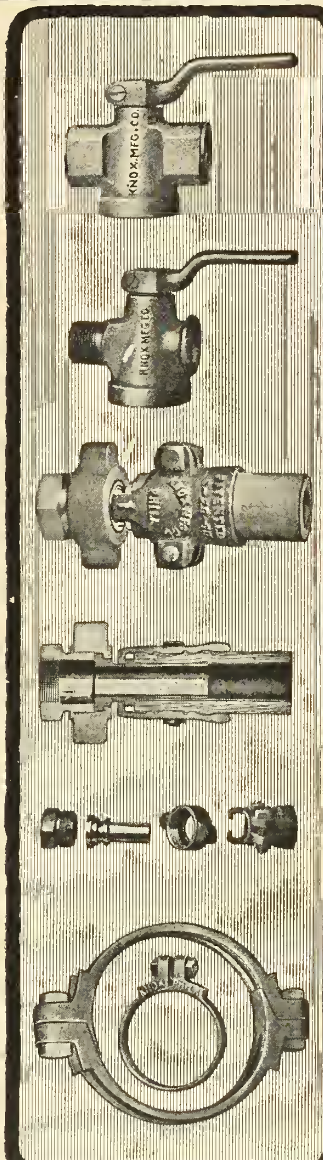

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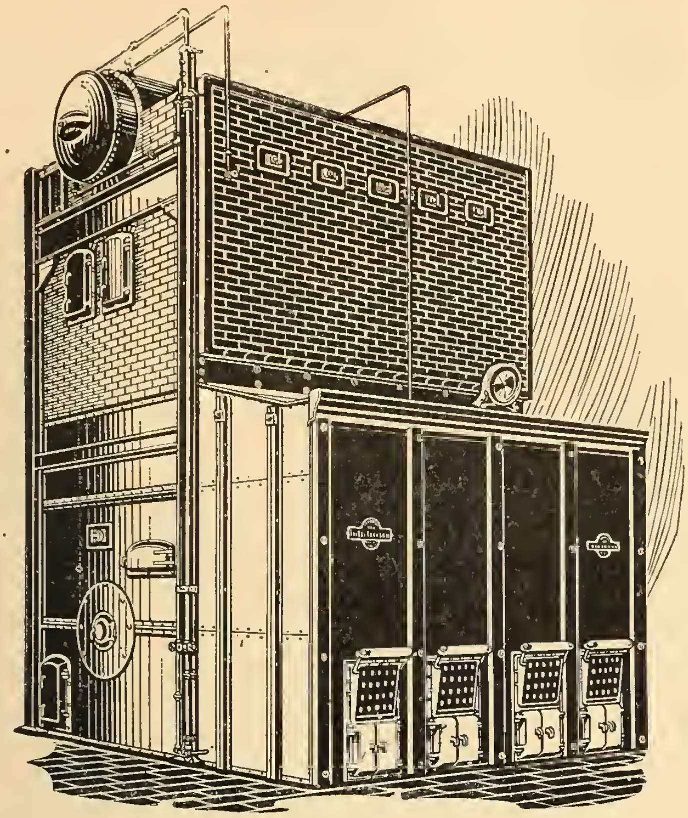

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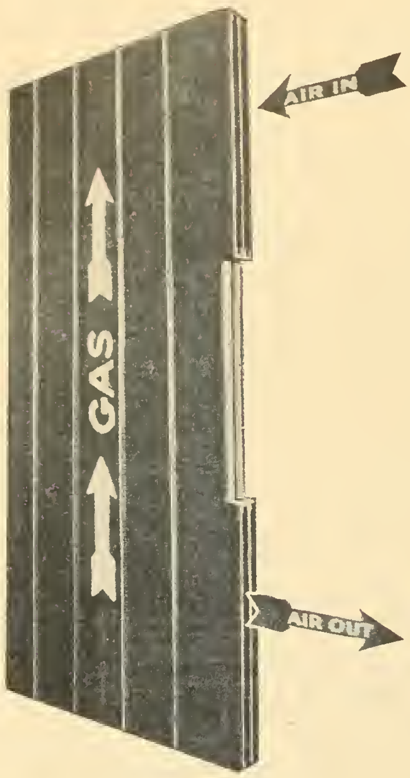

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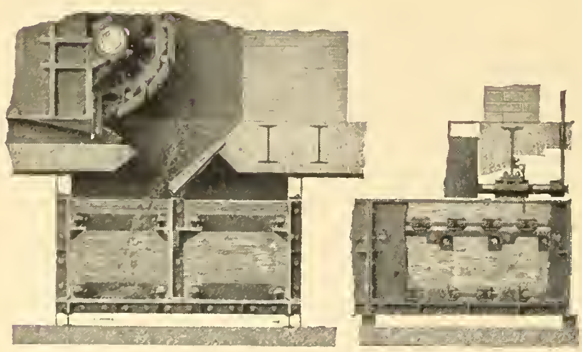

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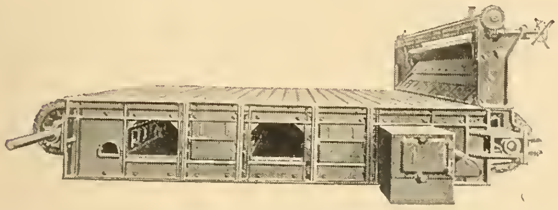

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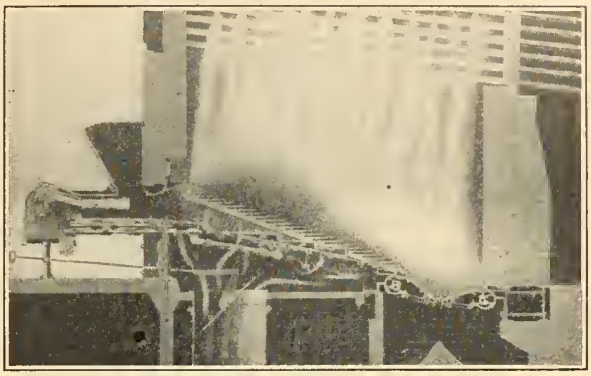

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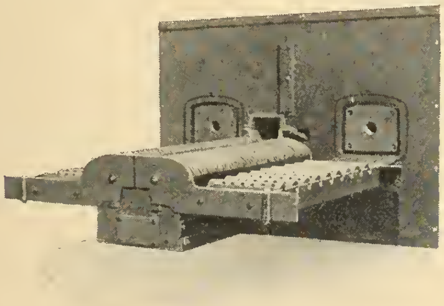

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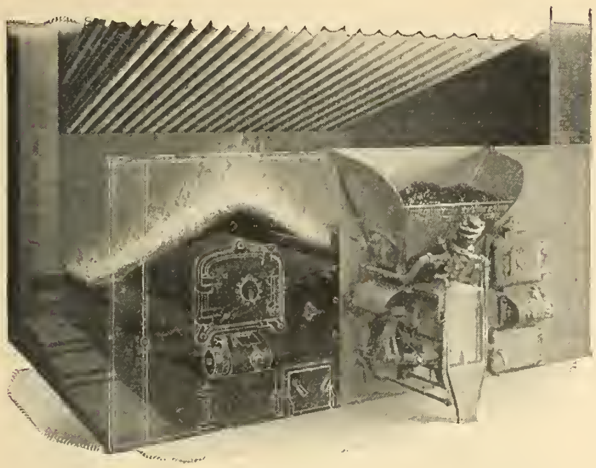

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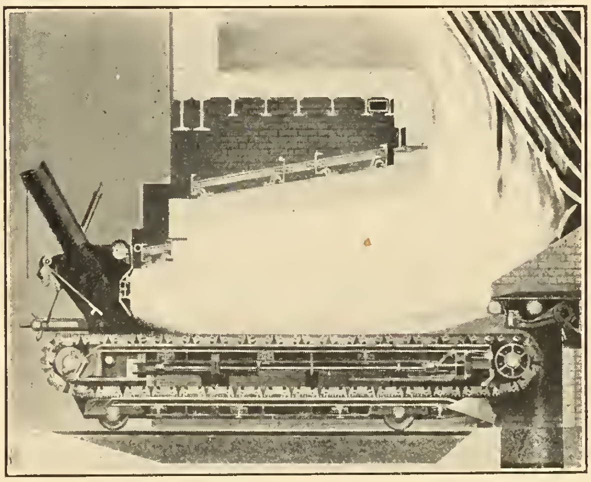

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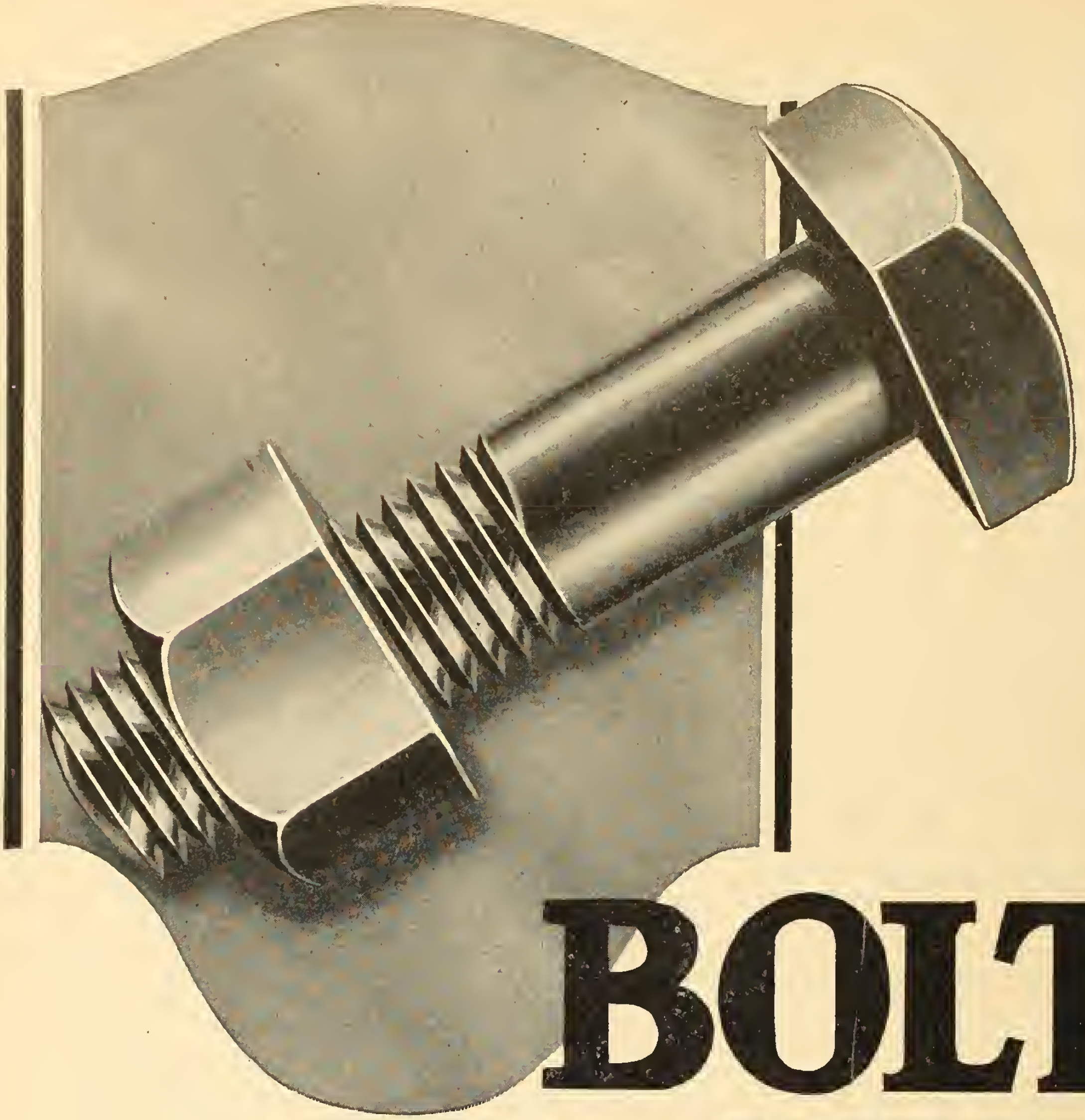

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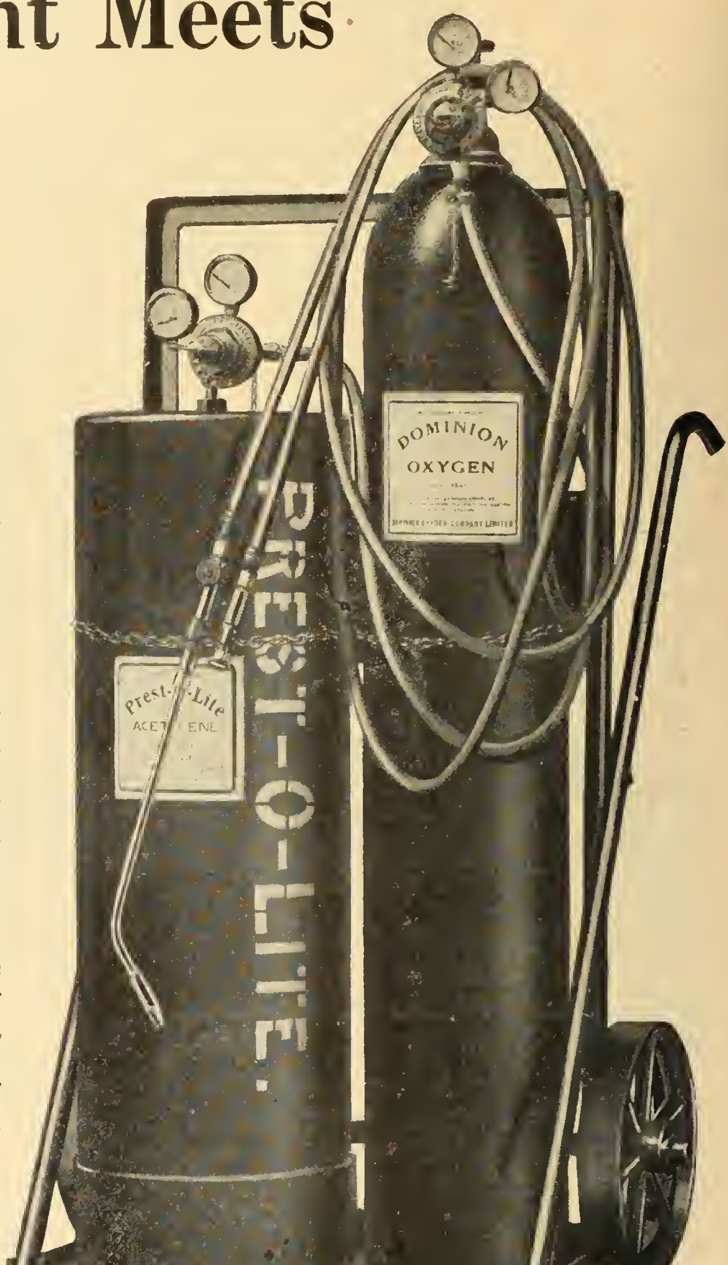

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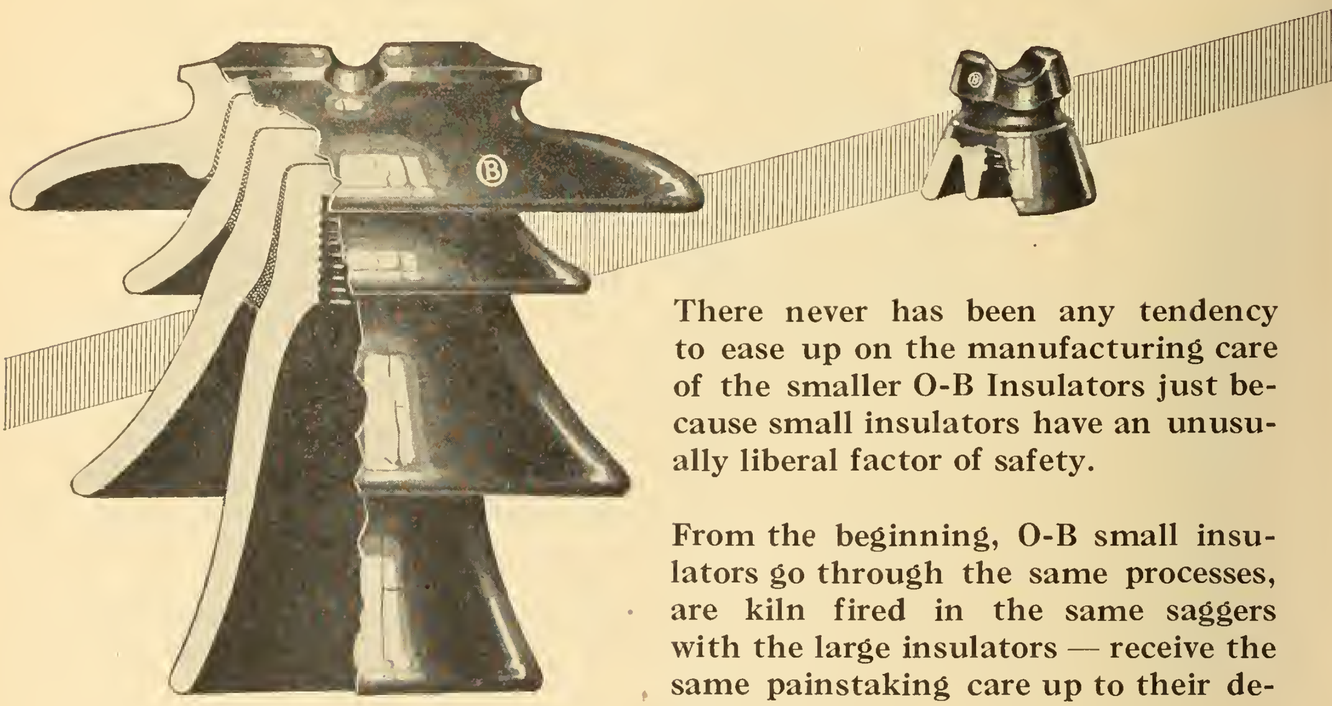

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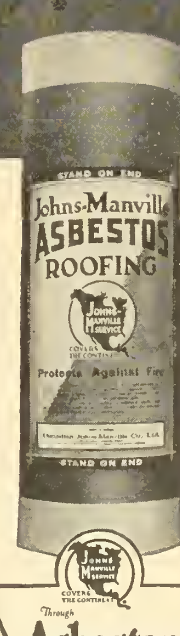
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The Municipal Underground Conduit System of Montreal

The Organization, Preliminary Investigation, and Details of Installation Features.

G. E. Templeman, A.M.E.I.C.

Chief Engineer, Electrical Commission of the City of Montreal.

Paper read before the Montreal Branch of The Engineering Institute of Canada, April 2nd, 1925.

The underground conduit system of Montreal consists of a network of ducts and manholes which contain the cables supplying practically every type of electric service with the exception of the telephone.

The need of an underground system of electrical supply can be realized by a study of figures Nos. 1 and 2. These photographs show the appearance of a typical street in the congested districts, before and after the installation of underground conduits.

There were about thirty companies and civic departments that had the right, by charter, to operate overhead wires in the city of Montreal. The confusion and congestion of street space that would have existed had each of these companies operated a separate overhead system can be readily imagined. The logical solution of this problem is an underground system of distribution. By such construction the streets are cleared of all poles and wires, except street lights, fire alarm standards and trolley wire supports.

Several of the more obvious advantages of underground service are:—

1 — Streets free from obstructions to the work of the fire department.
2 — Less public hazard.
3 — Less interruption of service due to lightning, wind and sleet storms.
4 — Appearance of streets greatly improved.
5 — Improved efficiency of distribution and quality of service because of the change over from an old overhead system built up in piece-meal fashion to a new underground one carefully designed for existing and future conditions.

The great disadvantage of an underground system is the large first cost. It should be noted, however, that underground equipment has, in general, a much longer life than overhead material.

The civic authorities recognized the seriousness of the situation and, by 1899, obtained legislation enabling the city to control the erection of poles and to compel the placing of all wires underground.

In 1903 the city employed Mr. C. E. Phelps, chief engineer of the Electrical Commission of the city of Baltimore, to make a report on an underground conduit system for all wires then on poles within the city of Montreal. This report was published in the Municipal Gazette of February 29th, 1904.

In 1907, the Canadian Underwriters Association appointed a committee to investigate street wiring conditions.

In 1909, the statute known as 9, Edward VII, chapter 81, section 39, was enacted by the provincial legislature. This act is the foundation of the present civic conduit system and will, therefore, be discussed in some detail in its amended form. The important provisions may be cited as follows:—

The city is authorized,—

1. To construct, administer and maintain a system of underground conduits.
2. To borrow to the extent of $5,000,000. for the purpose of financing the undertaking, that is,—
    (a) To pay for the construction and purchase of underground conduits.
    (b) To take over and pay for overhead equipment expropriated.
3. The city is required to pass a by-law providing for the appointment of an electrical commission, composed of three engineers, one appointed by the city, one by the power companies and the

Figure No. 1.—Victoria Square, Corner of St. James and McGill Streets before removal of overhead wires.

Figure No. 2.—Victoria Square, Corner of St. James and McGill Streets after overhead wires were removed.

third by the Quebec Public Service Commission; this board to have control of design, constructions and maintenance of the system. The present members of the commission are:—Dr. L. A. Herdt, M.E.I.C., of McGill University, appointed by the Quebec Public Service Commission, chairman; Mr. R. S. Kelsch, M.E.I.C., commissioner, representing the companies; Mr. DeGaspé Beaubien, M.E.I.C., commissioner, representing the city of Montreal.

4. The city is authorized to charge for and receive rentals on duct space used or reserved, — the rentals to be sufficient to provide for:—
   - (a) Interest on capital required for the construction of the conduit system.
   - (b) Sinking fund to amortize the capital debt in forty years.
   - (c) Maintenance and operating costs of the Electrical Commission.

The act also provides,—

1. That there shall be provided spare ducts for future requirements.
2. That the companies must furnish information as to their underground requirements.
3. That the companies must occupy conduits as they are built.
4. That the city shall take over and pay for all overhead materials ordered removed because of the installation of underground conduits. It shall also take over and pay for any underground conduits belonging to the companies and shall pay for any cables, etc., therein that have been rendered useless; the compensation in all cases to be determined by the Electrical Commission, acting as an arbitration board.
5. That the city or any interested person or company can appeal to the Quebec Public Service Commission against any of the rulings of the Electrical Commission except on the amount of an award for expropriated materials.

Under construction procedure, the act provides,—

1. That the area and location of the conduit system and parts thereof shall be determined by the Electrical Commission.
2. That the drawings, specifications, rules and regulations prepared by the Electrical Commission shall be approved by the Quebec Public Service Commission.
3. That the city shall call for tenders.
4. That the interested companies are eligible to tender, as well as the public.
5. That the Electrical Commission shall report on tenders received.
6. That the city shall award the contract.
7. That the Electrical Commission alone have the direction and supervision of the construction.

The organization of the commission and its relation to the city and to the various companies is shown by Figure No. 3. It will be noted that, as far as the use

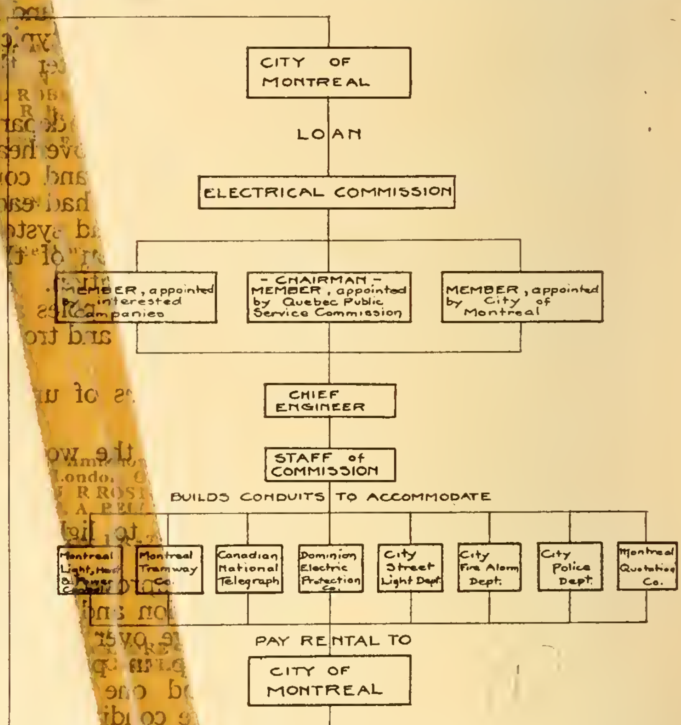


Figure No. 3.—Organization of Commission and its Relation to the City and to the Various Companies.

of duct space is concerned, the Electrical Commission does not distinguish between the civic departments and the companies.

Procedure

Immediately after organization, the commission ascertained what companies had the right to operate overhead and underground systems, and the kind of electric service supplied. There are two main classes of service, — signal and power. With the exception of the civic departments and the Montreal Quotation company, the signal companies are under Federal jurisdiction. The power companies are all under Provincial control.

At the inception of the commission, the seventeen light and power companies had merged into two, — The Montreal Light, Heat and Power Consolidated and the Montreal Public Service Corporation. The recent merger of these two companies has again simplified conditions from a distribution standpoint.

The power and tramway companies each own and operate a system of underground ducts which carry 13,000-volt transmission or tie lines between their various power houses and sub-stations. It was considered advisable that these lines or power arteries should be kept separate from the civic system. They were therefore left in the possession and control of their respective owners.

The inherent nature of a telephone system, which requires a separate circuit between each telephone and the exchange, necessitates the use of underground cables much in advance of the other classes of service. For this reason, The Bell Telephone Company started an underground system in about 1890. It was agreed, after

Figure No. 4.—Extent and Location of Present Underground Conduit System.

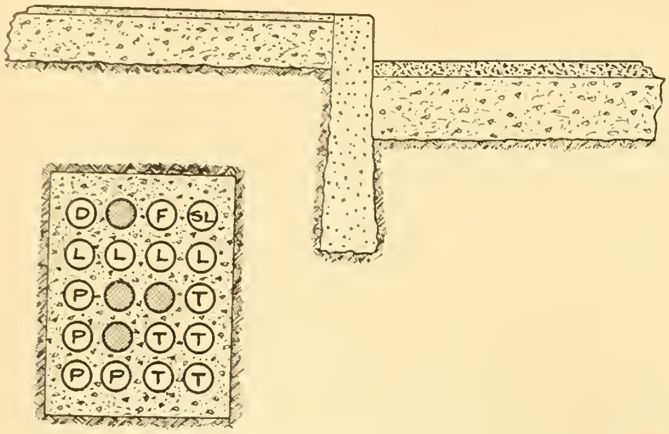


Figure No. 5.—Typical Duct Section and Allotment of Duct Space.

D = Dominion Electric Protection Company
F = City Fire Alarm
SL = City Street Light
L = Laterals
P = Power Companies
T = Montreal Tramway Company Spares

careful consideration, that the telephone company should continue to operate their own separate system.

In addition to these, the Canadian Pacific Railway Company's Telegraph operates a small private system of conduits.

The absence of the two extremes of electric service, telephone and 13,000-volt power arteries, simplifies the problem in many ways.

Thus, there are four separate conduit systems in Montreal in addition to the civic system. The types of electric service cables that are contained in the civic conduits are:—

(*A*) — *Power Cables*

1. 4500-volt d.c., civic street lighting.
2. 2300-volt a.c., primary distribution feeders.
3. 600-volt d.c., tramway feeders.
4. 600-volt a.c., secondary distribution.
5. 250/500-volt d.c., distribution.
6. 110/220-volt a.c., secondary distribution.

(*B*) — *Signal Cables*

1. Fire alarm cables.
2. Messenger and burglar alarm cables.
3. Canadian National telegraph cables.
4. Stock ticker cables.

The selection of the district to be supplied with underground electrical distribution is the next important question. The first districts to be considered are, of course, those near the centre and congested area of the city. Figure No. 4 shows the extent and location of the present system.

A prime qualification in a projected district is that it shall be directly connected to some part of the system already built. The next step is to determine the pole and wire density per street mile; this is compared with similar data for the districts already constructed.

The relative importance of a street or district and its traffic conditions are important factors. The areas surrounding power stations and the central offices of signal companies must be given full consideration, not only to reduce overhead congestion at these points but

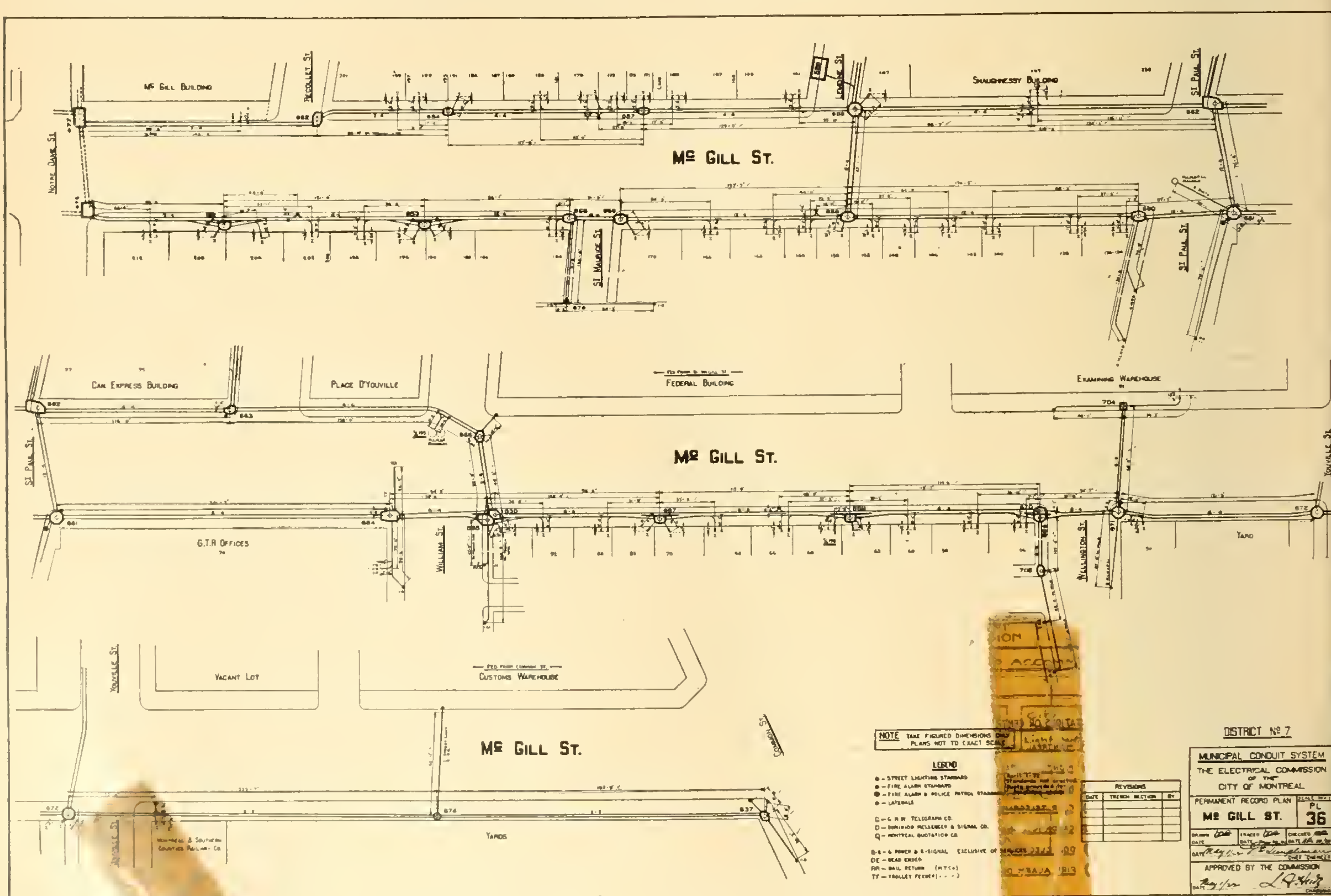
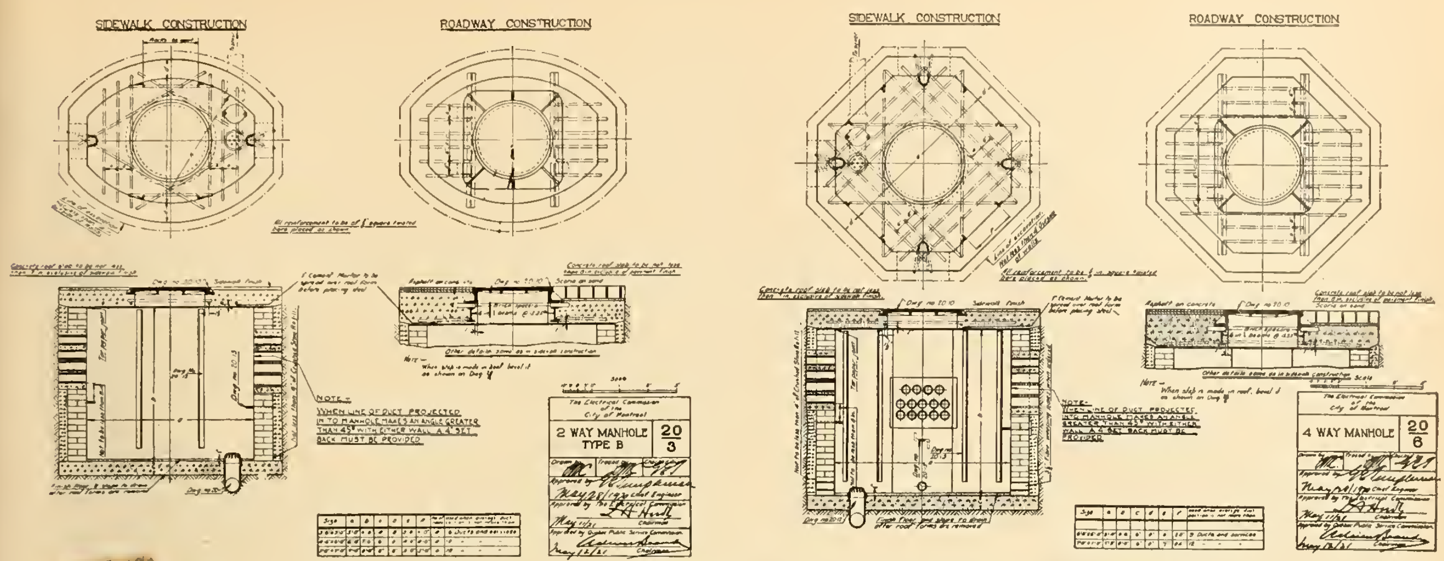


Figure No. 6.—Record Plan of Work on McGill Street



Figures Nos. 7 and 8.—General Details of Standard Manholes.

also to render the service of that station as free as possible from the dangers of conflagrations or storms.

It follows from the above that extensions to the system will be along two lines:—

1. The block method, where several complete blocks are constructed as one district.
2. The single street method, where the new district consists of a single important street or traffic artery passing through a territory that is lightly loaded from an electrical standpoint.

Thus, in the present system, St. Catherine, Bleury, St. Lawrence and Sherbrooke streets are single street districts; whereas the downtown areas were constructed as block districts.

Some cities have an excellent network of lanes, where the presence of a small, lightly loaded pole line, delivering lighting and telephone service, is not objectionable. This greatly simplifies the underground requirements. Unfortunately there are very few lanes in the older section of Montreal that can be used for this purpose, so that it is necessary to supply the much more costly house to house distribution.

Joint or Separate System

It has been shown that both power and signal cables must be provided for. The cables must be arranged so that power cable faults shall not damage other cables. This is one reason why the power arteries and telephone cables were left as separate systems. The streets of Montreal, particularly in the older districts, are generally narrow, so that there is a limited amount of sub-surface space available. This fact, together with the greatly increased cost of separate systems for power and signal service, led to the adoption of a common manhole system in all cases where signal requirements do not exceed four ducts. In any run containing more than this number, separate manholes are provided, if space is available. The present system includes only a very limited area in which more than four signal ducts are used.

In addition to the above, the following precautions are taken:—

1. Special D shaped service manholes are used in some cases to by-pass certain cables, such as tramway feeders, fire alarm and street light cables.

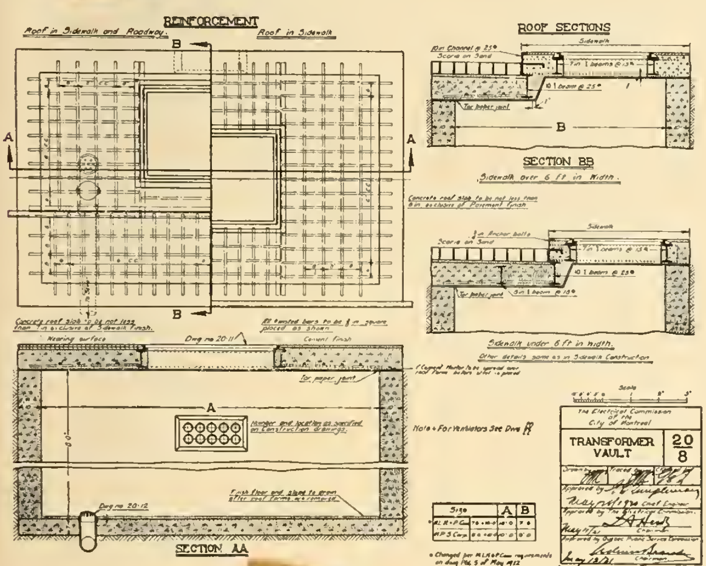


Figure No. 9.—Transformer Vault

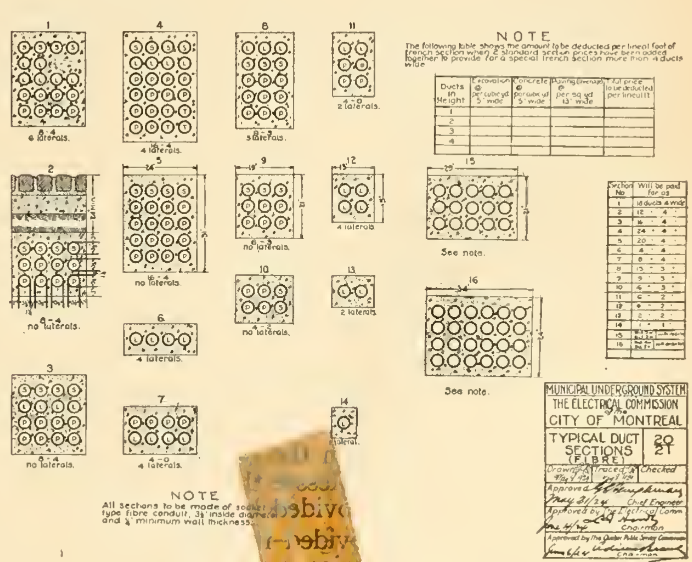


Figure No. 10.—Typical Fibre Duct Sections

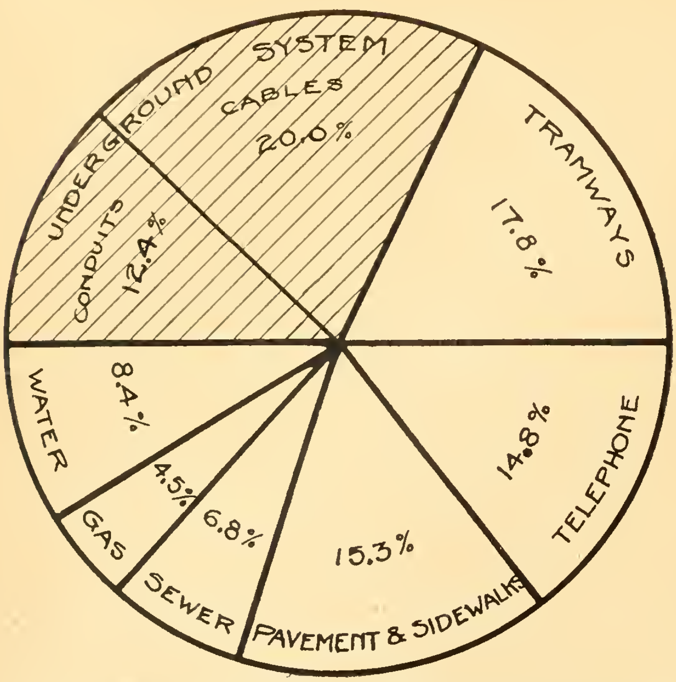


Figure No. 11.—Graphical Representation of Relative Investments of the Various Utilities per Mile of 60-foot Double Car Track Street in Central Sections of City

Underground System		$262,000.00
Conduits	$100,000	
Cables	162,000	
Tramways		144,000.00
Telephone		120,000.00
Pavement and Sidewalks		123,000.00
Sewer		55,000.00
Gas		36,000.00
Water		68,000,00
Total		$808,000.00

Note:—13,000-Volt Network not included.

2. Signal and power cables are racked as far apart as possible in the manholes, the signal wires being placed near the top.
3. Concrete separation is used between ducts.
4. In all manholes signal cables are protected with a half inch covering of cement mortar; power cables are covered with either cement mortar or asbestos cloth.
5. Glass insulators are provided on all cable hangers.
6. The sheaths of all cables are bonded together and to ground cones at all street intersections. Direct connections to water mains are provided at all transformer vaults, which are spaced 800 to 1,000 feet apart.

Provision of Duct Space

All lessees are required to state the amount of duct space they wish to reserve, within a specified time after the receipt of notice and plans showing the location of the proposed duct runs, etc., from the commission.

In addition to the total of these reservations, the commission is required to provide a reasonable number of ducts for future use.

Spare capacity in a duct line may be sub-divided as follows:—

1. Spare capacity within the cable itself.
2. Ducts reserved by a lessee that are not occupied.
3. Additional ducts provided by the commission.

The spare capacity provided in the cable itself will vary with the class of service and in some cases will amount to 100 per cent. For example all cables operating at 2,300-volts have 4,400-volt insulation and will in all probability be operated at 4,000 volts in the near future.

The exact number of ducts required can be more closely estimated for trolley feeders, street lighting and fire alarm cables than for general power service. The records of the commission show that about 50 per cent of the duct space reserved is actually occupied.

The actual number of ducts provided as spares depends upon the number of ducts reserved, the number of companies or classes of service in any given run, the location of the run with reference to stations or traffic arteries and, to some extent, on the duct formation. It is economical to use a regular section, that is, if the run is laid four wide, the total section should be some multiple of four.

The spares provided by the commission over the whole system are to-day 22.5 per cent of the ducts built. Combining this with the figure for ducts not used but reserved, it is seen that 36.7 per cent of the system is occupied. This compares with the figure of 35 per cent for the city of Baltimore's conduit system, an older and much larger system.

Figure No. 5 shows a typical duct section and the allotment of duct space. The signal cables are placed at the top of the section. The street lighting cables are usually placed near the curb to facilitate connection to the standards. The tramway feeders are also placed on the street side so that connections to the rails and trolley wire poles can be readily made. The power and lighting cables are, in general, on the building side. The spare ducts are usually located in the centre of the section so that any of the lessees may use them without awkward racking in the manholes.

Construction

No general rule is used for manhole spacing, except that the extreme limit for cable pulling is about 500 feet. There are very few sections in the civic system with more than 400 feet between manholes. It is necessary to provide service manholes from which ducts may be taken to the various buildings and these must be located so that the services are as short as possible. To this end duct runs and manholes are usually located under the sidewalks. One or more service holes are built in every block in addition to the main manholes at the street intersections, so that the average spacing between holes is reduced to about 125 feet.

Figure Number 6, record plan of work done on McGill street, shows very clearly almost all types of construction in use.

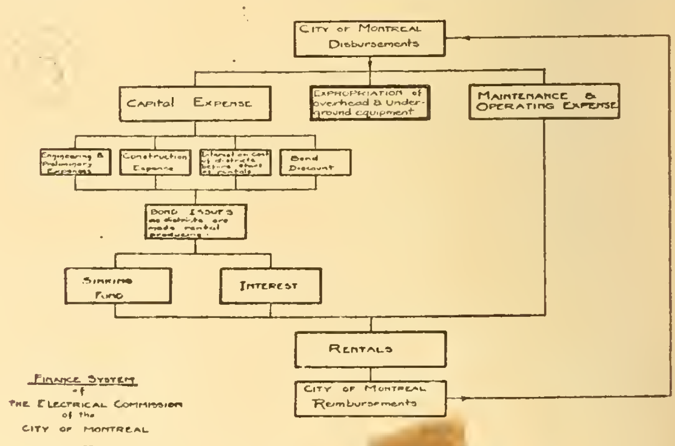


Figure No. 12.—System of Financing Civic Underground Conduit

Service holes can generally be made according to the standard drawings. It is not often possible to do this with the main manholes at street intersections on account of obstructions, etc., and the fact that they must be built so that the cables can be trained efficiently.

Figures Nos. 7 and 8 illustrate standard manholes, the general details are the same in all cases. Brick walls are used because of the greater adaptability and ease of construction of irregular shapes. A cubic yard of concrete costs less than the corresponding amount of brick work but a more rapid rate of construction is obtained with the latter. This is important on heavy traffic streets.

Every precaution is taken to prevent any bond between the brick work and the roof. It is found that over 10 per cent of the roofs built lift somewhat in the winter, and, in cases where there is any bond, some of the brick or concrete wall is lifted with the roof and cracked walls result.

A four-inch layer of crushed stone is provided on the outside of the brick work to allow moisture to settle below the frost line. Weeping pipes are also placed near the floor of the manhole in bad ground. A clearance of two to four inches is provided between the cover frame and the steel reinforcing of the roof so that the frame can meet minor changes in street grades without disturbing the steel work. A six-inch tile connection is made to the sewer from every manhole and nearly all service holes unless the cost of the connection is unduly great.

Figure No. 9 shows a transformer vault. These are now built 7½ by 14 by 8 feet deep, inside dimensions. The walls are made of concrete, since the hole is rectangular, and must be located in a space clear of all obstructions. The covers of these vaults are always located in sidewalks so that in cases where the sidewalks are very narrow a portion of the vault extends under the roadway. The roof construction in such cases is clearly shown by the above figure.

The bearing parts of both the manhole cover and frame are machined to prevent hammering under heavy traffic. In some cities steel covers are being used, instead of iron, to take care of increasing street loads. Up to the present time, however, the only covers lost in the Montreal system have been those showing defective iron. No indications of excess stress have been observed in roof slabs.

Duct Sections

The general practice previous to 1921 was the use of tile ducts for power cables and fibre ducts for signal cables. For the last four years, however, fibre alone has been used for all classes of service. Figure No. 10 shows the fibre duct sections that are the standard practice in the civic system to-day. The envelope surrounding the duct mass has a minimum thickness of 2 inches on the sides and 3 inches on top and bottom. The separation between ducts is 1¼ inches. The mixture used is 1.3.5., giving about 1,500-pound concrete with ¾-inch stone. One size of fibre duct, 3½-inch bore and ¼-inch wall, is employed for all purposes.

It may be well to discuss, here, the reasons for preferring fibre. Although this material is a little cheaper than tile, more concrete is employed in its use making the cost of the duct section almost the same. Several cases have occurred where a bursting water main tore off the side envelope of a tile duct section and filled the duct run with sand and mud. A frequent cause of

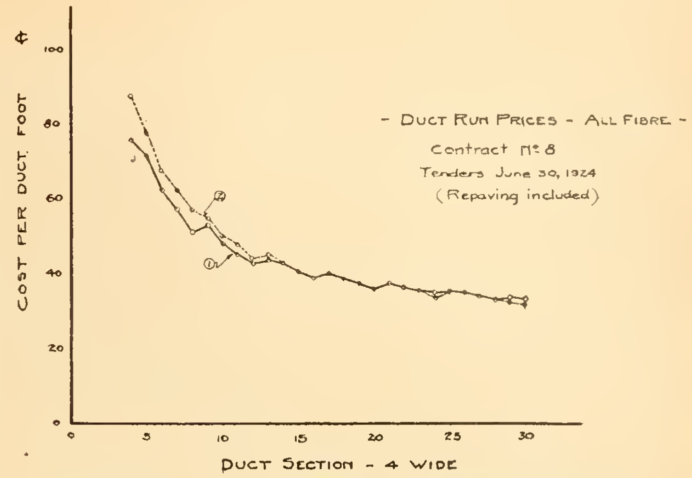


Figure No. 13.—Unit Prices Tendered for Duct Runs

damage to the tile sections was the occasional necessity of bridging a cut for a house sewer, etc. Fibre construction stands up under this treatment much better than tile does since monolithic construction is more nearly approached.

Fibre ducts are manufactured in five- and eight-foot lengths which are put together by socket joints. This method of jointing keeps gas and water out of the system to a far greater degree than is possible with tile, which is made in 1½-foot lengths and simply butt-jointed. In general, the use of fibre results in better and more rugged construction at no increase in cost.

Layout of Runs and Manholes

The location of trenches and manholes is usually determined at the same time and the manhole excavation commenced first so that any unforeseen obstructions may be dealt with. Forms are set in the manhole excavation from which the duct lines are started. It is desirable to lay the duct line at least twenty-four hours in advance, so that the forms can be removed and the brick work built up around the concrete duct section without delay. When the walls of the manhole are completed, the roof form is placed and the slab poured. The cover frame is placed to a grade given by the city road department.

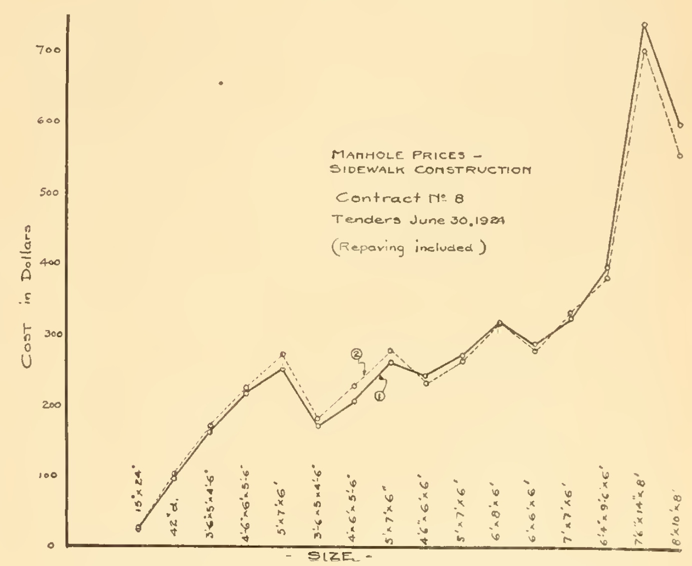


Figure No. 14.—Unit Prices Tendered for Manholes

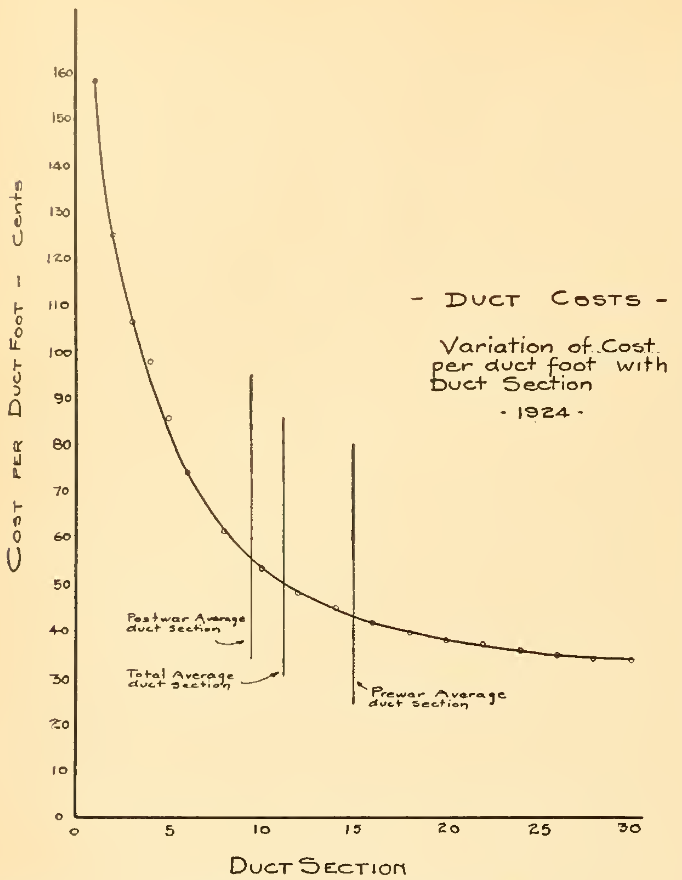


Figure No. 15.—Characteristic Curve of Duct Section Cost for Economic Trench Width

Detail field sketches are made of every duct section and manhole. All runs and service ducts are accurately located for the record plans. On the completion of any run, the ducts are carefully tested for continuity and freedom from obstructions.

As contracts have all been awarded on a unit price basis and rentals are charged per duct foot, a large amount of detail work is required in the matter of records. The contract price does not include the reinstatement of paving which is done by the city road department and charged to the district.

As soon as the final figures are checked, the permanent record plans are made. These are then sent to all lessees who are given six to nine months in which to install their cables. The lessees are notified that rentals will commence on a given date. At the same time notices are published, advising the proprietors and tenants of all buildings in the district that their wiring must be arranged to receive underground electric service. An inspection department follows up all alterations and it takes about four to six months of continuous work before these wiring changes are completed.

As each company or lessee completes its cable installation, it notifies the commission that the overhead material belonging to them is ready for release and can be taken over by the city. A joint inventory is then prepared by representatives of the city, the company and the commission.

The accepted list is appraised and the commission, sitting as a board of arbitrators, makes an award after hearing the interested parties. On payment of the award, by the city, the overhead material is removed from the streets.

From what has been said, it can be seen that it takes from three to four years to accomplish the removal of overhead material from the time the first plans are drawn for a given district.

Operation and Maintenance

Space will permit of only a brief description of the operating and maintenance features. Operating is becoming an ever increasingly important part of the work. Construction methods, procedure, drawings and specifications have become fairly well standardized. The operation of the system is governed by a definite set of rules and regulations approved by the Quebec Public Service Commission. One of the important rules is that all lessees must obtain a permit before opening any manholes. By means of these permits an accurate record is kept of all faults, repairs, etc.

The first cables were installed in 1914. To-day there are over 200 miles of cable in the civic conduits. There have been about forty-one permits issued for the repair of cable faults in the ten years of service ending December 1924, covering an average cable mileage of 145. Twenty-eight of these faults were minor ones in 110-volt service taps. Of the remaining thirteen, about six are mechanical faults due to street excavation such as the resetting of curbs, etc. In three cases only have the lead sheaths of other cables been injured. There is but one case on record where the fault involved damage to conductors of other lessees' cables.

Damage by electrolysis is indicated in one case only, an excellent testimony of the care taken by the Montreal Tramways Company in the matter of bonding and negative returns.

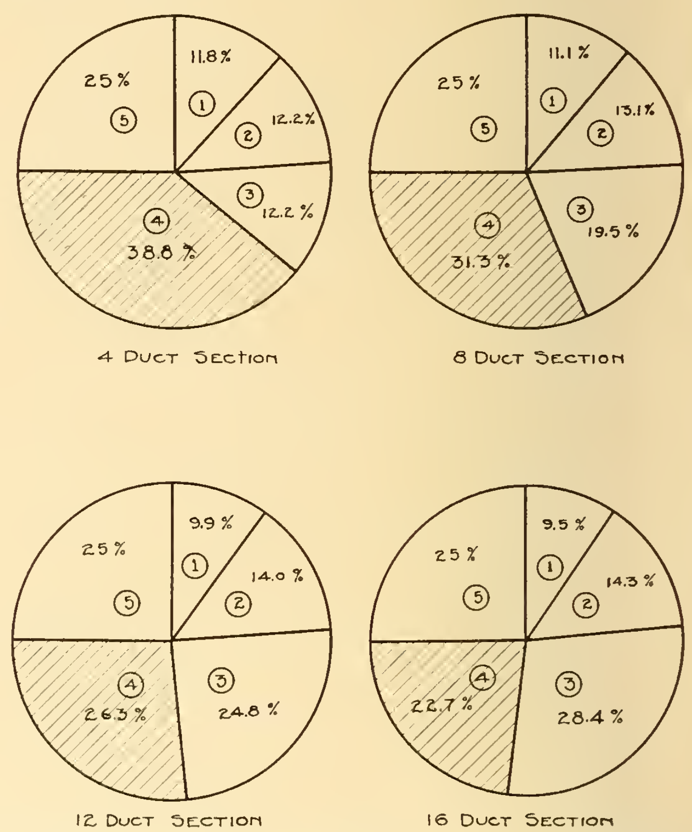


Figure No. 16.—Subdivision of Costs of Typical Duct Sections

1 — Excavation 3 — Fibre Duct
2 — Concrete 4 — Repaving
5 — Overhead and Profit

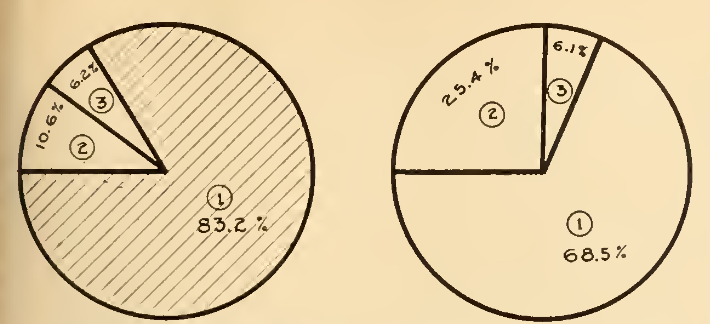


Figure No. 17.—Analysis of Capital and Contract Costs

A. Capital Costs

1. Contract Cost.......... 50¢ per duct foot
2. Engineering and Organization Overhead............... 6.3¢ per duct foot
3. Interest................... 3.7¢ " " "

Total 60¢

B. Contract Costs

1. Ducts		2. Manholes	
Main Runs...............	57.6%	Manholes.................	20.6%
House Services / Permanent Laterals	8.6%	Transformer Vaults.......	4.8%
Temporary Laterals.......	2.3%	3. Extras..........................	6.1%

This data is submitted as being of interest to those dealing with cable systems.

Detail records are kept of every foot of duct space and the allotment thereof. Corresponding records of the cable installed in every duct are available. An annual check is made of the cables in house service ducts, since, in this case, duct space is charged for only when used.

Annual rental statements, covering each conduit district, must be compiled for each lessee. Although wiring changes in buildings are made before or at the time of the initial cable installation, there is a certain amount of alteration going on all the time, particularly on a street like St. Catherine. These alterations demand a continual follow up and the close co-operation of the interested company, the fire underwriters and the commission.

The maintenance of the system includes cleaning and repairs. All manholes are cleaned at least twice a year, those in the roadway being overhauled more frequently, depending upon conditions. Repairs and minor additions, such as house service connections, are made by the same crews.

The cost of repairs is a very small item, the amount for last year being only 0.2 per cent of the capital cost of the system.

Costs

Figure No. 11 shows graphically the relative investments of the various utilities per mile of 60-foot, double car track, street in the central sections of the city such as St. Catherine, Bleury, or St. Lawrence streets.

The Tramway Company paves its own right-of-way and this cost is included in their investment as shown. The figure for the cables in the conduit system includes the cost of all cables occupying space in the system. In addition there is at least 20,000 dollars per mile spent for changes in house wiring, which has not been included in the above figures. The conduit system and cables therein represent about one-third of the total, or, in other words, the street investment is increased 50 per cent by the addition of underground conduits and cable. It is evident, therefore, that districts selected for underground service must be confined to the congested areas.

Figure No. 12 shows, in a general way, how the civic underground conduit system is financed. It can be seen that all money is paid out by the city and that it is all reimbursed, with the exception of the amounts spent on compensation for overhead materials. These amounts, less the salvage value of the material, are the direct contributions of the city to the system as a whole.

Figures Nos. 13 and 14 show the tendered unit prices, for duct runs and manholes, received on one contract last year.

Figure No. 15 shows the characteristic curve of duct section cost for the economic trench width. The increase in cost per duct foot as the section becomes smaller is striking. The vertical line on the right is the average duct section built previous to 1916, the one on the left is the average for the section built since 1921. The postwar average section is at the critical point of the curve and any further reduction in duct section will have to stand a greatly increased cost per duct foot.

The sub-division of costs of some typical duct sections is shown by figure No. 16. Repaving is the largest single item, being 38.8 per cent of the total cost of the four-duct section and 26.3 per cent of the twelve-duct section. The cost of re-paving is taken at $5.00 per square yard for the various types of paving encountered. In addition to the standard costs there are extras such as, a fee of $160.00 for each crossing under double car tracks, etc., making the cost of these street crossings very high.

Figure No. 17 is an analysis of capital and contract costs. It is seen that duct construction is 68.5 per cent of the total contract cost, manhole construction 25.4 per cent and extras 6.1 per cent. The last item is made up of extra excavation, concrete, rock, moving of pipes, poles, etc. The figure shown is a little high because of the inclusion in that account of several small unit price items.

The relation between construction, engineering and office overhead and interest, making up the capital cost of the system, is clearly shown on the above plate. The accrued interest charges on the cost of a district, up to the date when it is put on a rental basis, are charged to capital.

Figure No. 18 shows that 77.5 per cent of the duct space is reserved and rentals collected thereon. According to a recent Privy Council judgment, the rental on this duct space must be sufficient to carry the entire system, so that although the system cost per duct foot is now 60 cents, the cost per duct foot on which rentals are collected is 77.5 cents.

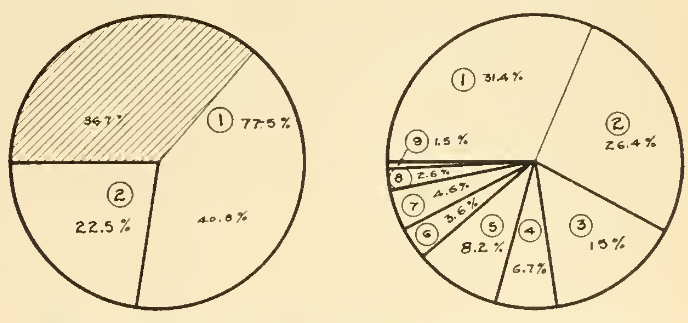


Figure No. 18.—Graphical Representation of the Allotment of Duct Space

A. Reserved and Spare Ducts

1. Ducts occupied.............. 36.7%
   Spares........................ 40.8%
2. Spare Ducts provided by Commission.

B. Reserved Ducts

1. Montreal Light, Heat & Power Cons.
2. Public Service Corporation
3. Montreal Tramways Company
4. City Street Light
5. City Fire Alarm
6. City Police Patrol
7. Dominion Electric Protection Co.
8. C. N. Telegraph Company
9. Montreal Quotation Company

The rental rate for the present year is 5.5 cents and made up approximately as follows: — 62½ per cent interest, 12½ per cent sinking fund and 25 per cent maintenance. The rental rate is subject to change from year to year in order to meet the actual fixed and operating costs of the system.

A yearly financial statement is prepared by a firm of chartered accountants employed by the commission.

Conclusion

The first work was done in 1913 and construction work continued until 1916. War conditions then stopped work until 1921, since which time additions to the system are being made at the rate of about 400,000 duct feet per year.

Figure No. 4 shows the system as it is April 1925, containing about 3,100,000 duct feet, 1,460 manholes and covering some 23 miles of the most important streets. The capital cost is about $1,900,000.

As previously shown, cables occupy 37 per cent of the duct space in occupied districts. These represent an investment of about $1,400,000. on the part of the various lessees.

The commission has awarded some $220,000. to the various companies as compensation for overhead material removed from the streets.

In conclusion, reference must be made to the excellent co-operation that exists between the commission and the various public utilities; for without this, in an undertaking of this kind, progress in construction and successful operation are impossible.

Figure No. 1.—Lake Louise Hotel — Completed Structure.

Extension to Lake Louise Hotel

A Description of the Extension to the Canadian Pacific Railway Hotel at Lake Louise, constructed under Winter Conditions.

H. S. Bare, A.M.E.I.C.
Hotel Construction Department, Canadian Pacific Railway.

Paper read before the Western General Professional Meeting, Banff, Alberta, July 13th, 1925.

The site of the extension to the Canadian Pacific Railway Company's hotel at Lake Louise, Alberta, is 5,670 feet above sea level. The hotel is 630 feet above the trackage of the main line, and the distance from point on railway where material was unloaded is nearly four miles.

There is a narrow gauge track joining railway to hotel, used in summer for gasoline driven passenger train cars. These cars were converted into flats and side dump ballast cars, and used for hauling material. An oil burning dinkey locomotive was also used for the heavier loads and pushing the snow plow.

The track is of sharp curvature, has a considerable stretch of 4 per cent grade, and is mostly built on side hill and in cuts, and it was no small part of the problem to operate the tramway during the severe weather. Heavy snow was common, and the temperature reached 58° below zero. Over 30,000 tons of material was hauled.

Two spurs, one overhead to the first floor of the hotel, were built and were of great value in getting materials close to the work. The contractor had to maintain a camp and feed upwards of 350 men. Accommodation was provided in the helps quarters, which were already equipped with radiators and piping, and as the boiler house was operated all winter, everybody was comfortably warm.

Power Supply

Power was at first taken from a 187-k.w., generator, fed by a 33-inch flume of wood staves. The power house is 3,300 feet from the lake, which is fed by the glaciers on Mount Victoria and Mount Lafroy. It receives very little water during the winter. The intake is shallow, and early in the job it was necessary to instal a steam unit and close the power house entirely.

The power house equipment was insufficient for the enlarged hotel, and a new generator was installed to take care of it. This unit is a Pelton reaction turbine driving direct a 375-k.w. generator, fitted with direct connected exciter. It is rated 440 h.p. when operated at 600 r.p.m., under a net effective head of 108 feet. A new foundation and extension to power house was built to take care of this, and the power line to hotel increased by the installation of three No. 2 cables.

The original boiler house equipment consisted of three 100-h.p. return tubular boilers, and an additional boiler of the same type was installed. As the old boilers were set too low for maximum efficiency it was decided to lift them to the level of the new boiler. The work in the boiler house included dismantling all boilers, feed water heater, pumps, water softener, etc., and moving to new locations, and it was not possible to start this work until late in the job, as it was necessary to keep the boilers in service. In fact, three additional temporary boilers were later set up in shacks to assist in heating the shell; the combined h.p. of these was about 200.

General Description of Hotel

The extension is a modern fireproof building, consisting of steel frame, (of 9,400 tons), reinforced concrete and tile floors; concrete, brick, stone and stucco walls; tile partitions; sloping roof of copper, and flat roof of tar and gravel laid on precast gypsum blocks. The finished floors are of quarry tile in the principal rooms, with Tyndal stone interior trim.

It is heated by a two pipe low pressure vacuum system, radiators being supplied with thermostatic traps; about one pound pressure is carried and all condensation is returned to feed water heater by means of Nash electrically driven vacuum pumps.

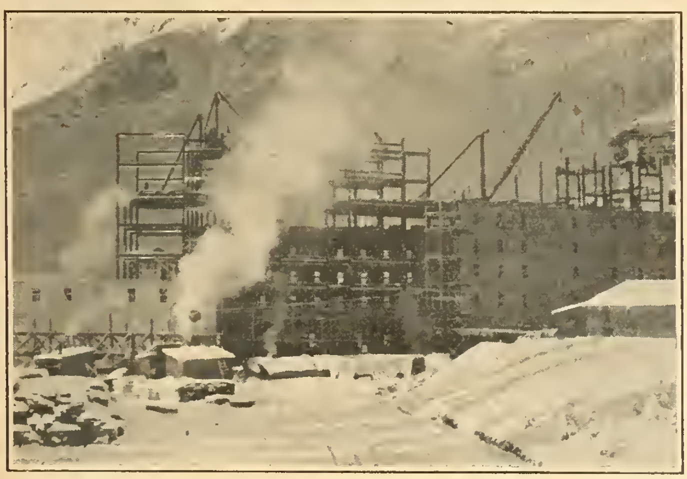


Figure No. 2. — Lake Louise Hotel — Erection of Steel Work and Hoarding.

Figure No. 3. — Lake Louise Hotel — Showing Hoarding Partially Removed.

Domestic hot water is heated by steam through Toby heaters with hot water storage tanks and supply and circulating lines through the building. Fire hose and racks are located at each end of all bedroom corridors.

Two additional storeys of bedrooms had to be installed over a part of the present concrete wing. Columns were carried to foundations through openings made in the floors, and the additional steel work hung from girders supported at the top of these columns, and carried over to the columns of the new wing. Numerous alterations were made to the old wing adjacent to new work to make the new building line up.

The dimensions of the building are as follows:—52 feet wide; 285 feet long; and 115 feet high. There is a basement, ground floor and eight bedroom floors; every bedroom has a private bathroom, and the additional bedrooms number nearly 300.

The basement, which is reached by stone staircase, contains various service accommodations, and the following public rooms: — Tavern, shoe shine, billiard room, toilets, barber shops and ladies hairdressing parlour. The photographer's dark room is also here.

The entrance to the hotel is through a large covered porch from the station to the main building. The rotunda, a room 38 feet wide and 80 feet long, faces the lake. Opening off the lounge is the main office, as well as the bank, information office, ticket office, telephone, entrance to elevators, news and curio stand, etc. From the lounge there is a stone staircase 10 feet wide, leading to the main dining room, located in the existing fireproof wing. This staircase serves a mezzanine floor on which are located the ladies rest room and doctor's office. There is a staircase from top to bottom at each end of the building. On the main floor, in addition to the rotunda, there is a lounge overlooking the lake through large one piece plate glass windows. There is also a ballroom, 36 by 70 feet, which opens out on to a loggia and balcony.

Excavation Commenced

The work of excavation commenced properly on September 1st, 1924, but very few men could be employed until September 15th, when the hotel closed for the season. The building rests on gravel and partly on glacier clay.

The usual table tests of the soil were made. The table legs were each 4 by 4 inches in section, made up of two 2 by 4 pieces. After twenty-four hours the legs could be reduced in area 50 per cent, and the load per square inch doubled by taking a 2 by 4 off each leg of the table.

There were a number of unusual conditions to be overcome in constructing a large building during the winter in this isolated locality, and it was decided before the building was commenced to build the new hotel inside a heated temporary house. An outside hoarding was erected around the entire building, approximately five feet away from the building line. This consisted of 2 by 8 studs at 33-inch centres in the lower panels, and 2 by 6 studs higher up. These were capped, strutted and braced to the steel frame at each floor, and were sheeted on the outside with common ⅞-inch boards, (not T. & G.), and lined inside with a heavy roofing tarred felt. Only one thickness of sheeting separated the new work from the weather, and as some natural light was necessary and desirable, openings covered with calico were left at frequent intervals.

The hoarding was erected as fast as the erection of the steelwork would permit, and suspended forms for the concrete floors were also erected right behind the steel workers. Heating coils, consisting of about 10,000 lineal feet, of 1¼-inch pipe, with necessary headers was installed and connected to the boiler house, but as the weather got colder the three temporary boilers were hooked up. As soon as conveniently possible, the permanent radiators in the rooms were connected as the construction of the exterior walls prevented a lot of the heat from the coils from penetrating inside the building; additional heat was also required to dry out plaster, etc.

After about six floors of forming were in place the fifth floor forms were flashed with wood across to the hoarding. Concrete was then poured for the lower floors first. The forms and hoarding proceeding immediately behind the steel gang until it was finished. The gypsum block slabs formed, (with two ply of tar and gravel, and a wood and ready roofing flashing to the hoarding), the top of the shell.

The floors were of reinforced concrete, with T-beams at 16-inch centres, formed between rows of 6-inch hollow tiles 12 inches wide; 2½ inches of concrete was floated over the tile and the total depth of beam is 8½ feet. The web is 4 inches wide and the span of the slab 17 feet.

Reinforcement consisted of two ⅝-inch round bars, but in a narrow web one bar of equivalent area would probably be better. The gravel was used straight from the pile without separating sand and stone; it was heated by steam nozzle buried in the pile near the mixer.

It has been found that an extra thickness or so called finishing coat laid on rough floor will not stand in an unheated building, and the whole thickness of the floor was poured and finished at once. At the right moment finishers got to work and sprinkled with a heavy coat of sand and cement and floated the floor to a fine finish. Eight floors were poured in seventeen days.

Completion of Work and Removal of Hoarding

Practically all the work inside and outside of the building was finished before the removal of the enclosure, and the building completed in every detail, the furniture installed, and the hotel ready for guests June 1st, 1925. The grounds were graded and planted, and no evidence of construction remained. I have not gone into details of this construction which were common to any modern hotel, but believe that it has been demonstrated in this job that winter building is quite as fast and satisfactory in many ways as summer work.

The hoarding and heating undoubtedly cost a considerable sum of money. The labour market was much better; the men were content to stay on the job away from home; there was no lost time due to weather conditions, and many men had work and occupation who would otherwise be unemployed. In fact, I doubt whether we could have kept the men on the job as successfully in the summer.

The architect, Messrs. Barott and Blackader, of Montreal, did the work under the supervision of J. W. Orrock, M.E.I.C., engineer of buildings, reporting to J. M. R. Fairbairn, D.Sc., M.E.I.C., chief engineer. The contractors were Messrs. Carter-Halls-Aldinger Company, Ltd., of Winnipeg, Sam Foxe being their construction superintendent. T. T. Rutherford was clerk of works, representing the architect; Basil Gardom, supervisor of hotel building construction was general supervisor of the work. H. S. Bare, A.M.E.I.C., assistant engineer, was general building inspector, reporting to Mr. Orrock.

Some Economies in the Steam Plant

Suggested Improvements in the Installation and Operation of Steam Plants to Eliminate Avoidable Losses in Increasing the Efficiency.

James H. Blake, A.M.E.I.C.
Mechanical Superintendent Department of Lands, Province of British Columbia.

Paper read before the Victoria Branch, The Engineering Institute of Canada, February 19th, 1925.

In the course of this paper it is not my intention to enlarge very fully on any one particular economy which may be effected in any particular plant, but more to outline some of the lines along which our energies may be directed in the endeavour to take care of avoidable losses and thus raise the efficiency of the equipment.

We will suppose that a man purchases certain equipment. This performs according to specifications, is efficient and economical in operation and gives a good return for the capital invested. He is satisfied. Is he not? Suppose on the other hand that other equipment has been purchased through lack of knowledge or judgment or even false persuasion, and is run at a loss on account of not doing the work either in time, quantity or quality, or is improperly installed or not properly handled. Is this man satisfied? I think you will agree that he is not, and that he would be pleased indeed to have some one advise him so that the machinery might be altered or handled to do the work expected, and thus give him an adequate return for the initial expenditure.

Owners of plants are as a rule looking only for a reasonable profit on their working capital, and if it is possible to get better results from even one part of the equipment than has been received in the past, a step in the right direction has been made. The old saw, "All roads lead to Rome", is very true when applied to steam power production if Rome represents the fuel bill. When the fuel bill increases "look out for storms", while if it diminishes every one is more satisfied; on the one hand the party responsible for the discovery of the leak or means of increased efficiency, and on the other hand the owner, on account of the decreased expenditure.

As business grows in any place where steam power is employed, the demands on the power plant increase until the question of either reorganizing or extending that plant must be considered. The load increases and calls for more plant, more machinery, more outlay, while the owner naturally shrinks from incurring the large capital expenditure necessary to install additional plant or even to bring his plant up to date.

There are ways, however, in which the capacity of many existing steam plants may be materially increased for a comparatively small sum and the most direct way to go after the problems involved is, after a complete survey has been made, to do away with the losses as far as possible, commencing, of course, with the most obvious.

Causes of Loss of Economy

The fundamental idea involved in power production, from the fuel pile to the shaft power, is the saving and utilization of the elusive B.t.u., and this endeavour is unfortunately offset by the indirect methods of applying the heat units available, and by the losses and wastage due to, in part, these methods which terminate in that final inefficient transformer of heat energy to shaft horse power, the steam engine.

We have the losses due to imperfect combustion of fuel, loss of heat in flues and chimneys, lost energy in the form of condensation and radiation, lost power in exhaust steam and, last but not by any means least, the visible and invisible leaks in poorly designed or badly fitted equipment.

The heat loss in incomplete combustion of fuel is due to many conditions and one fruitful cause is faulty design of the furnace in that one or more of the principles of combustion has been disregarded. The most frequent offense has been due to allowing insufficient opportunity for complete combustion before the gases come in contact with the boiler and they are chilled or reduced below the temperature at which they will burn.

Insufficient draft may be due to air leaks in the boiler setting, stack too small in area or not of sufficient height, poor design in combustion chamber or breechings, or restricted or tortuous passages between fire and chimney. Insufficient draft causes incomplete combustion because sufficient air is not provided to properly combine with the volatile hydro-carbons, etc., which are distilled from the fresh fuel, and allow these gases to pass off either wholly or partially unburned. The result is smoke, soot and loss.

Poor firing is another avoidable source of heat loss. A thin clear fire gives better results than a fire having a thick fuel bed. Overloading a boiler frequently reduces its efficiency because it is not able to absorb the heat from the burning fuel fast enough and thus the escaping gases are of an extremely high temperature. Insufficient air spaces in grates and poor air supply are also factors which must be considered.

The heat lost in flues and chimneys may amount to thirty per cent of the heat value of the fuel and besides being among the most serious losses is also one of the easiest to take care of. This heat should be used to heat the water in the boiler but instead it is being carried off unused. Of course under ordinary conditions the loss of a certain percentage of the heat is unavoidable and if natural draft is used it is expedient that the gases leave the chimney at a temperature quite considerably higher than that of the atmosphere, as we know it is this condition which produces the necessary draft. The extra heat not required for draft purposes may be utilized to a great extent as I will point out later.

An entirely unnecessary waste which in some plants is quite considerable is caused by excess air passing through the furnace, absorbing the heat there and passing on to the outer air without giving up any of this stolen heat. Theoretically about 12 pounds of air is required to burn 1 pound of coal depending on the quality and composition of that coal, but in practice, under fairly good conditions, 18 to 20 pounds of air per pound of coal is used. However, with bad firing, cracked brickwork, poor design or other conditions the quantity may rise to 70 or even 80 pounds.

It will thus be seen that if too much air is admitted to the furnace the excess will be heated up, taking away useful heat, lowering the temperature of the fire and causing incomplete, or at any rate, inefficient combustion. Again if too small a quantity of air is admitted there will be incomplete combustion and consequent loss of heat because the gases will be driven off, but not consumed, and pass thus to the chimney. We will also have smoke, which, however, will be a greater offence against public health and cleanliness than lack of economy, as the loss by unconsumed carbon is small compared with losses in unconsumed gases and the other heated products of combustion.

Means of Utilizing Waste Heat

There is still a large percentage of heat passing up the chimney, which is lost even with the increased economy obtained by efficient regulation of the air supply, and part of this is recoverable to a certain extent. One way in which this heat may be utilized is by the use of an economizer, installed in the path of the gases from the furnace to the smoke stack. The best known form of economizer is that which consists of a bank of tubes connected by headers through which the boiler feed water is passed. These tubes are kept clear of sooty and tarry deposits on the outside by scraping. As the flue gases are frequently at a temperature approximating 650° Fahrenheit the feed water may be heated quite considerably, say to about 200° Fahrenheit, while the flue gases will have given up a proportion of their heat in performing useful work and will be reduced in temperature to somewhere around 400°.

The saving obtained depends entirely, or at any rate to a great extent, on the condition of the plant previous to installing the economizer, but as a rule the cost will be regained in a very short time by the saving in fuel which may be anywhere between 5 and 25 per cent.

A further saving in most cases, may be obtained by superheating the steam and thus raising its temperature to a point higher than that due to its pressure and so drying it. Superheat is most valuable in a factory where long stretches of pipes supply steam to isolated engines or are used for heating, etc. As we all know, steam as supplied by the average boiler is more often wet than dry and condenses in the pipes because of the loss of heat by radiation. The consequent result is the continued loss by traps or drain cocks. Now, when the steam is superheated, this does not take place to nearly such an extent as the drop in temperature is not sufficient to condense the steam, and thus, although the steam may have lost its superheat before it gets to the required place, it is still in a dry condition. The economy in using steam which has been superheated in an engine is due principally to the superheating ensuring the absence of water from the cylinders during expansion. When water is present during expansion it evaporates as the pressure falls and in doing so abstracts a large quantity of heat from the cylinder walls. The cylinder walls have to be heated again and this heat is in turn abstracted from the incoming steam. As to actual advantages take the case of a single boiler burning coal, say costing $5.00 per ton and using 3 tons per day, 300 days in the year, the total annual cost for fuel would be $4,500. A superheater would cost, roughly, for this boiler, including piping alterations, about $800. The saving will be at least 10 per cent, or may be 15 per cent. If only 10 per cent were saved, the total cost would be repaid in a very short time, — less than two years, — besides the further advantage of increased output, obtained by the fact that steam only, not a mixture of steam and water, is now passing through the pipes.

Condensation and Radiation

Another serious loss is common in the average factory due to condensation and radiation in the steam pipes, the amount of which is seldom realized. As we all understand that steam engines are heat engines, it is very evident that our aim is to get all the heat to them that we can. Therefore steam pipes are not fulfilling their proper function, (although they may be useful as radiators), if we allow this heat to escape by radiation, and thus be expended in heating air, instead of being led, with as little loss on the way as possible, to the engine or other apparatus. Conveying steam in uncovered pipes or badly covered pipes, a condition which is much too common, is to be compared with the attempt to carry water in a basket, and some valuable experiments have been made with a length of 6-inch steam main to determine the amount of this loss.

Taking the liberal figure of 30 pounds weight of steam per hour as equal to one horse power, the continuous loss for 100 square feet of pipe amounted to slightly over 2.5 horse power, with the pipe bare. With the best coverings this loss only amounted to about 0.22, or less than a quarter of a horse power, i.e., something like one-twelfth of its former loss. One hundred square feet of radiation surface on a 6-inch pipe is obtained in a length of about 63 feet, so that the loss throughout a large factory may be very considerable.

A loss of this kind, which may be so easily reduced, has little excuse for its continuance. A common fallacy in this respect is that the pipe is a small one and the loss is therefore negligible. As a matter of fact the smaller the pipe the greater the loss, that is, if it is expressed as a percentage. This may be explained in this way: a 2-inch pipe has four times the area of a 1-inch pipe, but has only twice the surface, (approximately, neglecting the thickness of the metal). Evidently then the ratio of cooling surface to sectional area of the larger pipe, is only one-half that of the smaller one.

In laying out steam piping the object should be to avoid as much as possible the use of small pipes, and to keep the steam in the main pipes until a short and direct run can be made to the point at which the small supply is required. As has already been indicated, if the steam is superheated the loss should be reduced to a marked degree.

No less important than covering the steam pipes is lagging the exposed surface of the boiler. The benefits to be obtained in this way are two in number: first. the heat is under control; second, it will be easier to keep up the steam pressure in the boiler as this great radiation loss would be eliminated.

This brings us to another source of loss in working. Many men in charge of steam plants, especially the smaller plants, have the belief that it is easier on the boiler and engine if they keep the steam pressure well below the blow-off pressure, and as a result will carry from 10 to 20 pounds less pressure. This involves loss in several ways. In the first place, the necessary volume of steam required at the low pressure is considerably more than at the higher, so that the loss in transmission through the pipes is more. The pressure at the far end of the pipe, also, is very low, so that the engine will not only be running uneconomically but will be running under speed and so the work of the factory suffers. Also, if the boiler is occasionally pressed for steam, there is not as large a heat reserve at the low pressure as at the higher pressure.

Another fault which is very similar in its effects is that of having reducing valves in a heating system, at or near the boiler, thus having low pressure steam and lots of condensation where high pressure steam might be carried with very little condensation.

Exhaust Steam

In most factories where the engine power is small the engine is run non-condensing. This is not an economical method of using steam, but the installation of a condensing plant would be out of the question as the cost would probably be too high to justify this step or there may be other conditions which make it inconvenient to make the change.

A considerable portion of the heat in the exhaust steam, however, may be utilized very simply and at a comparatively small cost without serious alteration to the plant. What I refer to is the feed water heater, which utilizes most of the exhaust steam.

In the open feed water heater where the exhaust steam mixes directly with the feed water, being condensed in the process and giving up its heat to the water, it has the disadvantage of mixing any oil or grease entrained in the steam with the feed water, unless some arrangement is made for its removal. This is liable to cause complications and additional expense. What is better, from many points of view, is to keep the exhaust steam separate from the feed entirely, the water being heated by conduction and radiation as in the closed type of heater. Such a heater is very efficient, does not contaminate the feed water, and, if properly designed, puts very little back pressure on the engine.

The economy obtained is a very considerable one. As a close approximation, it may be taken that 10 degrees Fahrenheit added to the temperature of the feed water will mean a saving of one per cent in fuel; that is, the exhaust steam has been robbed of this amount of heat which would otherwise be wasted. Taking, then, feed water at an initial temperature of 65 degrees, and raising it in the heater to 180 degrees, the saving is 115 divided by 10 or 11.5 per cent. This increase is easily obtained, and the alterations required for the installation are usually small and can nearly always be carried out without interfering with the running of the plant or factory.

The introduction of cold feed water to a boiler is not to be recommended as this causes severe strains due to the difference in temperature, and thus decreases the life of the boiler. So, here we have a further economy and advantage.

Assuming that the feed water heater is placed on the suction side, then the limit of temperature is that set by the boiler feed pump, while if an injector is used the water cannot be more than about 130 degrees Fahrenheit. If, however, the heater is on the discharge side of the pump, the limit is raised and a much higher temperature may be utilized. The exhaust steam may be used also for other purposes, such as the heating of buildings, heating water or other operations.

Another source of loss may be found in the using of a large number of small steam engines scattered throughout the plant. This, of course, again introduces radiation and condensation losses. The remedy is to replace these small engines with electric motors by installing a central generator to look after this end of the power requirements.

The amount of water blown off at drain cocks and badly adjusted steam traps is responsible for considerable loss, especially when the water goes direct to the sewer, as every eight pounds of water evaporated and condensed represents approximately one pound of coal burned under the boiler. Thus we see that the loss in a year is one which cannot be overlooked. Do away with steam traps if possible and return the proceeds of condensation direct to the boiler, or, if this cannot be done, return it to the feed tank, but *take care of it*, as every B.t.u. represents a certain amount of money.

Leaky valves and joints and badly packed glands are responsible for a great deal of loss. Engine drains are left partly open to get rid of the water. This, however, brings us back again to the necessity of well covered pipes and the advantages of superheated steam, as this loss arises on account of the extreme wetness of the steam. Often the valves are allowed to leak in steam lines because of the time and expense incurred in taking them off for refacing. There are now on the market, machines with which the valve seat may be faced without disturbing the valve from its position in the pipe line, and in any factory where there are a large number of valves such a machine would pay for itself in practically no time.

There are certain advantages accruing to the use of high speed engines in comparison with slow speed engines which may be briefly stated as follows:

First: — For a given steam pressure and cutoff, the power of an engine varies directly as its speed. There are four factors which determine the power of any engine: (1) The mean effective steam pressure; (2) the area of the piston; (3) the length of stroke of the piston; and (4) the speed of the piston. In other words, an engine with a cylinder of a given diameter and length of stroke, moving under the influence of a given mean effective pressure, will develop power in proportion to its speed, and if the speed be doubled the power will be doubled. In order, then, to obtain a given power under a given mean effective pressure we require an engine only one-half as large if we double its speed. This is the first argument for high speeds, economy both in first cost and space.

Second: — In most cases where power is supplied by a steam engine, it must be transmitted to other shafting, which usually runs at a much higher speed. Whether this transmission is by belt, or spur or friction gearing, it can be performed more efficiently if the ratio of the speeds is not too great. To cut down this ratio idler or intermediate shafts are employed, otherwise, with belt driven apparatus, the arc of contact of the belt on the driven pulley is so small as to invite serious slippage. By increasing the speed of the engine this shafting may be eliminated, and in many cases the machine may be direct connected. In spite of all that may be said against this practice, it cannot be denied that it often saves a very considerable amount of space.

Third: It is claimed that the economy in the use of steam in high speed engines far exceeds that of the older slow-speed engines and there is a good deal of justice in this claim, because one of the main losses in the engine, i.e., the cooling of the cylinder walls and steam passages during exhaust and re-evaporation, is greatly reduced. As far as re-evaporation is concerned, it is obvious that the cylinder walls are chilled very considerably during this process and the more steam is passed through the engine in a given space of time the less will be the re-evaporation.

Fourth: High-speed engines must be high-pressure engines, i.e., the steam pressure should be maintained until it reaches the piston and the governor should change the point of cut-off, and not act on the steam pressure as on a throttling governor. The reciprocating parts should be as light as possible, consistent with strength. The steam should be cut off early in the stroke, and there should be a moderate amount of compression to cushion the reciprocating parts. This will give us further efficiency in operation, since, if we use higher pressure steam we use less of it.

Summing up, therefore, we find that less cost, less space and less steam is required on all counts.

No power user can afford to neglect any possible means of reducing his losses, and thus his operation and maintenance costs, because of keen competition and rising cost of production, etc., and by having his power plant carefully looked into, and savings made, such as suggested, the cost of his power will be less and his plant will run more efficiently. The advice of an expert on such matters has often obviated the necessity of laying down more boiler power and other additional plant, by getting better value out of that already installed, and the need for such advice arises from the fact that each case must be studied from its own individual standpoint, and attention paid to the special conditions of each one.

I have no doubt that some of the points mentioned may be termed trivial, but the old saying, "Look after pennies and the pounds will take care of themselves," holds as good here as anywhere else, and in many cases by eliminating these small losses higher power may be developed without increasing the size of the plant.

Highway Work in the Canadian National Parks

Construction Details applying particularly to Park Highways designed for Tourist Traffic.

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Highway work in the National Parks of Canada can be regarded from a slightly different view point to the highway work in districts outside the park areas. Park highways have their main use for recreational purposes and apart from tourist transportation, are not used to any extent commercially.

The tourist season in the West is practically limited to four months of the year, which means that we have an intensive motor traffic over that period, moderate traffic over, say, another three months, and little traffic for the balance of the year. As all our main national parks are in the Rockies or Selkirk ranges, the construction season unfortunately coincides with the season of heavy traffic.

In the parks there is a fairly large amount of engineering work of a very diversified nature, including water and sewer systems, telephone and electric light systems, river protection work, drainage, etc., but highway work is our largest single operation and for the present year about forty per cent of our expenditure on engineering works will represent highway construction and maintenance.

There is a very good reason for this expenditure, namely, to open up and make accessible our park scenic areas to motor cars, thereby promoting tourist traffic to the parks and to Canada. The length of stay of tourists in any district depends on the number of scenic drives and scenic points available to them. Increasing these, increases the stay of tourists, with a resulting increase in tourist revenue.

Prior to 1918*, the majority of tourists came to our parks by train, but since that date the number of motorists has increased rapidly, until in 1924, out of a total to all parks of 271,996 visitors, 90,126 came by motor car. This is an increase of 100 per cent over our motor tourist figures for 1922. The greatest increase followed the opening of the Banff-Windermere road, and indicates clearly the value of roads in promoting tourist traffic.

There are about 375 miles of motor highways in our main western parks, namely, Banff National Park, Kootenay Park, Yoho Park, Glacier Park, Jasper Park, and Revelstoke Park, and practically all of these roads are in mountainous districts. This mileage accordingly represents a considerable investment, an investment that must be kept up and properly maintained to pay dividends. Motorists will not take lengthy pleasure trips on bad roads.

* Total visitors 78,452.

Location and Construction Problems

A discussion of park highways naturally divides itself into location, construction, and maintenance, but the limited time available only permits a brief reference to each of these phases. Factors affecting location are grades, curvature, construction costs, road material, and the scenic attractiveness of the possible routes available. The possibility of the location being affected by floods and snow slides is, of course, considered. On our main highways a maximum grade of 6 per cent is set, and no curve has a radius of less than 50 feet. On all sharp curves an endeavour is made to widen the road from one and a half to two times its normal width. The same engineers are kept on location work, and with their thorough knowledge of the parks, a very satisfactory location is usually obtained.

The highway construction is carried on by both day labour and contract. In view of the short construction season, and of the fact that our own engineering staff has a wide experience in road construction in mountainous districts, day labour operations are favoured. It has been found that by a little organization and planning, we can construct new roads at practically whatever rate desirable. In order to avoid the heavy capital investment that would be required for very large gangs, any new grading work is usually spread over the four summer months.

The standard width on tangents for new road work in the parks is a 16-foot clear wheelway with side ditches, continuous with the road section, so that there is from 18 to 20 feet of width available for traffic.

Only two or three points will be mentioned in connection with the construction operations that might be of interest. One is the necessity and eventual economy of grubbing completely and thoroughly between the limits of grading and to a depth of at least two feet, below the finished grade line. Roots and small bushes that are not grubbed out will be a hindrance to proper maintenance and conditioning of the road until they are removed.

Another important point is the cleaning of the right-of-way, which is the original forest floor, of all pine needles, moss, decomposed vegetation, and other debris. Such material is, of course, absolutely useless for road material, and it is removed from the grade and wasted before the ground surface is broken with the plow. This is done with the road grader, whenever the slope of the ground permits. On numerous occasions we have traced a soft spot in the completed road to the incorporation of some such material in the road bed.

Provision for adequate drainage is, in these mountainous areas, possibly the most important fact for consideration. The roads in many instances are very near the headwaters of streams, and in some cases near the timberline, with the result that the spring run-off is sudden and intense. A drainage opening may be dry in the morning and full to overflowing by six o'clock in the evening. A watercourse may be dry for ten months of the year and carry a considerable volume of water for the months of June and July. Our engineers are encouraged to travel over roads under construction after severe rainstorms, and observe the run-off in existing drainage structures and in the various watercourses.

The crowning of the roads will be referred to only briefly. On the average this will approximate one-half inch for every foot of width, an eighteen-foot road being given a nine-inch crown. The actual crown given, however, depends on the rainfall of the locality and the material in the road bed. For example, on the Banff-Windermere road, our rain gauges show that there is 35 per cent more rain in the Vermilion River valley just west of the Continental Divide, than in the Kootenay valley. The material in the Vermilion section has more clay than the Kootenay valley material. Consequently the road through the Kootenay valley does not require as much crowning as that in the Vermilion section. In addition to being a drainage feature, crowning is a great advantage to proper maintenance. A crowned road is easier to shape and maintain with the grader than a flat road.

In view of the high curvature on our mountain roads, special attention has been given for some time to superelevation on curves. Those of you who have motored on the Edith Cavell road in Jasper Park or on the Banff-Windermere highway, will have noticed how easy it is to drive the banked curves.

Maintenance Considerations

Our park highway system is in the gravelled road stage at present but with the steady increase in motor traffic we are considering certain treatments to assist and reduce the cost of maintenance.

Nine years ago, at a Canadian Good Roads Association meeting, it was stated that fifty cars a day was then the accepted limit of travel on gravel roads. The fact that gravel roads in Canada and the United States now carry from 200 to 500 cars a day, indicates how far maintenance of gravel roads has advanced.

The use of screened gravel, permitting regrading and reshaping of gravel roads with a maintenance grader, and the use of what is called a "floating coat" of fine screened gravel over the main gravel base, has increased the carrying capacity of gravelled roads 100 per cent. Wear on a gravel road is indicated by ravelling, eventually producing holes, and by corrugations. Ravelling and holes are remedied on our park highways by the maintenance grader, usually after rain, or in a continued dry spell by first wetting the sections of road to be reshaped. Corrugations in a gravel road, often started by sudden acceleration or retardation of cars, can be removed by reshaping with a grader working from the sides to the centre of the road.

However, a floating coat of fine screened gravel about ¾ inch thick is found to be the best remedy for this trouble, which has developed to a considerable extent in the south. I have found that the ideal thickness of gravel on our roads is between four and six inches. After being applied to a prepared subgrade the gravel is well worked over with the grader and is ready for comfortable driving almost immediately. A thicker coat of gravel, unless placed in layers and rolled, is bound to become wavy due to the shifting of the loose gravel under a fairly compacted surface.

A coating of four or five inches of screened gravel, with no stones larger than 1½ inch, will give a good road for two or three seasons, providing it is lightly regraded once or twice during each season. During the third year it is advisable to freshen the original gravel and provide new binder by applying a fine screened coat about one inch thick. This surface coat should consist of well graded gravel passing through a half-inch screen.

In regrading a gravel road, the best policy is to start from the sides and work in. The tendency of most maintenance men is to shave off the top of the gravelled road until they reach the bottom of the holes, rather than to fill in the holes from the material that has been pushed out to the sides of the road. Incidentally I might say that the effect of balloon tires on our gravel roads was regarded with some interest. It has been found however, that they are no more destructive, and I think, personally, not as destructive, as high pressure tires. The latter tires, by their hardness, knock out the binder and small stones, while the balloon tire flows over the road and does its damage chiefly by suction. When the road is damp, or treated with light oil, no additional damage will be done by balloon tires.

Treatments for the Elimination of Dust

Considerable research work, and a large amount of discussion, has taken place throughout the country with regard to the best treatment of gravel roads. Dust is the evidence of wear, and its elimination means comfort and maintenance economy. A light, non-caking oil, just heavy enough to lay dust, is satisfactory. During last winter, we carried on experiments with various grades of oil and this year are applying a medium fuel oil to sections of road in Banff, Kootenay and Jasper Parks. A similar oil, laid two years ago on the Banff-Windermere road, gave excellent service, did not form a hard traffic mat, and is still in evidence at the present time. Heavier asphaltic oils, such as 40 per cent, 60 per cent and 80 per cent asphalt, are a satisfactory treatment for compacted gravel and macadam surfaces, but form a traffic mat. This traffic mat pits badly when wearing out and must be scarified before the road can be properly repaired or re-graded. Consequently we do not favour the heavier asphaltic treatment, except for town streets and macadam roads in the vicinity of our townsites.

Another treatment of gravel roads that is coming into favour again, is the application of calcium chloride. This is applied in the form of a flake, the total application per season being about two pounds per square yard of gravel surface. The road surface is first scratched with the grader to provide some loose material to combine with the calcium chloride. As you are aware, this chemical has a great affinity for water, and will absorb sufficient moisture during the night to keep the road surface fairly damp throughout the day. It has given excellent satisfaction in various localities and experimental stretches of park roads, treated with it last season, showed good results. One great advantage of calcium chloride treatment is that a hard traffic mat does not form and the road surface can be floated with a grader at any time. Some four miles of the Banff-Windermere road, are being treated with calcium chloride this year.

Another more permanent form of treatment, which we hope some day to utilize more or less extensively in the parks, is the application of tar sands from the McMurray districts. As far back as 1916 the Parks Branch reserved some two square miles of tar sand deposits for use in the parks, in the expectation of its eventual use in the townsites and on the main highways. In 1923, some 580 feet of tar sands were laid on a compacted gravel road in Jasper Park, with very excellent results. The McMurray tar sands were mixed with an equal quantity of screened gravel as heating proceeded, laid two inches thick on the prepared gravel subgrade, and rolled. The resulting surface has all the appearance of sheet asphalt paving and does not become as slippery in wet weather. It is proposed this year to lay a short experimental stretch in Banff.

A discussion of park highways would hardly be complete without a brief mention of the possibility of motor accidents. Considering the elements of danger that are unavoidable in the case of mountain roads, accidents are few, and in the most instances are due to some neglect or fault on the part of the drivers concerned. We have found that tourists, not used to mountain roads, will not drive near enough to the outside edge of the road when it is on their right. They also have the tendency of rounding curves on the wrong side of the road at high speed, in spite of warnings and signs to the contrary. Last year highway engineers of the states of Montana, Oregon, and Washington, made a careful survey of motor accidents on their state roads, with the following very interesting conclusions:

> "Accidents averaged only 3.23 for every 1,000 cars. Of the accidents occurring, the majority were due to the fault of the car drivers themselves and totalled from 51 to 66 per cent of all motor car accidents in the above three states. Accidents due to the fault of others ran from 11 to 15 per cent; to faulty equipment 9 to 21 per cent; to faulty road conditions 12 to 16 per cent."

It will be noticed that bad road conditions are only a minor cause for accidents, and that the main factor is the deportment of the motorist himself. Every year, on our park roads, we are trying to reduce the likelihood of accidents by widening bad curves, placing hubguards, and regulating the speed of traffic. That is all that can be expected of any highway organization. The safety of any road really depends on the class of motorist using it, and it will be safe if the latter exercises reasonable precautions.

Discussion on Park Highways

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The subject involves so many varied points that it is not an easy matter to single out special features. On my way to this convention I had the unique privileges and great pleasure of motoring over the far-famed Banff-Windermere highway. All the favourable comments I had read or heard about this highway were fully justified. The evident care and discretion in locating a route combining the aesthetic and the practical, the excellent and permanent nature of construction, the up-to-date methods of maintenance—all such features created very favourable first impressions. Here one finds all types of construction on widely-varied locations, with different kinds of sub-soil and surfacing materials, with evident ranges in moisture and run-off conditions. But particularly on the easterly portion of the highway, where there was stronger evidence of superior construction, the various problems appear to have been solved by superior engineering skill and construction ability.

What particularly impressed one was the manner in which different construction foremen had variously expressed their individual ideas as to crown, surfacing and super-elevation. While the crown appeared to be unduly emphasized in clayey soils all appeared to agree on the necessity for adequate super-elevation at the curves. Because of this super-elevation, the stout protection rails and the significant and systematic warning and guidance signs, one felt a pleasing sense of security and satisfaction in motoring over this highway at varying speeds. The constant wonder was that with such a wide roadbed and so many precautionary measures, there should be any accidents or mishaps on this motor highway. As one visualized the streams of motor traffic sure to result from the wide publicity of this highway one felt doubtful whether an ordinary gravel road would in a few years prove economical in upkeep. Apart altogether from the elimination of dust — at times a source of discomfort — the removal of the fine surfacing by local winds and motor suction and the ravelling of the roadbed during extreme droughts, would appear to demand some remedial measures.

Many highway authorities are discarding the use of heavy road oil treatments in favour of frequent applications of calcium chloride. After frequent applications of heavy oils the roadbed obtains a matted surface liable to produce corrugations and to get mushy under wet weather and winter conditions, and detrimental to regular dragging operations so essential for the preservation of a uniform and fairly even surface of gravel roadbeds. Of course light oil treatments do not offer the same objections. At any rate one feels inclined to predict that within a few years the cost of maintenance, (which I now understand averages $350 per mile annually), will have increased to such an extent as to compel the authorities to hard surface several stretches of this highway presently difficult to keep intact by ordinary maintenance methods. It affords me great pleasure "to give tribute to whom tribute is due"; — the engineers and surveyors who conceived and carried out so successfully this great undertaking are worthy of the highest commendation. Mr. Wardle, the chief engineer of the National Parks Board, should be specially singled out for credit for the major task of designing and supervising such excellent construction work.

The Provincial Highway Department of British Columbia, which I represent, is at present engaged on the construction of highways more or less of this class. The Golden-Yoho Park road, although only 17 miles in length embraces many interesting and peculiar construction features. Chiefly of a side hill nature on grades up to 9 per cent, it involves heavy construction — a 3 mile portion of it comprising 51 per cent solid rock, 14 per cent loose rock, 34 per cent hardpan and only 1 per cent earth, averaging $33,000 per mile for a 14 foot road. The ultimate intention is to form a circuitous route from Banff via Field, through rugged mountainous and river scenery.

Another highway in which intense interest is being displayed by motorists from far and near, is the Fraser-Canyon highway, part of the historic Cariboo road, reaching into the Hinterland of British Columbia. Paralleling as it does in places, one or other of the transcontinental railways, this highway is most daring in conception and of particularly heavy construction involving extensive rock cuttings and short tunnels. Several miles of this highway will cost between $50,000. and $60,000. per mile, exclusive of gravel surfacing. Traversing the Fraser and Thompson River valleys, with its varying panorama of mountain and valley scenery this highway bids fair to be a rival of the Banff-Windermere highway. As proposals are a foot to reserve park areas along this highway, it will become one of the favourite camping grounds in the North American continent. At the present satisfactory rate of progress, it is expected this highway will be open for traffic by the summer of 1926, thus completing the only missing link in the Trans-Provincial Highway of British Columbia.

Western Professional Meeting

Banff, Alberta.

July 11th, to 16th, 1925

Everyone privileged to visit *The Engineering Institute* Camp, at Banff, must have been impressed by the happy choice of site made by the Calgary Branch. With the kind permission of the officers of the Canadian National Parks, our tents were pitched at the junction of the Bow and Spray rivers, and they made a picture which will long remain in the memory.

The undoubted success of the meeting was due not only to the delightful surroundings, but also and in even greater measure to the admirable arrangements, effective organization, and hard work contributed by the branch members. Those who only saw the camp in complete working order on the opening day of the meeting can have little idea of the energy expended by Colonel Whyte, Mr. Boese, Mr. Ford, and the many others who struggled with the delivery and arrangement of the tents, bedding, cooking equipment, and other necessary supplies. Problems of commissariat, water supply, sanitation, and light, all had to be solved; provision had to be made for mail and telephone service, transportation of members to and from the station, and innumerable other things necessary for the comfort of members. All these matters were effectively dealt with, and at eleven o'clock on the morning of Sunday, July 12th, the Camp officially commenced its existence in splendid western summer weather. During the day, we were cheered by brilliant sunshine, but when bedtime came, the bales of blankets were greatly in request.

Arrivals commenced on Saturday and continued during Sunday, so that at the time set for the first meal, lunch on Sunday morning, upwards of sixty names were registered, the numbers being afterwards increased to nearly one hundred.

Sunday was spent quietly in renewing old acquaintanceships, and the real business of the meeting commenced on Monday morning with the first session.

The meeting assembled in the G. W. V. A. hall, Banff, about eighty members and guests being present. On the platform were, The Hon. C. R. Mitchell, attorney-general of Alberta; R. S. Stronach, superintendent of the Rocky Mountain National Park, and Major George A. Walkem, M.E.I.C.

The meeting was called to order at 10.15 a.m. by A. S. Dawson, M.E.I.C., vice-president. On behalf of the Calgary Branch, Mr. Dawson welcomed the members to Banff, and felt confident that the meeting of so many delegates from the East and from the West would be of the greatest benefit to *The Institute* as a whole. He traced briefly the history of *The Engineering Institute of Canada*, the national engineering society of the Dominion, and referred to its growing membership of over 5,300, and to the twenty-four active branches, each under the management of its own chairman and executive committee. Membership in the E.I.C., meant service in the advancement of the engineering profession and service in the advancement of mankind.

After being introduced by the chairman, R. S. Stronach greeted the delegates on behalf of the Parks Department, and spoke of the many engineering problems which arise in the administration of that department, particularly in connection with the roads and highways of the parks, and the methods of dealing with the rapidly increasing motor traffic upon them. The growing popularity of the National Parks is shown by the fact that there are now nearly three times as many visitors as in 1920.

The Hon. C. R. Mitchell regretted the absence of his Honour the Lieutenant-Governor, and desired to welcome the members of *The Engineering Institute* on behalf of the Alberta Government. He anticipated increasing opportunities for engineering work in Alberta, as he believed that this province is now entering upon a new phase of activity both agriculturally and industrially.

The chairman introduced R. J. Durley, M.E.I.C., the newly appointed general secretary of *The Institute*, who thanked the members for the hearty welcome which he had received.

E. A. Wheatley, A.M.E.I.C., registrar and secretary-treasurer of the Association of Professional Engineers of the Province of British Columbia, conveyed a message of greeting from his association. He was sure that the British Columbia association would appreciate the assistance and help which they hoped to receive from *The Institute*.

S. G. Porter, M.E.I.C., representing the Association of Professional Engineers of the Province of Alberta, thanked *The Institute* for arranging this Western Professional Meeting, thus affording to the representatives of the various associations of professional engineers a welcome opportunity for the informal interchange of views.

D. A. Macaulay conveyed to the meeting the greetings of the Canadian Institute of Mining and Metallurgy, and congratulated *The Institute* on the idea of holding a professional meeting in a place like Banff, and also on the enthusiasm shown and the effective way in which the scheme has been carried out.

F. L. Macpherson, M.E.I.C., of the Victoria Branch of *The Institute*, brought the greetings of that branch, and expressed the hope that among the subjects receiving attention at the meeting, questions of classification, remuneration, and employment would receive attention. As a result of activity in this direction, practical results of benefit have already been obtained in Victoria, but the matter required to be continually followed up.

Dr. R. W. Brock, M.E.I.C., representing the Vancouver Branch, expressed the good wishes of that branch, and congratulated the Calgary Branch on the excellent arrangements made for the present meeting.

The secretary read a telegram of greeting from Vice-President F. A. Bowman, M.E.I.C., Halifax; and announced that messages of regret had been received from President Arthur Surveyer, M.E.I.C.; The Hon. C. A. Stewart, minister of the Interior; The Hon. E. M. McDonald, minister of National Defence; W. W. Cory, deputy minister of the Interior; J. B. Harkin, commissioner of National Parks, and Patrick Philip, M.E.I.C., deputy minister of Public Works, Victoria.

C. E. Sisson, M.E.I.C., brought the greetings of the Toronto and Peterborough branches.

J. H. Hunter, M.E.I.C., conveyed a friendly message from the Montreal Branch, and said that during his journey to the West he had been impressed with the responsibility of engineers for the wonderful development of the western country. He felt sure that western activities and enthusiasm would be a great help to *The Institute*, and that the fullest measure of co-operation between the western branches would be available for this purpose.

R. N. Blackburn, M.E.I.C., expressed the good wishes of the Saskatchewan Branch, and drew attention to the fact that that branch had the distinction of including in its membership the first active woman member of *The Institute*, Miss Hazel Marguerite White, Jr.E.I.C.

Robert Livingstone, M.E.I.C., conveyed the greetings of the Lethbridge Branch, and A. L. Ford, M.E.I.C., on behalf of the Calgary Branch, expressed appreciation of all the kind messages which had been received.

Park Highways

The chairman then called upon J. M. Wardle, A.M.E.I.C., chief engineer of the Parks Department, for his paper on "Highway Work in the Canadian National Parks". Mr. Wardle's paper is published in full in this issue of *The Journal*.

Camp at Banff Meeting

Mr. Wardle showed a number of excellent slides illustrating the methods of construction and maintenance used on the parks highways.

F. L. Macpherson, M.E.I.C., of the Victoria Department of Public Works, complimented Mr. Wardle on the excellent condition of the roads under his charge and especially on the effective hub guards provided on curves. He stated that in British Columbia considerable success had been obtained with chloride treatment and with tarvia. He thought that all the western highway departments were crippled by insufficient provision for maintenance, the allowance for this purpose being in some cases in British Columbia as low as $30.00 per mile per annum. Such an amount seemed quite insufficient on roads costing originally from thirty to fifty thousand dollars a mile.

Mr. Wardle stated that on the Banff-Windermere highway a larger amount was available for maintenance, but heartily agreed with Mr. Macpherson's statement that more money should be expended on maintenance.

Reconstruction of The Lake Louise Hotel

There being no further discussion on Mr. Wardle's paper, the chairman called upon H. S. Bare, A.M.E.I.C., of the Hotel Construction Department of the Canadian Pacific Railway, for his paper on the "Reconstruction of the Lake Louise Hotel", which is published elsewhere in this issue.

Entertainment on Monday Afternoon and Evening

On Monday afternoon, motor drives, mountain climbs, golf, and sight-seeing trips were arranged for, the ladies of the party were entertained at tea by Mrs. A. S. Dawson and the wives of the members resident at Banff, and in the evening, Mr. M. P. Bridgeland, of the Topographical Surveys Branch, gave his illustrated lecture on the "Rocky Mountains". His wonderful coloured slides, particularly those of mountain flowers, were especially appreciated. Later in the evening, by permission of the Park officials, the swimming accommodation at the Cave and Basin was reserved for our members.

Visit to Exshaw Works of Canada Cement Company

On Tuesday morning, a visit was paid to the Exshaw works of the Canada Cement Company, where lunch was generously provided by the kindness of the company, and wonderful things to eat were provided by the Exshaw ladies. Some of the party went down to visit the power house of the Calgary Power Company, at Seebe, and the return to camp was made in time for some golf in the evening. During the afternoon, a special meeting of Council was held in the camp. As darkness fell, a lantern and screen was arranged out-of-doors, and Dan McCowan gave a talk on "Wild Life in the Rocky Mountains Park". His wonderful photographs of mountain goats and sheep and other animals, and birds, many of them taken high up on the mountains, were a revelation to the audience, who were delighted with Mr. McCowan's fund of quaint information regarding beasts, birds and fishes.

Alberta Petroleum Geology

The second session for the presentation of technical papers was held on Wednesday morning, with Vice-President A. S. Dawson, M.E.I.C., in the chair. The chairman introduced Dr. O. B. Hopkins, chief geologist of the Imperial Oil Ltd., Toronto, who read a paper on "Alberta Petroleum Geology".

Dr. Hopkins pointed out that a question of great importance to the West is whether real oil fields of the first magnitude exist, and if so, where are they? Interest in this matter was first aroused in 1913, and in 1914 culminated in a boom, which was checked by the war, but has now arisen again, although in a less intense form. A considerable number of wells are being drilled, but in most cases oil production is only reached at considerable depths, and the smaller concerns have difficulty in finding oil by reason of the expense involved. Probably more than ten million dollars has already been spent in Alberta on prospecting for oil, with the result that so far more information than oil has been obtained. Time only will show whether the hopeful anticipations of many will be realized.

Western General Professional Meeting, Banff, Alta., 1925

In describing the methods of oil prospecting now adopted, Dr. Hopkins said that originally drilling was undertaken only where oil or gas seepage or asphalt deposits had been found, this being the case, for example, at Black Diamond. There are many cases, however, where oil exists, although there is no external evidence of seepage. From the geological point of view, the occurrence of oil is usually associated with certain types of rock folding, the oil occurring at the anticline or apex of the fold. It is customary to find gas in the apex, oil on the flanks, and in many cases water below. Oil generally occurs in tertiary or cretaceous formations and is often associated with marine deposits, from which it is thought that oil has been derived from animal or vegetable beds buried n deposits laid down by the sea. Information gained from geological investigation is now more largely used in oil prospecting than heretofore, and fewer people are being led away by prophets who claim mysterious methods of detecting oil beneath the surface. One problem, therefore, is to locate the axis of favourable structures and while this is comparatively easy in hilly country, outcrops are hard to find on the plains, although easier in the foot hills. In such cases, where the folding is gentle, special methods have been developed, and among these may be mentioned:—

(1) The Torsion Balance, which determines differences in gravitational attraction. Where rock of great density exists beneath the surface, the force of gravitation is higher than where the rocks are less dense. A high value of gravity thus often indicates that granite or other dense igneous material lies under other strata. A low indication of the balance may aid in locating strata of low density, as in the case of the salt occurrences in Louisiana.

(2) The seismograph is used to locate hard or soft strata by measuring the differences in the times of arrival of a wave, generated by an explosion of dynamite one-half or three-quarters of a mile from the instrument. The explosion wave traverses rocks at different speeds depending upon their density, and the difference in the times of the arrival of the waves passing through shallow and deep strata gives an idea of the depth of the hard rocks.

A further aid in locating promising localities for investigation may be obtained in Alberta from the consideration of the qualities of the coal in the different districts. It has been found that the percentage of fixed carbon in coal calculated on an ash-free basis depends on the degree of pressure or alteration to which the coal has been subjected, and so far no oil fields of importance have occurred in regions where the percentage of fixed carbon in the coal is in excess of 68 per cent. From this point of view, the low fixed carbon contained in the coals of the plains area is encouraging, whereas near the older coals of the Kootenay formation, success is not so likely.

The results of prospecting in Alberta have shown oil in notable quantities at Wainwright, and at Black Diamond, southwest of Calgary. In the latter case the oil is abnormally light. In drilling, difficulty often arises from the high angle at which the strata lie and from the high gas pressure which is encountered, for example, at Black Diamond. Much skill and long experience is required to put down wells successfully under these conditions.

In discussing Dr. Hopkins' paper, Dr. Allan felt that the advice of such a geologist as Dr. Hopkins could not fail to be of the greatest benefit to the province. As Dr. Hopkins has said, petroleum, especially in the plains, is difficult to discover, particularly where the rocks are covered with glacial material. He said, however, that in Alberta there were some twenty thousand square miles of country where finding oil was a possibility. In the past, incompetent advice and untrue statements had created a poor reputation for the western oil fields. In many cases, geologists had been handicapped by being called in to advise as to the exact points where drilling should be done, on lands which had already been selected and leased in accordance with the advice of dreamers or other incompetent advisers. Thus, in many cases, wells had been put down in places where success was not to be expected.

Dr. R. W. Brock, M.E.I.C., agreed with Dr. Hopkins that prospecting for oil was not the business of the small concern. For success, the very best available technical assistance was needed. It was unfortunate that in the past difficulties had arisen from the government regulations which had tended to prevent prospecting by the large operators. In the case of oil, the small operator has a very little chance of success. Dr. Brock wished to point out that the boom in western Canada oil was in no sense due to any action of the Canadian government or public, but had been engineered by persons who came from outside of Canada, and had secured the public ear by publicity methods of their own.

Mr. Davies directed attention to the importance of concerted action to prevent the indiscriminate putting down of wells. Lack of proper control of salt water and other features encountered during drilling might easily cause irreparable ruin to an undeveloped oil field.

Aerial Photography

Discussion on Dr. Hopkins' paper having been concluded, the chairman called upon Mr. Bridgeland to read a paper on "Aerial Photography", prepared by F. H. Peters, M.E.I.C., director of the Topographical Surveys Branch, Department of the Interior, Ottawa. Mr. Peters pointed out that Canada had taken a leading part in the use of aerial photography for reconnaissance and mapping purposes. In this Canadian work, the flying and actual care of the machines and equipment was in the hands of the Royal Canadian Air Force, while the methods adopted in surveying and photography were directed by the Topographical Survey Branch, who carried out the actual mapping and plotting of results.

At present, the lack of reliable maps in forest country makes it difficult to deal with fires, as the location of natural fire checks, lakes, rivers, etc., is often not accurately known. Such maps are, however, readily made by aerial photography; for example, a practically undeveloped territory 90 by 50 miles situated east of Winnipeg was covered last year by 1,360 photographs. The topography was recorded, and the areas of coniferous and deciduous trees, and the rock formations shown, at a cost of less than one dollar per square mile. Aerial photographs are valuable in indicating the extent of land suited for agricultural, forestry, and mining purposes, and in many cases their use has prevented the settling of land which is really unsuitable for agriculture.

The photographs taken by an aerial survey are of two kinds, oblique and vertical, the former being used where a large area has to be covered without great detail being shown, and the latter being more suitable for recording detail upon a small area, such as a town or city. Last year, 37,000 square miles were photographed by the oblique method, a set of three pictures being taken about every three miles. A striking feature was the carrying out by the Royal Canadian Air Force of a 2,700 mile flight in northern Manitoba, largely in unexplored country. In order to construct a map, it is of course necessary to supplement these photographs by a ground traverse, the stations of which are marked upon the photographs after they have been located.

In the case of vertical pictures, the cost of the survey on a given area is greater, and the flying and photographing is also more difficult, as it is necessary to fly at a uniform altitude, on parallel equally spaced courses, and without any tilting of the camera. Last year, 4,320 square miles were mapped by the Topographical Survey Branch in this manner, a large proportion of this area being surveyed for land and oil survey purposes. The pictures are usually taken at about 12,000 feet altitude. A number of slides illustrating points raised in Mr. Peters' paper were then shown.

Major A. L. Cuffe, A.M.E.I.C., said that the Topographical Survey Branch had taken the leading part in the development of photographic survey methods. He thought that such work was of the greatest value to the country, and mentioned incidentally that it called for the development of new designs of aircraft, quite different from fighting machines, and thus encouraged new construction and the aircraft industry.

Dr. Allan had made considerable use of aerial survey methods in his geological work, and in one case had saved over six weeks' time of a field survey party, by eliminating certain areas which the photographs from the air showed to be not worthy of further examination. He explained the great value to the geologist of the work of the Topographical Survey Branch.

P. E. Doncaster, M.E.I.C., said that in connection with river regulation, aerial photographs could be of the greatest assistance. Photographs of the course of a river, like the Columbia, would enable effective consideration to be given to problems of maintenance and regulation, for the general scheme could be laid out from the aerial photographs, and in this way the points could be decided where a more detailed survey would be needed, thus saving much unnecessary travel and delay.

A. L. Ford, M.E.I.C., pointed out that aerial photographs were occasionally of the greatest value in explaining engineering projects or works to non-technical persons, who are called upon to decide on their financial advisability.

Natural Resources of Alberta

Edgar Stansfield, M.E.I.C., Research Council of Alberta, next gave his paper on "The Natural Resources of Alberta". Mr. Stansfield explained that his real subject was the work of the Research Council of Alberta, which had hitherto been confined to three main lines of investigations, namely, coal, road materials, and geological investigations. Mr. Stanfield's paper will appear in the next issue of the Journal.

Camp Sports

On Wednesday afternoon, the Camp Sports were held, the events including not only the items usual on such occasions, but many specially exciting contests, such as the "Councillors' Race". Prizes were afterwards distributed to the successful competitors by Mrs. A. S. Dawson.

The third and final technical session was held in camp on Wednesday evening.

Vancouver Harbour Development since 1920

Major Geo. A. Walkem, M.E.I.C., read a paper by Major W. G. Swan, M.E.I.C., consulting engineer to the Vancouver Harbour Commission, on the general development of Vancouver harbour since 1920. The paper gave statistics and particulars of the progress made, especially in respect to the increase in loading and storage facilities, elevator construction, increase in number of loading berths, and the amount of merchandise and grain handled.

Major Swan pointed out the great increase in grain movement through the port of Vancouver since 1920, fifty-five million bushels having been shipped in 1923. He considered that particular attention must be paid to berth charges and costs of shipment through the port of Vancouver, as a very small difference in cost was sufficient to determine whether grain would be shipped by the eastern or the western route. The paper was followed by a number of slides illustrating the harbour works.

In discussing the paper, Major Walkem emphasized the importance of the point raised by Major Swan as regards the cost of shipment, and said that the Vancouver people are vitally interested in lowering the cost of handling shipments through the port. He trusted that means would be found for taking the Vancouver Harbour Commission completely out of politics, and felt sure that satisfactory progress would follow if this were done.

E. A. Jamieson, A.M.E.I.C., drew attention to the new bridge across the Second Narrows, which is now approaching completion. It is of the single leaf bascule type, and will give the railways access to North Vancouver.

Votes of Thanks

J. H. Hunter, M.E.I.C., in proposing a vote of thanks to the ladies and gentlemen who had helped to make the 1925 Western Professional Meeting a success, pointed out that this meeting had been one of the most successful that *The Engineering Institute of Canada* has ever held. On his motion, seconded by C. H. Fox, M.E.I.C., it was unanimously resolved that the hearty thanks of *The Institute* be conveyed to the following, for their hospitality and attendance at the meetings, and kind assistance given:—

> The wives of engineers, residents of Banff, and other ladies, particularly Mrs. Dawson, Mrs. Wardle, Mrs. Walker, Mrs. Stinson, Mrs. Childe, and Mrs. Warden.
>
> The Honourable Charles Mitchell, who represented His Honour the Lieutenant-Governor of Alberta;
>
> Dr. O. B. Hopkins, for his paper on Alberta Geology;
>
> Mr. M. P. Bridgeland and Mr. Dan McCowan for their illustrated evening lectures;
>
> Mr. N. B. Sanson for guiding the mountain climbers, and Mr. Davies, the manager of the Canadian Pacific Railway hotel, for his invitation to a dance; Mr. J. B. Harkin, Mr. J. M. Wardle, A.M.E.I.C., and Mr. J. S. Stronach for their permission to use the camping ground, and to enjoy other facilities of the Park; the officers of the Canada Cement Company, particularly Mr. W. D. Armstrong, of Exshaw, and Mr. McGuire, for their hospitality;
>
> The officers of the Calgary Power Company, Mr. G. A. Gaherty, A.M.E.I.C., and Mr. F. J. Robertson, A.M.E.I.C., for their invitation to Seebe.

The thanks of *The Institute* are specially due to those organization and individual members who so generously made special donations towards the financing of the meeting.

Departures began early on Thursday morning, although camp was actually closed until Friday noon. By Friday evening, however, many of the tents were down, the camp ground began to wear a deserted appearance, and the very successful Banff Meeting was at an end.

Registration

R. J. Durley	Montreal.	G. A. Gaherty	Montreal.	J. B. deHart	Lethbridge.
A. L. Ford	Calgary.	F. J. Robertson	Seebe.	W. H. Bradley	Lethbridge.
G. H. Whyte	Calgary.	Mrs. Robertson	Seebe.	J. H. Hunter	Montreal.
G. P. F. Boese	Calgary.	J. Hadden	Calgary.	J. G. Hall	Winnipeg.
W. D. Armstrong	Calgary.	J. A. Spreckley	Calgary.	N. M. Hall	Winnipeg.
A. E. Welby	Banff, Alta.	Miss Spreckley	Calgary.	H. R. Carscallen	Calgary.
E. A. Jamieson	Vancouver.	J. J. Hanna	Calgary.	M. H. French	Maple Creek.
Mrs. E. A. Jamieson	Vancouver.	C. C. Richards	Calgary.	Mrs. French	Maple Creek.
Master Jamieson	Vancouver.	Mrs. W. A. Davidson	Calgary.	Master French	Maple Creek.
R. N. Blackburn	Regina.	Miss Davidson	Calgary.	A. G. Stewart	Edmonton.
Mrs. Blackburn	Regina.	G. A. Macauley	Drumheller.	Master Stewart	Edmonton.
Miss H. M. White	Regina.	Mrs. Macauley	Drumheller.	J. Dow	Lethbridge.
P. Turner-Bone	Calgary.	D. H. Quigley	Coalhurst.	Mrs. Dow	Lethbridge.
Mrs. Bone	Calgary.	Mrs. Quigley	Coalhurst.	Miss Mitchell	Lethbridge.
C. H. Fox	Winnipeg.	E. A. Wheatley	Vancouver.	J. J. Hanna	Calgary.
Mrs. C. H. Fox	Winnipeg.	F. L. McPherson	Victoria.	D. G. Doncaster	Nelson, B.C.
Major Geo. A. Walkem	Vancouver.	Dr. J. A. Allan	Edmonton.	Mrs. Doncaster	Nelson, B.C.
Three Walkem Jrs.	Vancouver.	Mr. Brady	Grand Forks, B.C.	R. L. Dunsmore	Calgary.
A. J. Sill	Winnipeg.	F. M. Steele	Calgary.	G. H. Morton	Calgary.
B. L. Thorne	Calgary.	J. R. Kaye	Calgary.	Mrs. G. H. Morton	Calgary.
H. L. Thorne	Calgary.	R. W. Ross	Edmonton.	Miss Jean Macauley	Drumheller.
Mrs. B. L. Thorne	Calgary.	L. S. Daynes	Prince Albert.	C. S. Dewis	Canmore.
C. E. Sisson	Toronto.	S. G. Porter	Calgary.	J. M. Wardle	Banff, Alta.
R. S. Trowsdale	Calgary.	E. Stansfield	Edmonton.	J. N. Stinson	Banff, Alta.
Kenneth Moodie	Calgary.	T. W. White	Edmonton.	C. M. Walker	Banff, Alta.
R. W. Brock	Vancouver.	Miss White	Edmonton.	A. S. Dawson	Calgary.
W. S. Brock	Vancouver.	R. Livingstone	Lethbridge.	M. H. Marshall	Calgary.
Frank Gaul	Vancouver.	W. Meldrum	Lethbridge.	C. G. Childe	Banff, Alta.

THE

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Maritime Professional Meeting

Halifax, Nova Scotia, October 8th and 9th, 1925

An announcement has already appeared, in the last issue of *The Journal*, regarding the Maritime Professional Meeting which is to take place at Halifax, N.S., on Thursday, October 8th, and Friday, October 9th, 1925. The Halifax Branch under whose auspices the meeting is being held has established an enviable reputation in connection with its meetings, which have been of a high order, remarkable for their enthusiasm and the development of that spirit of good-fellowship which is so desirable among members of the profession.

The committee, in whose hands the responsibility for the arrangements of the programme has been placed, are determined that this meeting will have a place in the foremost rank of the notable professional meetings convened by *The Institute*.

To those familiar with conditions in the Maritimes, the choice of date for the holding of the meeting will be appreciated. At this time of the year the Maritime Provinces are at their best, and with Halifax, with its numerous points of interest, as a centre, the visiting members are assured of not only an interesting meeting, but of a most enjoyable time. As will be seen from the tentative programme given below, the technical sessions include the reading and discussion of only three papers. The subject of each of these papers is of great interest to members of *The Institute*, not only in the Maritime Provinces, but throughout Canada.

The balance of the programme is devoted to excursion trips to points of engineering interest, with ample provision for entertainment, which require no further dilation when it is repeated that the Halifax Branch are acting as hosts.

TENTATIVE PROGRAMME
(*subject to revision*)

THURSDAY, OCTOBER 8TH:

Morning: 9.00 a.m. to 1.00 p.m. Registration.
Inspection of Technical College.
Paper: "Short Electric Transmission Lines", (illustrated by lantern slides) by Gordon Kribbs, M.E.I.C., of St. John, N.B.

Noon: 1.00 p.m. Complimentary Luncheon.

Afternoon: 2.30 p.m. to 6.00 p.m. Inspection trip around Halifax Harbour, affording an opportunity to view the development of this Atlantic Port. Inspection of Imperial Oil Refineries and Acadia Sugar Refineries, Halifax Golf and Country Club.

Evening: 8.00 p.m. to 11.30 p.m. Paper: "The Building and Care of Earth Roads", illustrated with motion pictures), by R. R. Murray, A.M.E.I.C., of Halifax, N.S.
Paper: "The Marketing of Cape Breton Coals, from an Engineering Standpoint", by W. M. Booth, A.M.E.I.C., of Sydney, N.S.

FRIDAY, OCTOBER 9TH:

Morning: 9.00 a.m. Automobile trip to Windsor.
Inspection of Gypsum Quarries, Handling and Loading Equipment.

Noon: 1.00 p.m. Luncheon.

Afternoon: 2.30 p.m. Inspection of Avon River Water Power Development at Avon Falls.
5.00 p.m. Return trip to Halifax.

Evening: 7.30 p.m. Farewell banquet.
Special speaker on some questions to be decided later, *not* engineering.

Secretary's Visit to Western Meeting

The report of the Western Professional Meeting which was held at Banff in July last, conveys only to a slight degree the great enthusiasm and goodwill which was manifest among the members attending. The meeting was an outstanding success and, as in the case of gatherings of this nature, greatly impressed upon the members the common interests of the various branches of *The Institute*, and it is expected that the forthcoming Maritime Professional Meeting, an announcement of which also appears in this issue, will be equally successful and enjoyable.

The Secretary was fortunate in meeting personally at Banff many of the members of the Western Branches including those to whom the success of the meeting was due, and was able to follow his stay there by a series of visits to the western branches, from Victoria to Sault Ste. Marie. At all these points he received the heartiest welcome and hospitality. The excursions to engineering works, irrigation projects and industrial developments, and the motor journeys through the country, which were so kindly arranged by members and friends, gave him a vivid impression of the activity and enthusiasm characterizing the West.

The prosperity of the Engineering Profession depends on industrial conditions and on the progress of construction, and it is encouraging to reflect that the favourable agricultural situation in the West cannot fail to react upon trade and industry in general. There seems good reason to expect that the sense of depression, which has made itself felt for so long, is gradually giving way to a feeling of optimism which will soon have a directly beneficial effect on the profession.

OBITUARIES

Charles Hawkins Marrs, C.E., M.E.I.C.

C. H. MARRS, C.E., M.E.I.C.

It is with sincere regret that we record the death of Charles Hawkins Marrs, C.E., M.E.I.C., formerly vice-chairman of the Hamilton Branch, which occurred on April 16th, 1925.

The late Mr. Marrs was born at Beamsville, Ontario, on April 19th, 1879. He attended Beamsville public and high schools proceeding to Hamilton Collegiate Institute for his senior matriculation which he obtained during July 1899. That same autumn he entered the School of Practical Science, University of Toronto, choosing the course in mechanical engineering. After the statutory three years study tempered by playing hockey for the "Old School" he was granted the S. P. S., Diploma of Graduation. During the winter of 1912-1913 he prepared a thesis on "Railway Plate Girder Bridges" for which the University of Toronto granted him the degree of C. E., which was conferred upon him at the Convocation in 1913.

His vacations while attending S. P. S. were spent with the motive power department of the Grand Trunk Railway at Windsor. He joined the staff of the Hamilton Bridge Works Company, Limited, of Hamilton in 1903 as draughtsman, speedily rising to the status of checker. In 1907 he moved to Pittsburg, Pa., entering the designing and estimating department of the Riter-Conley Manufacturing Company. He returned to Canada to the old firm in 1911 as designing engineer. Within a very few months he was placed in charge of that department, during the war he became assistant chief engineer.

Every variety of clean field sport interested him, and he had the happy knack of mastering sport technique and tactics speedily and thoroughly. At Varsity he played on the senior hockey team of his faculty, then in later life lawn bowling, curling and golf. He held active membership in the Victoria Lawn Bowling and Curling Club, the Glendale Golf and Country Club and the Thistle Club, all of Hamilton. In Kiwanis Club activities he cheerfully undertook his share and was particularly drawn to its work among boys.

Mr. Marrs was elected Member of *The Institute* on February 25th, 1919, and played his part in the affairs of the Hamilton Branch, first as a committeeman and then in the capacity of vice-chairman.

Masonry also claimed him; he was Senior Warden of The Barton Lodge, No. 6, Hamilton at the time of his death, a thirty-second degree Scottish Rite Mason, member of Murton Lodge of Perfection, Hamilton Sovereign Chapter of Rose Croix, and Moore Consistory.

On June 17th, 1908, at Hamilton, Ontario, he was married to Grace Longhurst, who with his two sons and two daughters survive him.

David Dick Jr.

The news of the death of David Dick Jr., of Welland, Ontario, which accured in Toronto on August 16th, 1925, will be received with deep regret by his many friends in *The Engineering Institute of Canada.* Although the late Mr. Dick was not a member of *The Institute,* on many occasions he entertained extensively large numbers of the members of *The Institute,* accounts of these entertainments appearing from time to time in the columns of *The Journal.*

Mr. Dick was well known throughout Ontario as president of the National Sand and Gravel Company at Welland, Ont., and through his connection with a number of other industrial organizations.

Death of Sir Adam Beck

After an illness of several months duration, Sir Adam Beck, chairman of the Hydro-Electric Power Commission of Ontario since its inception in 1906, one of the most widely known men in the hydro-electric industry in the world, died at "Hedley" his London, Ont., home on August 15th, 1925, in his sixty-eighth year. It is no exaggeration to say that the eyes of the industrial world have for years been centered on this great public enterprise, the success of which is largely due to the organizing ability, zeal and indefatigable energy of Sir Adam. He devoted his life to this achievement, and his death has removed from the public life of Ontario and from the Dominion, an outstanding figure and a dominating personality.

The story of Sir Adam's early vision of a publicly owned and operated power monopoly for the province of Ontario; how he became associated with this gigantic undertaking; his early struggles in the face of the keenest opposition; and his great part in the success of the enterprise, is one of the most interesting industrial and engineering romances of the age.

Sir Adam was the son of Jacob Beck, who came to Canada in 1837. He was born on June 20th, 1857 at Baden, Ont., a place founded by his father. He passed through the public school of Baden and then attended Dr. Tassie's school at Galt, then the Rockwood Academy; later graduating from the Western University at London, Ont., which years later conferred upon him the honorary degree of LL.D.

SIR ADAM BECK

In 1878, Sir Adam Beck engaged in the iron foundry and milling business with his father, at Baden, and in 1880 he removed to Galt where he commenced the manufacture of boxes and wood veneer, developing an extensive business with branches at London, Toronto, Hamilton and Montreal. In 1902, having been three times mayor of London, he was elected to the Ontario Legislature to represent that city.

With the rapid development in transmission of electric power over long distances, the exploitation of the great power resources of Niagara Falls came to the fore, and in 1903 Sir Adam was appointed a commissioner to investigate the possibilities of developing and distributing power from Niagara Falls. In 1906, as minister without portfolio in the Whitney Government, Sir Adam introduced a bill in the Legislature creating the Hydro-Electric Power Commission of Ontario, and in June of that year he was appointed chairman of the Commission, in which capacity he continued until his death.

The history of the development of this unique public utility is one of the most interesting in the annals of the engineering profession, and through its pages will ever be written the name of its creator and architect, Sir Adam Beck.

Many tributes have been paid to Sir Adam of which the following bear witness to the profound sorrow and deep sense of loss occasioned by his death:

"The greatest of us — if greatness means worth, capacity, vision, initiative, tireless energy, creative enthusiasm and enduring public service — is gone. Adam Beck needs neither eulogium nor memorial in marble. His epitaph is "writ in deeds." His monument is on the highways and in the homes.

"He was blessed with a generous share of this world's goods. He had social position. He was a sportsman. Life logically might have led him along easy and pleasant lines — a gentleman dabbler in politics, a patron of commendable philanthropies.

"But early in life Adam Beck dreamed a dream. It gripped him. Its vast possibilities — its crusading call — inspired him. He consecrated himself to its accomplishment.

"And, gradually, the great hydro-electric power project, built on the principle of public ownership and operation, came into being — and grew. There was need of visioned leadership. There was need of organizing skill. There was need of amazing capacity for hard work. There was need of indomitable courage. There was need of ruthless fighting qualities. There was need of stern integrity. Beck supplied them all." — *The Globe, Toronto.*

F. A. Gaby, M.E.I.C., chief engineer of the Ontario Hydro-Electric Power Commission, who was in almost daily touch with Sir Adam Beck for the last eighteen years, said that relatively few people really knew Sir Adam Beck. Although he had intimate friends in public and political life he had very few intimates in his personal and family life. "The dominating feature of his life, I believe, was rare tenacity and singleness of purpose in espousing any cause in which he believed."

"Speaking on behalf of the Government, and, I believe, of the whole people of Ontario, I desire to express the feeling of profound and universal sorrow occasioned by the death of Sir Adam Beck. Our sorrow at the parting of Sir Adam is equalled only by the sense of loss which has befallen the public life and the public service of this Province.

"Sir Adam was an outstanding figure in Ontario, and indeed in all Canada. It is now 20 years since Sir James Whitney launched his hydro-electric policy, which many well-meaning people in those days thought to be visionary and impracticable. Sir James ensured the success of the undertaking through the wonderful organizing ability, and zeal and energy of Adam Beck, who realized the value of the opportunity of placing within the reach of all the great advantages which nature and science had combined to bestow upon this community. To the achievement of this task, Sir Adam gave his life down to the last fleeting moment."—*From statement issued by the Hon. G. Howard Ferguson.*

"For nearly 20 years Sir Adam Beck devoted his energies to the work of this commission and gave to Ontario the best example of public ownership in the world. Owing to his masterful personality he came to be regarded as the personification of 'Hydro.' "—*The Mail and Empire, Toronto.*

PERSONALS

E. G. McLellan, S.E.I.C., has been appointed to the staff of the Canadian Pacific Railway, construction office at Tisdale, Sask.

W. J. D. Reed-Lewis, M.E.I.C., chief engineer of the Super Cement Company has recently been removed to Detroit, Mich.

W. R. Hughson, A.M.E.I.C., formerly with the Department of Railways and Canals located at Cornwall, Ont., has accepted the position of construction engineer with the Backus-Brooks Company.

Louis W. May, Jr.E.I.C., who was for five years with the Hydro-Electric Power Commission on the development of Niagara Falls has joined the staff of the Sutter Butte Canal Company at Gridley, California.

W. D. MacKinnon, S.E.I.C., who graduated from Queen's University this spring is with the Bailey Meter Company at Cleveland, Ohio. Mr. MacKinnon had been connected with this company during the summer vacation of 1924.

Casper Weisburgh, S.E.I.C., has been transferred from the service department of the Canadian Westinghouse Company at Isle Maligne, Quebec, to the company's plant at Hamilton, Ontario, where he is completing the student's apprentice course.

F. Howard Grose, M.E.I.C., who has been located at H. M. Dockyard, Malta, is leaving for Devonport, England, to assume the duties of superintending civil engineer of H. M. Dockyard to which position he has recently been appointed.

A. M. Reid, Jr.E.I.C., who has been located in Montreal for some months on the staff of the Bell Telephone Company of Canada, has returned to Toronto as division plant engineer of the Toronto division of that company, with which he has been connected since his graduation from Toronto University in 1923.

Howard E. Meadd, A.M.E.I.C., who has only recently been located at Fort Frances, Ont., has joined the engineering staff of the Howard Smith Paper Mills Limited at Cornwall and is engaged on preliminary estimates and designs on the proposed changes and extensions to the company's Cornwall mill.

Harold J. Maxwell, Jr.E.I.C., of St. John, N.B., is with the Ingersoll-Rand Company, portable compressor department, New York City. Mr. Maxwell graduated from the University of New Brunswick in 1923, and was for a short period with the Dominion Bridge Company at Montreal.

Louis Hurtubise, A.M.E.I.C., of Montreal has been appointed secretary of Versailles, Vidricaire, Boulais, Limited, bond house of Montreal. Mr. Hurtubise who is a graduate of Ecole Polytechnique of the year 1903. He was for some thirteen years town engineer and general manager of the town of Montreal East, and is at present also associated in the capacity of secretary of Le Comptoir Financier, Limited.

G. O. Johnson, A.M.E.I.C., squadron leader, Royal Canadian Air Force, has been transferred to Fort Osborne Barracks at Winnipeg, Man. Mr. Johnson joined the Royal Air Corps in 1917 and was promoted to captain the following year. Since that time he has been connected with the Royal Canadian Air Force having been superintendent of Camp Borden Air Station and in 1920 appointed to the staff of the Air Board at Ottawa. In September 1921 he was appointed to squadron leader and in May 1922 was acting assistant director of the Royal Canadian Air Force.

F. C. Gamble, M.E.I.C., Recovering from Recent Illness

The numerous friends of F. C. Gamble, M.E.I.C., will be pleased to hear that he is recovering from his recent illness and that he is now out of the hospital. Mr. Gamble has retired from the active practice of his profession since 1918. He was councillor of *The Engineering Institute of Canada* from 1892 to 1898 and president in 1915. He was also chairman of the Victoria Branch, 1912 to 1913, and during his chairmanship Mr. Gamble generously offered the loan of his valuable technical books to the Victoria branch. This offer was gladly accepted and the loan has formed the nucleus of the Victoria branch library.

Mr. Gamble was born in Toronto on October 23rd, 1848 and received his early education at Upper Canada College and through private tuition, later entered the Rennselaer Polytechnic Institute of Troy, N. Y. His first work was as chainman on the Intercolonial Railway between the years 1869 and 1870. Subsequently he became assistant engineer with the Great Western Railway; resident engineer for contracts of the Prince Edward Island Railway; assistant engineer on the Intercolonial railway during the years 1876-1877, and for the Q.M. and O.R. the following year.

In 1879 Mr. Gamble was engaged in private practice. The following year he was first assistant engineer on contract No. 42, of the Canadian Pacific Railway, and the next year in the same capacity in British Columbia. From 1881 until 1887, he was assistant engineer with the Department of Public Works, British Columbia and for the following ten years was government agent and resident engineer for that department. In the year 1897 he was again engaged in private practice and in 1898 was appointed public works engineer for the provincial government of British Columbia, becoming chief engineer of the Department of Railways for the Province in 1910.

F. C. GAMBLE, M.E.I.C.

Capt. J. F. CAHAN, M.E.I.C.

The Hon. J. F. Cahan, M.E.I.C., appointed to Nova Scotia Highway Board

Captain J. F. Cahan, M.E.I.C., who was recently taken into the Cabinet of the provincial government of Nova Scotia as minister without portfolio has been appointed a member of the Provincial Highways Board.

The Hon. J. F. Cahan was born at Halifax, N.S., in 1889, and after received his early education at the high school of that city, he entered Dalhousie University from which he received his degree of Bachelor of Engineering. Subsequent to completing a post graduate course in engineering at McGill University, in 1910 he was appointed resident engineer of the building of the University of Saskatchewan which post he occupied until 1912. In 1912 he was superintendent and construction engineer for the Western Canada Power Company, Limited, engaged on pumping installation, construction of dams and extension of the company's power house. In 1915 he enlisted for overseas service as lieutenant in the first Canadian Pioneer Battalion and was promoted to the rank of captain. At Courcellette, in 1916, Captain Cahan received severe wounds as a result of which he was confined to the hospital for several years and has since been prevented from returning to the practice of his profession. In addition to his extensive engineering training, Captain Cahan is possessed of a very pleasing personality and is one of the ablest speakers in Nova Scotia.

J. S. Armstrong, M.E.I.C. returns to Private Practice

J. S. Armstrong, M.E.I.C., of Fredericton, N.B., has entered private practice as consulting engineer specializing in harbours, canals, railways, transport, patents and special submarine works.

Mr. Armstrong has had very extensive engineering experience and a variety of engineering work although recently due to poor health had retired from active practice. He is a graduate of King's College, Windsor, N.S., of the year 1869, and was awarded the General Williams prize in engineering. His early work was in connection with railway construction on the Intercolonial Railway in 1870. The following year he was engaged on the Bay Verte canal, Keafer location, Fort Lawrence Route. Subsequently he was assistant engineer with the Department of Public Works in charge of a party on the St. John, N.B. harbour survey. His later appointments included the following:—assistant engineer, locating and on construction of the Salisbury and Hillsboro Railway; leveler on Aulac and Cape Tormentine Railway survey; general survey and plan for Halifax sewerage; engineer for Gold Mining Company prospecting and mining in Nova Scotia; member of contracting firm engaged for five years in building construction in St. John, N.B.; construction engineer and general manager, Lincoln Pulp and Paper Company at Lincoln, Maine; preliminary and location surveys for the Temiscouata Railway in Quebec and New Brunswick in charge of preliminary survey and construction of a section of the Edmunston and St. Francis branch of that railway; principal assistant engineer with the Chignecto Marine Transport Railway between the years 1888 and 1891; engineer and general manager, Chambersburg and Gettysburg Railway in Pennsylvania; manager of the Caledonia Mining and Manufacturing Company at Graffenburg, Pa; chief engineer of the Canso and Louisburg Railway in Cape Breton, engaged on preliminary and locating surveys; bridge engineer and principal assistant on Midland Railway in Nova Scotia and later contractor's engineer for the Shubenacadie bridge.

In addition to the above Mr. Armstrong was for a period engaged in private practice as attorney under the United States government register and was later engineer and secretary-treasurer of the Coal Mining Company in the Grand Lake Coal district of New Brunswick. He was actively engaged in the Good Roads Movement throughout New Brunswick being the organizer of this movement in the St. John City and County Good Roads Association and in the New Brunswick Good Roads Association.

Institute Members engaged on Topographical Survey Work

Some insight into the extensive work of the Topographical Survey Branch of the Department of the Interior may be obtained from the following notes of the field work on which members of *The Institute* are engaged under the direction of F. H. Peters, M.E.I.C., director of Topographical Survey of Canada.

P. E. Palmer, D.L.S., A.M.E.I.C., and G. A. Bennett, D.L.S., A.M.E.I.C., are engaged on topographical surveys in the vicinity of New Glasgow, Nova Scotia. Vertical aerial photographs are being used in conjunction with plane table methods for the production of maps on the scale of one inch to one mile.

A. L. Cumming, D.L.S., A.M.E.I.C., is engaged on vertical and horizontal control surveys for mapping in western Nova Scotia. Permanent monuments are being placed at suitable intervals for use on future surveys.

B. W. Waugh, D.L.S., M.E.I.C., is engaged on plane table topographical surveys in the vicinity of Sussex, New Brunswick.

P. M. H. LeBlanc, D.L.S., A.M.E.I.C., and C. B. C. Donnelly, D.L.S., A.M.E.I.C., are making horizontal and vertical control surveys for mapping the area covered by the Shawinigan sheet of the Topographic Map of Canada in Quebec. Permanent monuments are being placed for use on future surveys.

C. Rinfret, D.L.S., A.M.E.I.C., is engaged on topographical surveys in the vicinity of Sorel, Quebec. Vertical aerial photographs are being used in conjunction with plane table methods for the production of a standard one inch to one mile topographic map.

B. H. Segré, D.L.S., A.M.E.I.C., is engaged on control surveys for aerial photographic mapping in the lac Seul district in northwestern Ontario. Permanent monuments will be placed at suitable intervals.

Wm. Christie, D.L.S., M.E.I.C., is engaged on control surveys for aerial photographic mapping in northwestern Ontario and eastern Manitoba. Permanent monuments are being placed at intervals of five to seven miles.

C. S. Macdonald, D.L.S., A.M.E.I.C., will be engaged on control surveys in the Muskoka lakes district of Ontario for mapping from aerial photographs.

E. F. Browne, D.L.S., A.M.E.I.C., is engaged on surveys of Ordnance lands in Ontario.

S. D. Fawcett, D.L.S., A.M.E.I.C., is making a careful traverse from Lydiatt, Manitoba to the Ontario-Manitoba boundary. Later he will make measurements to control plotting from aerial photographs in northwestern Ontario and take latitude and longitude observations.

J. Carroll, D.L.S., A.M.E.I.C., is acting as navigational officer with the Royal Canadian Air Force on flying operations being carried out from the base at Victoria Beach on lake Winnipeg.

J. Hardouin, D.L.S., A.M.E.I.C., is making miscellaneous land surveys in Manitoba and Saskatchewan.

G. C. Cowper, D.L.S., A.M.E.I.C., and F. H. Wrong, D.L.S., A.M.E.I.C., are engaged on topographical surveys for the revision of the Touchwood sheet of the Sectional Map of Canada in Saskatchewan.

C. M. Walker, D.L.S., A.M.E.I.C., is making miscellaneous land surveys in Alberta.

G. H. Blanchet, D.L.S., A.M.E.I.C., is engaged on exploratory and control surveys in the vicinity of Great Slave lake in the Northwest Territories.

C. H. Taggart, D.L.S., A.M.E.I.C., is engaged on topographical surveys in the vicinity of Kamloops, B.C. Photo-topographical, transit and range-finder methods are being used for the production of standard topographic maps.

It has been announced that the firm of F. H. Hopkins and Company, Limited, railway, mining, lumbering, contractors' and municipal supplies, Montreal and Toronto, have been appointed sole eastern representatives and distributors for the new, large corporation, known as the "Caterpillar" Tractor Company, of California, which company was recently formed to acquire all the rights, titles and interests in the C. L. Best Tractor Company, of San Leandro, Cal., and The Holt Mfg. Co., of Stockton. Cal. and Peoria, Ill., thus uniting two of the largest tractor manufacturing interests in America, producing tractors for lumbering, mining, municipal and agricultural work.

The buildings of the consolidated companies, under roof, cover 32 acres of actual manufacturing plant, capable of producing from 7,000 to 10,000 tractors per year, and tractors, for the future, will be known as "Caterpillar 30" and "Caterpillar 60", designating the "Best" track-laying tractors, and "Caterpillar Northern Logger" also "2, 5 and 10 ton" of the "Holt" design.

The Topographical Survey of Canada, Department of the Interior, have recently published a map of the Fond du lac river basin in northern Saskatchewan. The scale is one inch to six miles and the map is one of a connected series of twenty maps covering the northern waterways from McMurray and Vermilion to the Arctic Ocean and easterly from Lake Athabaska to The Pas, Manitoba.

Another map recently issued by the Topographical Survey of Canada is the new edition to the Banff sheet of the Sectional Map of Canada. This is published on the scale of one inch to three miles and covers an area of approximately fifty to ninety miles. The adjoining sheet to the west, the Donald map, was issued about two months ago.

Annual Convention of the Canadian Good Roads Association.

Quebec City, September 22nd, 23rd and 24th, 1925.

A preliminary survey of the programme arranged for the twelfth annual convention of the Canadian Good Roads Association to be held at the Chateau Frontenac, Quebec, reveals the practical nature of this Dominion-wide meeting, and the array of expert talent in highway matters that will contribute papers and participate in the discussions ensures that the delegates, who will attend from every part of Canada, will learn a great deal about the technical problems that confront them in the expansion of the Good Roads policy.

The road engineers of the United States will contribute largely to this knowledge, and the importance of the gathering is recognized by the American Road Builders Association, who under the chairmanship of W. H. Connell, their president, will hold a meeting of the executive at Quebec during the convention, the outcome of which will likely be a closer affiliation between the two bodies in regard to reciprocal representation in their respective countries.

The problem of dust elimination on gravel roads, which is of particular interest to Canadian municipalities, will be dealt with by B. C. Tiney, of the State Highway Department of Michigan, with Alex. Fraser, A.M.E.I.C., chief engineer of the Quebec Road Department, leading the discussion. The United States government will send a special representative to talk on federal aid in highway construction, and the Canadian aspect will be dealt with by W. A. Campbell, chief commissioner of highways for the Dominion. Allied with this is the question of "Equitable Taxation for Highways" which will be dealt with by S. L. Squire, deputy minister of highways for Ontario, with H. S. Carpenter, M.E.I.C., deputy minister of highways for Saskatchewan opening the discussion. The economic value of traffic census in its relation to types of road and maintenance costs will be spoken on by J. L. Boulanger, deputy minister of roads, Quebec, the discussion being led by R. M. Smith, A.M.E.I.C., location engineer of the Ontario highways. The chairman of the Manitoba Highways Board, A. McGillivray, A.M.E.I.C., will speak on provincial maintenance systems, while the important topic of winter roads, cost data and snow fighting equipment will be handled by Bertram E. Murray, county road superintendent of Warrensburgh, N. Y., who has had considerable experience in the keeping open of a portion of the New York-Montreal highway in winter-time. A paper on bituminous paving mixtures for re-surfacing old macadam roads will be delivered by D. McK. Hepburn, of Philadelphia, and like several other papers during the convention will be illustrated. The Hon. J. Lyons, of Ontario will deliver a paper on "Colonization Roads", and E. A. James, M.E.I.C., consulting engineer of the York County Highway Commission will lead the discussion on "Recent Developments in the Construction of Cement-Concrete Roads," which is being read by H. E. Breed, consulting engineer of New York State and former highway engineer for New York State. "The Economic uses of Refined Tar in keeping with Traffic Conditions" will be dealt with by J. Stanley Crandell, consulting engineer of New York, while W. C. Perkins, of the Eastern Paving Brick Association, Philadelphia, will give an address on modern brick pavements.

W. Rees Jeffries, the chairman of the London Road Board will probably reach Canada in time to attend the convention and if so will speak on English practice in the construction of highways, while among the prominent visitors to the convention from across the border who have already signified their intention of participating in the various discussions will be A. P. Sandles, secretary of the National Crushed Stone Association; Paul D. Sargent, chief engineer of the state of Maine, Charles H. Innis, chairman of the Maine State Highway Commission; J. Paul Jones, secretary of the State Highway Department of Delaware, William F. Williams, commissioner of highways for Massachusetts and F. E. Everett, highway commissioner of the state of New Hampshire, while T. A. Hill, chief highway commissioner for the government of Newfoundland will also likely be present.

The Lieut. Governor of Quebec, the Hon. Narcisse Perodeau, will formally open the convention on the Tuesday morning, and the Hon. G. S. Henry, minister of highways for Ontario will reply to the various addresses of welcome, on behalf of the association. The various sessions will be presided over by the Hon. J. L. Perron, honorary president of the association, Hon. P. J. Veniot, president, Hon. W. R. Clubb, of Manitoba, and the Hon. G. S. Henry of Ontario. Mr. Perron, as minister of roads for Quebec has invited the delegates to make tours over the surrounding district, and included in these will be a visit to a section of the Quebec-Murray Bay highway and a French Canadian dinner at Construction Camp No. 2, which is 2,000 feet above sea level and will enable the visitors to obtain splendid panoramic views of the St. Lawrence valley. In addition to the business meetings a number of social entertainments will be provided for the delegates and the ladies, Mrs. J. L. Perron having accepted the convenorship of the Ladies Committee, and these will include a reception at Spencerwood, boat and automobile trips to places of interest, and other functions of an enjoyable nature, the convention concluding with a trip to the Saguenay river on the Friday, returning to Quebec on Monday morning, with the possibility of a daylight voyage up the river to Montreal during that day. A large number of requests for reservations have already been received by George A. McNamee, the secretary of the association, New Birks Building, Montreal, and there is every indication that the 1925 convention will attract a record attendance to the ancient Capitol of Quebec.

EMPLOYMENT BUREAU AND MEMBERS' EXCHANGE

Situations Wanted

Electrical Engineer

University graduate desires position, with an engineering firm or power company, where technical training combined with business experience will be of value. One year's experience in testing department of one of the largest electrical manufacturing companies in Canada. Several years business experience. Good office man. Available at short notice. Location immaterial. Apply box No. 191-W.

Building Superintendent

Advertiser, A.M.E.I.C., seeks position as above. Qualified to supervise power plant and heating systems. Construction and maintenance. Organization and efficient operation of staff. Office routine, etc. Apply box No. 192-W.

Electrical Engineer

Manitoba University Graduate in Electrical Engineering, with three years experience on design, checking and construction with large American electrical contracting firm desires position in engineering department of public utility or contracting company in Canada. 28 years of age, in excellent health and of good appearance. At present employed. Available on two weeks notice. Best of references. Apply Box No. 193-W.

Testing Engineer

A young engineer, age 30, McGill Graduate, and past student in Metallurgy of the Royal School of Mines, London, England, desires a position with some inspection and testing company; 4½ years' experience in the testing of timber, also inspection of iron and steel. Apply box No. 194-W.

Situations Vacant

Instrumentmen Vacant

A pulp and paper company with headquarters in Montreal, requires the services of four junior instrumentmen for survey work in Quebec. Apply box No. 140-V.

Chief Draughtsman

A firm of civil engineers in Florida, U.S.A., requires the services of a chief draughtsman qualified to take complete charge of a five to ten table draughting room, the work in connection with which consists of general engineering, and requires a knowledge of land surveys. Apply box No. 141-V.

Surveyors

Word has been received that there is a possibility of a number of openings in connection with survey work in Florida, U.S.A., for men capable of taking charge of survey parties. While these openings are not yet officially announced, the employment bureau at headquarters, would appreciate being advised of any members available for such work in order that an adequate list may be compiled. Apply box No. 142-V.

Transitmen

Two Transitmen on road and bridge work for a pulp and paper company near Montreal. Prospects of permanency. One or two years experience required. Apply Box No. 143-V.

Members' Exchange

An institution in Montreal would like to secure the following numbers of the Surveyor to complete their files, and if any members have spare copies to donate the Secretary would be pleased to forward them to the advertiser:—

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BRANCH NEWS

Calgary Branch

G. P. F. Boese, A.M.E.I.C., Secretary-Treasurer.
W. St. J. Miller, A.M.E.I.C., Branch News-Editor.

The Western Professional Meeting

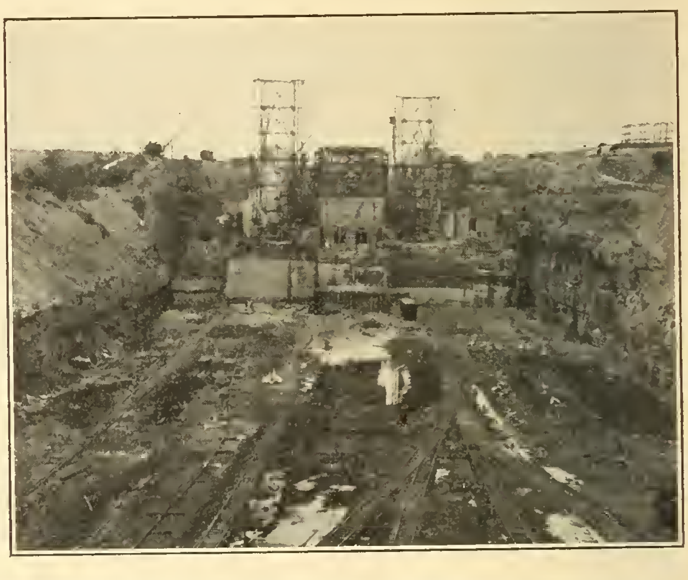
The five days at Banff proved to be a great success and we, the Calgary Branch as a whole, are more than pleased to feel that the arrangements and entertainment were managed and carried out to the satisfaction of all concerned. This was evidenced on all sides by the remarks of our many visitors who one and all appeared to enjoy themselves thoroughly.

References to the various papers presented will be found on other pages of *The Journal*, as also a review of the trips made to various points of interest, especially the one to the Canada Cement Company's plant at Exshaw. Under the heading of "Branch News" it would seem fitting that a few words were added to express the keen appreciation of the branch in particular towards the management and staff of this company in permitting us to invade their premises in the manner we did. It would be difficult to find a more interesting plant for the engineer to visit, and further, one would have to go a long way to exceed the hospitality shown and the luxuriousness of the luncheon that followed. My, how the early arrivals ever managed to await the coming of the late ones with such a meal in sight on the tables is almost beyond conception. However, there were no "scenes" and everything went well—in more senses than one! Personally I am still puzzling as to what kind of aggregate lamb, tarts, and ice cream made with the cement-dusted lining to our insides. The result would be more a "natural" than a Portland cement concrete. However, there was no "slacking" when the time came to eat, and friendships were cemented in a concrete manner as the inner man was being reinforced. Speeches were few and to the point, and votes of thanks were heartily endorsed by all present. Even the Chinese cook was just about decapitated with a smile.

Through the courtesy of the Calgary Power Company, the ladies of the party were driven over to the power plant at Seebe during the time the men were inspecting the cement works and they thoroughly enjoyed the trip.

The afternoon devoted to sports proved what a remarkable creature an engineer really is. He can exert a ten-ton-to-the-square-inch energy at 90° in the shade on a glaring hot cement road and never say boo — when such an occasion offers. The ladies, and children too, helped to make a hot afternoon feel like — well — a hot afternoon ! All did valiantly striving to win one or more of the many fine prizes that were on view.

Messrs. J. M. Wardle, A.M.E.I.C., C. G. Child, A.M.E.I.C., G. H. Morton, A.M.E.I.C., and W. St. J. Miller, A.M.E.I.C., were members of



Welland Ship Canal Flight Locks looking south from Grand Trunk Railway Bridge. A general view of the construction of the Flight Locks at Thorold showing the pit for Locks No. 4 and the breast walls of Lock No. 5. *Photograph taken June 17th, 1925.*

the committee present in charge of sports and the prizes were kindly presented by Mrs. A. S. Dawson.

The sing-song and camp fire that took place on the banks of the Bow river proved an enjoyable feature when a number of old-time songs, specially composed limericks, and parodies, were heartily sung. Through the courtesy of the C. P. R., the ball room at the Banff Springs hotel was thrown open on one evening to all members and their families and a delightful time was spent dancing to the strains of a splendid orchestra.

The golf tourney proved a great success, the entrants vieing keenly with one another for winning places. Sulphur mountain was scaled by several members, and not only the younger members at that!

The glories of Banff were viewed by many from the east for the first time, some of whom will return again and again to view those limitless expanses of beauty and grandeur, such as are available in few places on this globe.

The Banff convention is a matter of history but the remembrance thereof is as a recurring decimal.

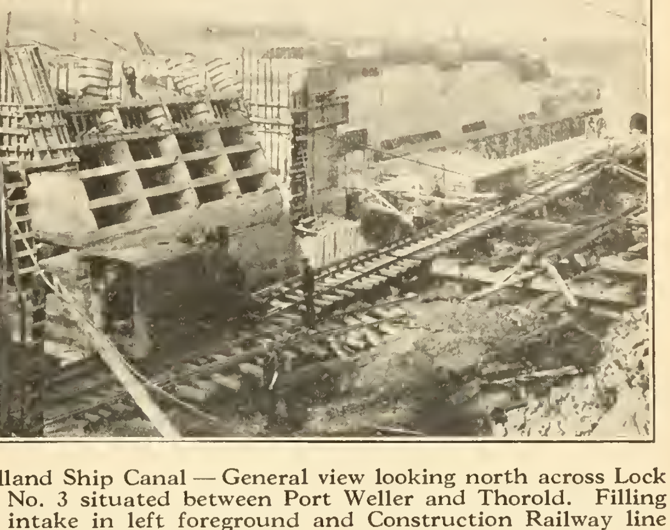
Visit of General Secretary

On August 5th, the branch was honoured to have as its guest our General Secretary R. J. Durley, M.E.I.C., at an informal dinner in the Board of Trade rooms, at which twenty-five members were present. Mr. Durley expressed himself very happily when he said he had been making what he liked to call a voyage of discovery. At every turn he seemed to be discovering something new and interesting. Following a history of *The Institute* in very few words, he expressed a strong desire for further co-operation amongst all members. He said the E.I.C. was a wonderful organization, almost unique amongst engineering societies of the world, in that it embraced all branches of engineering, and that it was essentially a national organization. He wanted to know our grievances, if we had any, so that he could endeavour to remedy them, and he invited criticisms and suggestions for the betterment of affairs of *The Institute*. He spoke at length on the matter of branch libraries and pointed out the benefit of having a technical library at headquarters from which books can be loaned out on a deposit system.

Several members spoke on general matters, and Chairman A. L. Ford, M.E.I.C., following a few eulogizing remarks, expressed the hope that Mr. Durley's visit would be an annual affair. A further appreciation of Mr. Durley was voiced by P. Turner Bone, M.E.I.C., who said that he himself was more familiar with affairs at Montreal than ever before since he had known and spoken with Mr. Durley, and he fully believed his new work would bear fruit abundantly.

Mr. Durley has undoubtedly left an impression in the wake of his voyage of discovery of a hard-working, painstaking secretary, and as a branch we are mighty glad he was able to be with us.

During the evening the chairman invited Councillor B. L. Thorne, M.E.I.C., to make two presentations, one to Branch Secretary G. P. F. Boese, A.M.E.I.C., and one to Lt. Col. G. H. Whyte, A.M.E.I.C. These presentations were in the form of silver engraved cigarette boxes, and

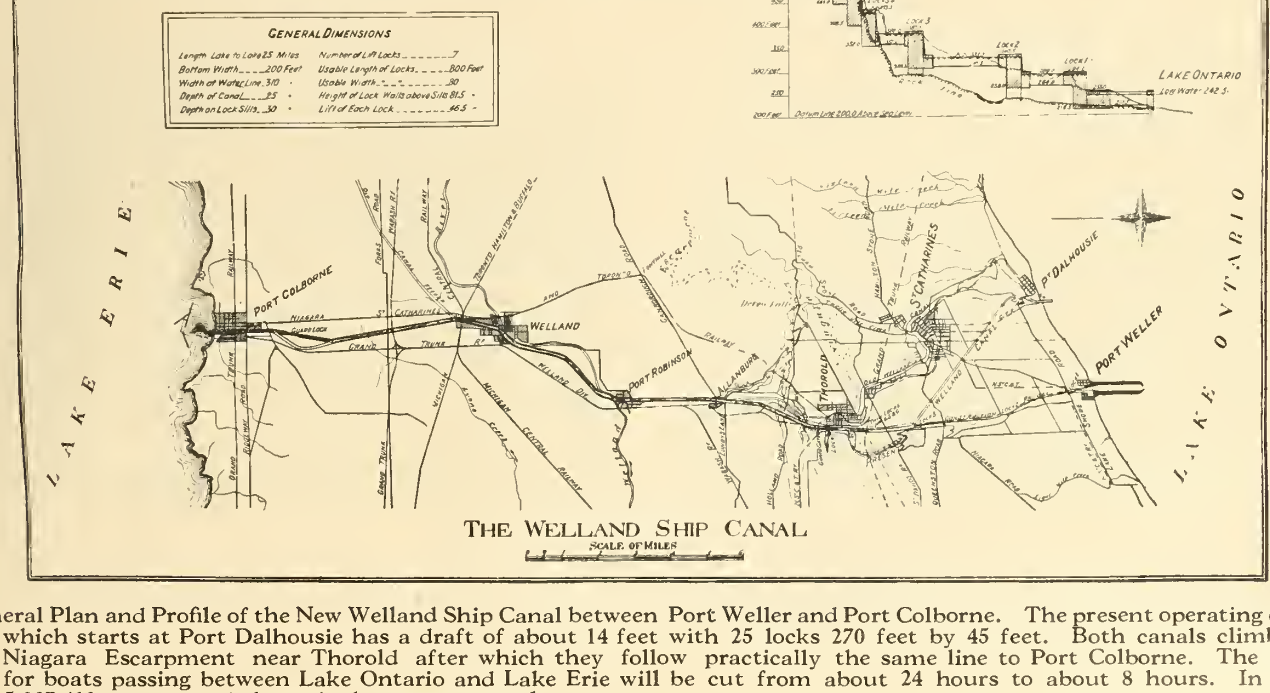


Welland Ship Canal — General view looking north across Lock No. 3 situated between Port Weller and Thorold. Filling intake in left foreground and Construction Railway line on far bank and, in line with top of box cars, the banks of the present Welland Canal. *Photograph taken October 30th, 1924.*

were given as a token of appreciation of the hard work and meritorious service in connection with the Banff meeting. The least that can be said is that they were well earned, for such affairs do not take place without a deal of worry and labour. The secretary's work was comprehensive and yet had to be attended to in detail, and the chairman of camp management committee bore the brunt of difficulties and troubles that always crop up under such circumstances.

Informal Luncheon to Mr. Durley

On his arrival in Calgary on July 9th, General Secretary Durley was the guest of the executive at an informal luncheon at the Board of Trade rooms, and on his return journey on August 5th an automobile trip was arranged for him to visit the well known Turner Valley oil fields forty-five miles southwest of Calgary. Mr. Kenneth Moodie, A.M.E.I.C., kindly drove the party down, which included Messrs. Durley,



General Plan and Profile of the New Welland Ship Canal between Port Weller and Port Colborne. The present operating canal which starts at Port Dalhousie has a draft of about 14 feet with 25 locks 270 feet by 45 feet. Both canals climb the Niagara Escarpment near Thorold after which they follow practically the same line to Port Colborne. The time for boats passing between Lake Ontario and Lake Erie will be cut from about 24 hours to about 8 hours. In 1924, 5,037,412 tons passed through the present canal.

Boese, Thorne, and Dingman. The famous Royalite No. 4 well was visited, and Mr. Durley was very interested in the ice-coated pipes, the separator plant, and the tremendous flame of waste gas projected over the river bank.

Lt. Col. J. H. Parks, M.E.I.C., appointed Railway Commissioner

The new appointee of the Board of Railway Commissioners of Canada is Lt. Col. J. H. Parks, M.E.I.C., who is a resident of Calgary. Col. Parks is congratulated by the Calgary Branch of *The Institute*. He was formerly connected with the construction department of the Backus-Brooks Company of Kenora, Ontario, and has had wide experience in railroad construction work which includes twelve years with the South African Railways.

Notes of Interest

We are glad to be able to announce that the people of Calgary successfully voted through a by-law in connection with the establishment here of the British milling firm of Spillers Overseas Limited. This means another big branch of an already important manufacturing industry in this city.

The demise of the question of the spray lakes power scheme has been announced following an extenuated and much harrassed existence. We regret to state that all activity on the site has ceased for the time being at least, survey and drilling parties having been laid off.

Apropos of the Banff Meeting

We are anxious to know:—

What's the matter with Durley. All together — "He's all right."

Why Spreckley did not get a fourth prize in the cigarette race at the swimming tourney.

If anyone took a snapshot of "Spider" Whyte in the caterpillar race.

Can you beat it? (See Moodie, captain of the Calgary tug'o war team in Calgary vs. the World.)

Why nobody could take away more than six prizes at the races. (C. G. Child).

How it was there were so many empty dishes after the Exshaw luncheon.

How much cement was consumed before the first course.

Why the rain did not dampen our ardour. Perhaps we were too hungry to even notice it.

If the ladies wondered why such a big power plant at Seebe was necessary to heat their curling tongs.

How the quartette enjoyed *their* recitations at the sing-song.

Why B. L. Thorne and A. L. Ford insisted on smiling so much during the convention.

Why the sports committee did not throw a fit of heat apoplexy as one of the events.

What Wardle and Morton did with their moustaches after the camp fire.

How it was that Boese did not make his usual "hole in one" on the golf course.

If there are any individuals more hospitable than the Canada Cement Company.

If Sulphur mountain is not high enough for some members.

If there had been a third prize in the ladies' swimming race who would have got it, — as only two finished.

What headquarters said when they received part of their guarantee back in the form of a cheque.

What was the matter with the Banff meeting generally, — Nothing at all. (Br. Ed.).

Niagara District Branch

R. W. Downie, A.M.E.I.C., Secretary-Treasurer.
C. G. Moon, A.M.E.I.C., Branch News-Editor.

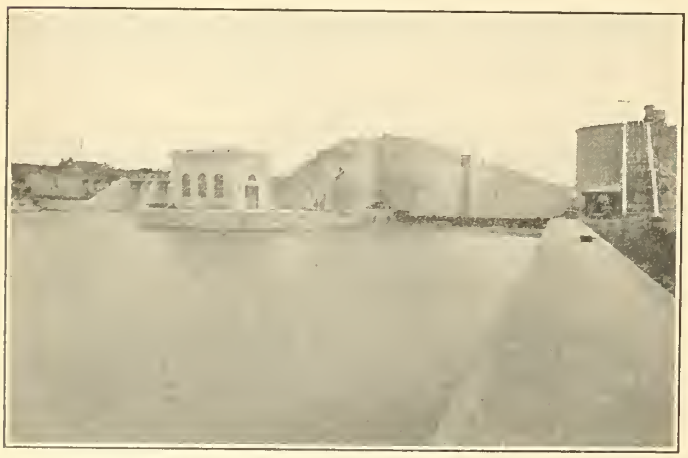
About thirty members of the Hamilton Branch motored up to Port Colborne on Saturday, August 15th, and spent the day inspecting various works on the Welland ship canal. Members of the Niagara Branch joined the party at Port Colborne and accompanied them through to Port Weller on lake Ontario, which was the final object of engineering interest.

At Port Colborne, tugs conveyed the party out to the new breakwater, stretching some 2,000 feet into Lake Erie. This breakwater, now in course of construction, is formed of a heavy mass concrete coping resting on reinforced concrete cribwork, stone filled. The cribs are being built at Port Maitland, some twenty-five miles up the lake, and are towed down and sunk into place on a specially prepared crushed rock base. Each crib is about 100 feet long, 50 feet wide and 30 feet deep. Dredged rock from the harbour channel is utilized to fill the pockets of the cribs and will be used as additional protection on the windward side of the breakwater; a fill some 50 feet wide and level with the top of the coping being called for on the plans.

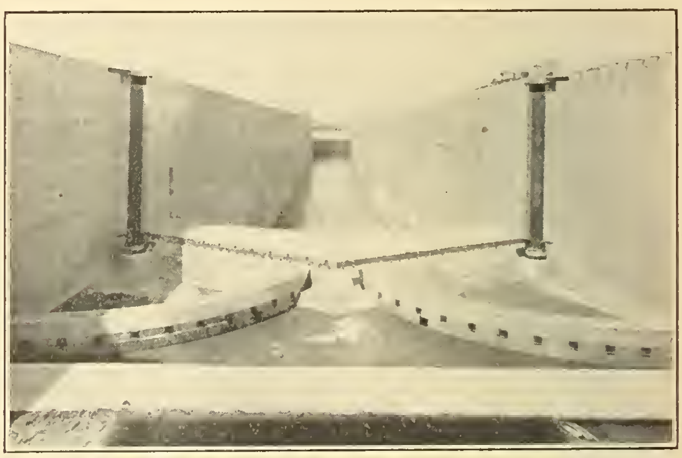
With E. G. Cameron, A.M.E.I.C., assistant engineer of the ship canal, acting as leader, the motorists followed various highways and by ways along the present waterway to the port of Thorold, stopping en route for lunch at Welland. There they boarded the sightseeing coach of the Welland ship canal construction railway for the remaining six miles to Port Weller. Down the Niagara escarpment and past the large flight locks, where they detrained for a moment to take snapshots and express surprise at the magnitude of the work. Following north through the fruit lands of the Niagara Peninsula the train then carried them right out to the end of the "made land" comprising the arms of Port Weller harbour and reaching out into lake Ontario about a mile and a half.

From this point, a somewhat dusty and tired party of the "originals" together with a scattering of "natives" headed for a swim at Port Dalhousie and something to eat at the Lakeside Inn.

We think the visitors enjoyed the day. We are sure that we enjoyed having them and trust that they will give us the pleasure of many more visits. A few photographs illustrating phases of the trip are published in another part of this issue.



Welland Ship Canal Lower Entrance Lock No. 1 at Port Weller. The timbering on water-gate is closed shutting out the waters of Lake Ontario. Unwatering pump house is situated in the centre of the picture and the waste weir at the extreme left. *Photograph taken July 8th, 1925.*



Welland Ship Canal Lock No. 1 looking north from upper gate recess. The breast wall pintels and bearings for the steel upper service gates are in the foreground of watering gate is shown closed at the far end of the Lock. *Photograph taken June 4th, 1925.*

Saguenay Branch

Burroughs Pelletier, A.M.E.I.C., Secretary-Treasurer.

Annual Meeting and Outing

On July 28th, the Saguenay Branch held its annual meeting, and following the precedent of last year it was decided to make the event the occasion for an outing to some places of interest to the members.

It was decided that the outing would consist of a visit to the various developments and mills along the course of the Chicoutimi river, and would also include a visit to the mills at Port Alfred.

The party left Chicoutimi station after the arrival of the morning train and proceeded immediately to the Chicoutimi hydro-electric power development of Price Brothers and Company, where the entire plant was visited. This plant was built two years ago, the designer being Mr. G. F. Hardy, M.E.I.C., of New York, and is used as a source of power for the company's mills at Kenogami.

The mechanical groundwood pulp mills of the Chicoutimi Pulp Company, was next visited by the members, who were shown over the entire mills from the gathering of the logs in the river to the finished product as shipped to purchasers.

Pont Arnaud power plant, (the property of La Compagnie d'Eclairage et d'Energie Electrique du Saguenay), was the item next on the programme. The power generated in this station is used by the Chicoutimi Pulp Company in its mills at Chicoutimi and also by the Roberval Saguenay Railway on that part of its line which is electrified.

The members next proceeded to the Chute Garneau power plant, the property of a recently formed company, La Compagnie Electrique de Chicoutimi, Limitée. The plant is a new one and is not completely finished yet, it being in operation for about two or three weeks before our visit. The purpose of the plant is exclusively to furnish lighting and power to the town of Chicoutimi. The members seemed very much interested in this power plant, the turbine of which is the first (and as yet only one), of the propellor type to be installed in the region.

The members were the guests at lunch of La Compagnie Electrique de Chicoutimi, which company was represented by Mr. Augustin Tremblay its manager and by Mr. J. E. Cloutier one of its directors. At the close of the luncheon C. N. Shanly, M.E.I.C., chairman of the branch, said a few words of appreciation and thanks on behalf of members for having been so courteously entertained by the company.

Immediately after luncheon the annual meeting was held, and after the annual meeting, owing to the time being somewhat advanced, it was decided to omit the next item on the programme, i.e., a visit to the dam of the Quebec Streams Commission at Portage des Roches, especially as there had been an excursion there last fall. The members therefore went direct to the Port Alfred Pulp and Paper Corporation's mill at Port Alfred, where the entire process of a sulphite pulp plant was seen.

This concluded the excursion and on the whole the impression seems to have been that all those who took part in the outing spent a very enjoyable day.

Hamilton Branch

H. B. Stuart, A.M.E.I.C., Secretary-Treasurer.

A regular meeting of the Hamilton Branch was held in the grill room, Royal Connaught hotel, Hamilton, at 8 P. M., Friday, March 27th, 1925, J. J. MacKay, M.E.I.C., Chairman, presiding.

The Geodetic Survey of Canada

The speaker of the evening, J. L. Rannie, M.E.I.C., D.T.S., M.E.I.C., supervisor of triangulation, Geodetic Survey of Canada, was introduced by John R. Dunbar, Jr.E.I.C., who not only had served under Mr. Rannie but had won *The Institute's* student's prize for a paper on the "Geodetic Survey of Canada."

Mr. Rannie chose for the title of his address "The Why and What of the Geodetic Survey of Canada". He outlined the utility of geodetic surveys to the land surveyor, engineer, navigator, physical geographer and town planner. He gave examples how the application of geodetic survey methods had made possible the solution of certain engineering problems with hitherto unobtainable limits of accuracy. He traced the development of the survey in Canada and illustrated its progress by means of excellent maps. He detailed the operations, both field and office, not only as to the "how" but also as to the "why". The above account does but scant justice to the speaker's command of and enthusiasm for this work, the careful preparation of his subject matter, the judicious selection of his lantern slides and the vigor, humor and mental attainments of the man himself.

Appointment of Nominating Committee

The following members were appointed the Nomination Committee; Messrs H. S. Philips, M.E.I.C., A. R. Hannaford, A.M.E.I.C., H. B. Dwight, A.M.E.I.C., J. A. McFarlane, M.E.I.C., W. B. Ford, A.M.E.I.C., and A. H. Munson, A.M.E.I.C., together with the chairman and the secretary. Messrs. A. Le P. T. Clifford, A.M.E.I.C., and A. Love, A.M.E.I.C., were appointed scrutineers, and Messrs. E. H. Darling, M.E.I.C., and E. G. MacKay, A.M.E.I.C., auditors.

Upon motion of Messrs. B. P. Richardson, M.E.I.C., and W. F. McLaren, M.E.I.C., the executive were granted permission to buy bonds when in their opinion the branch funds and the market were suitable.

Special Meeting at Brantford

A special meeting has held in the Y.W.C.A., rooms, Brantford, on Friday, April 17th, 1925, with F. P. Adams, A.M.E.I.C., city engineer of Brantford and a committeeman of the branch in the chair.

H. D. Rothwell, district engineer, Hydro-Electric Power Commission of Ontario, spoke on "Hydro-Electric Power Development in Ontario". He quoted facts and figures showing its expansion not only in material property but in service to take care of new markets, pointing out that these new uses of power were fast absorbing the available supply. His particular experience of late had been the supply of electric power to the farms and he dealt most minutely with the various problems peculiar to that service, not only original construction and maintenance but also finance.

Alan Mair Jackson, A.M.E.I.C., had constructed a camera for the purpose of recording the visit of the Hamilton members. Due either to its construction, or his manipulation, or the strained poses of the victims the instrument broke to atoms where at the genial fabricator gave an impromptu discourse on genteel expletives for use by engineers in distress with numerous examples. The joke was on the visitors and they enjoyed it.

After discussion on professional engineering legislation, the meeting adjourned for refreshments.

Annual Meeting.

The annual meeting of the Hamilton Branch was held at the Royal Connaught hotel, Hamilton, on Wednesday, May 6th, 1925, with J. J. MacKay, M.E.I.C., chairman, presiding. The result of the election was announced showing the following members elected to the executive for 1925-1926:

Chairman	C. J. Nicholson, A.M.E.I.C.
Vice-Chairman	F. P. Adams, A.M.E.I.C.
Secretary-Treasurer	H. B. Stuart, A.M.E.I.C.
Committeemen — 1925-26-27	Hugh Lumsden, M.E.I.C.,
	Guy Marston, A.M.E.I.C.
1925-26	W. L. McFaul, M.E.I.C.,
	L. W. Gill, M.E.I.C.
Emeritus	J. J. MacKay, M.E.I.C.,
	Immediate Past Chairman.
Ex-officio	W. F. McLaren, M.E.I.C.

The financial statement was read by the secretary-treasurer but publication is deferred until the opening meeting of the next season pending the receipt of the rebates to the end of the financial year.

The speaker of the evening was Prof. H. E. T. Haultain, M.E.I.C., who spoke on "The Tribal Spirit amongst Engineers". He mentioned various instances to prove that glimmerings of such a spirit exist and pointed out that the solution of its development, in his opinion, lay in promoting protective legislation.

Ed. Sterne, chairman of the District Committee of the Association of Professional Engineers of Ontario led the discussion and went into further detail as to how such legislation was to be promoted.

Following the discussion the incoming Executive were called forward and introduced to the members.

Lightning Phenomena and Protection.

A joint meeting of the Hamilton Branch of the E.I.C., with Toronto Section of the A.I.E.E., was held in Westinghouse auditorium, Hamilton, on Friday, April 24th, 1925. At this meeting Dr. J. Slepian, Assoc. A.I.E.E., research engineer of the Westinghouse Electrical and Manufacturing Company of East Pittsburg spoke on "Lightning Phenomena and Protection". He told of recent research into this subject and of the practical application of the results of this research in developing and improving appliances for the protection of transmission lines and substations. The discussion was very clear cut and concise. It must be confessed that, to those unfamiliar with the latest ramifications of electrical knowledge, the whole evening savored somewhat of magic.

The Canadian Westinghouse Company supplied refreshments during the consumption of which many very pleasant get-together, get-acquainted conferences took place.

Preliminary Notice

of Applications for Admission and for Transfer

August 19th, 1925.

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in September 1925.

R. J. DURLEY, Secretary.

*The professional requirements are as follows:—

A Member shall be at least thirty-five years of age, and shall have been engaged in some hranch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office, or a term of instruction in a schoolof engineering recognized hy the council. The term of twelve years may, at the discretion of the council, he reduced to ten years in the case of a candidate for election who has graduated from a school of engineering recognized hy the council. In every case the candidate shall have held a position in which he had responsible charge for at least five years as an engineer qualified to design, direct or report on engineering projects. The occupancy of a chair as a professor in a faculty of applied science or engineering, after the candidate has attained the age of thirty years, shall be considered as responsible charge.

An Associate Member shall be at least twenty-seven years of age, and shall have heen engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized hy the council. In every case a candidate for election shall have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years. The occupancy of a chair as an assistant professor or associate professor in a faculty of applied science of engineering, after the candidate has attained the age of twenty-seven years, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council, shall be required to pass an examination before a board of examiners appointed by the council. The candidate shall he examined on the theory and practice of engineering with special reference to the branch of engineering in which he has been engaged. This examination may be waived at the discretion of the council if the candidate has held a position of professional responsibility for five or more years.

A Junior shall be at least twenty-one years of age, and shall have been engaged in some hranch of engineering for at least four years. This period may be reduced to one year, at the discretion of the council, if the candidate for election has graduated from a school of engineering recognized by the council. He shall not remain in the class of Junior after he has attained the age of thirty-three years.

Every candidate who has not graduated from a school of engineering recognized hy the council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects: geography, history, (that of Canada in particular), arithmetic, geometry, euclid (books I, IV and VI), trigonometry, algebra up to and including quadratic equations.

A Student shall be at least seventeen years of age, and shall present a certificate of having passed successfully an examination equivalent to the final examination of a high school or the matriculation of an arts or science course. He shall either be pursuing a course of instruction in a school of engineering recognized hy the council, in which case he shall not remain in the class of student for more than two years after graduation; or he shall be receiving a practical training in the profession, in which case he shall pass an examination equal to that prescribed for admission to the grade of Junior in the foregoing section and he shall not remain in the class of Student after he has attained the age of twenty-seven years.

An Affiliate shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience, qualify him to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as references does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

DIXON—KEITH, of Galahad, Alta. Born at Tickhill, Yorks, England, July 10th, 1898; Educ., Doncaster Grammar School, England; 1921, on C.P.R., survey; 1922, rodman on rld. survey for Columbia River Lumber Co.; 1923, rodman on survey, C.P.R., and 1924-25, instr'man., constrn., dept., C.P.R., at present at Climax, Sask.
References: C. Flint, J. R. Paget, T. F. Francis, C. H. Davis.

DUBE—WILBROD, of 20½ d'Aiguillon, Quebec, Que. Born at St. Agapti, Que., Jan. 7th, 1895; Educ., B.A.Sc., C.E., Ecole Polytech., Univ. of Montreal, 1921; 1921-24, engr., Dept. Public Works and Labour, Quebec, Que.; May 1924 to date, engr. in office of Tanguay & Chenevert, Architects, Quebec, Que.
References: A. Frigon, T. E. Rousseau, I. E. Vallée, J. P. P. Joncas, L. C. Dupuis, E. S. T. Lavigne.

FINLAY—ALLAN HUNTER, of Victoria, B.C. Born at Guelph, Ont., Aug. 29th, 1897; Educ., B.A.Sc., Univ. of B.C., 1924; 1915-19, overseas, Capt. M.C. and Bar; 1922 (summer), with B.C. Coast triangulation survey; 1923-24 (summers), asst. to divn'l. engr., Revelstoke Divn., C.P.R.; At present, res. engr., C.P.R. Crystal Garden Amusement Centre, Victoria, B.C.
References: F. W. Alexander, J. N. Anderson, E. G. Matheson, W. H. Powell, A. Lighthall, E. P. Girdwood.

HAY—JOHN CARTER, of Ottawa, Ont. Born at Newcastle-on-Tyne, England, June 20th, 1889; Educ., Bath Lane Science and Arts School, Newcastle, and private tuition; 1911-12, office work, instr'man. and leveller, Quebec & Saguenay Rly.; 1912-13 (4 mos.), transitman on prelim. location, Canada & Gulf Terminal Rly.; 1913-14, instr'man., N.T.C. Rly.; 1914 (Sept.-Dec.), instr'man., Glengarry & Stormont Rly.; 1915 to date with Surveys Division, Dept. National Defence, as follows: 1915-16, i/c of level parties, Quebec and Ontario; 1916-18, i/c party on waterways and lake control survey, Halifax, and of control of Aldershot Military Camp, Kentville, N.S.; 1918 (May-Nov.), i/c of control party in Cape Breton; 1918-19, office work; 1919-23, plane table work in Cape Breton and Quebec; 1923 (June-Oct.), i/c of topog'y., Sarcee Military Camp; 1923 (Oct.-Dec.), revision work, outskirts of Toronto; 1923 to date, plane table work in Ontario and Quebec, and office routine during winter.
References: J. B. Cochrane, R. Strickland, W. N. Cann, E. J. Bolger, J. Strachan.

PLAMONDON—EDWARD ALEXANDER, of Ottawa, Ont. Born at Huntingdon, Que., Oct. 28th, 1888; Educ., Grad. St. Hyacinthe Model School; 1910-11, asst. to topog'l. engr.; 1912-13, on running vertical control in N.S. and Quebec; 1914-15, i/c of party doing horizontal control of base of topog'l map for Dept. National Defence; 1916-18, overseas; 1919 to date with Dept. National Defence as follows: 1919, on primary level work; 1920-22, chief of party, horizontal and vertical control; 1923, at Sarcee Military Camp on both control and topog'y., and in Oct. and Nov. aided officer in charge of horizontal control in making two foot contour of govt. property at Long Branch, Ont.; 1924-25, chief of party, vertical and horizontal control, Surveys Branch, Dept. National Defence.
References: J. E. R. Ross, J. E. Browne, J. L. Rannie, W. C. Murdie, E. J. Bolger.

STAIRS—HENRY GERALD, of Halifax, N.S. Born at Halifax, Jan. 8th, 1904. Educ., Three years engrg., Dalhousie Univ., 1921-22, 1923-25; 1921 (summer), with N. S. Prov. Highway Board; 1922-23, with C.P.R.; 1924 (summer), and at present, instr'man, N.S. Prov. Highway Board.
References: W. P. Copp, H. R. Theakston, H. M. Dibblee, C. G. J. Luck, H. S. Johnston.

FOR TRANSFER FROM CLASS OF ASSOCIATE MEMBER TO MEMBER

BAIRD—ALBERT FOSTER, of Fredericton, N.B. Born at Chipman, N.B. Dec. 6th, 1891; Educ., B.Sc. (E.E.), Univ. of N.B., 1914, M.Sc., Univ. of N.B., 1917; 1913, student work with Canadian Westinghouse Co., Hamilton, Ont.; 1919, investigation of telephone transmission problems, Northern Electric Co., Montreal; 1916-19, professor of mech'l. engr., and 1920 to date, professor of physics and elect'l. engrg., University of New Brunswick, Fredericton, N.B. (Also acted in consltg. capacity to N.B. Hydro-Electric Commn., and to N.B. Public Utilities Board.)
References: F. P. Vaughan, W. R. Pearce, S. R. Weston, B. M. Hill, C. McN. Steeves.

MANSON—ALEXANDER BROCK, of Stratford, Ont. Born at Twnp. of West Zorra, Dec. 16th, 1883; Educ., B.A.Sc., Univ. of Toronto, 1910; 1908, land surveys, Dept. of Indian Affairs; 1909-10, asst. engr., Stratford; 1911, instr'man., Mond Nickel Co.; 1911-12, res. engr., C.N.R.; 1912 to date, city engr., Stratford, Ont.
References: P. Gillespie, A. D. LePan, E. G. Hewson, H. A. Brazier, W. P. Near, A. F. Macallum, W. L. Malcolm, F. McArthur.

WESTON—SAMUEL RAYMOND, of 6 De Monts Street, St. John, N.B. Born at Upper Gagetown, N.B., May 15th, 1889; Educ., B.Sc. (C.E.), Univ. of N.B., 1914; 1910 (summer), rodman and instr'man, rly. constrn.; 1911 (summer), student asst., D.P.W., Chatham, N.B.; 1912-13 (summers), survey work, N.B. Rly. Co.; 1914, rly. location; 1915-16, private practice with A.A. Colter; 1916-18, res. engr., constrn., St. John & Quebec Rly.; 1918-19, managing engr., Midland Coal Co. Ltd.; 1919-20, private practice; 1920-23, asst. chief engr., 1923-24, acting chief engr., and 1924 to date chief engr., N.B. Electric Power Commn., St. John, N.B.
References: G. G. Hare, R. H. Cushing, G. Kribs, H. G. Acres, A. A. Colter, W. J. Johnston, A. C. D. Blanchard.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

GARNEAU—JEAN BERCHMANS, of 5 Christie Street, Quebec, Que. Born at Quebec, Oct., 29th, 1890; Educ., Surveyor, Laval Univ., 1912; 1910, Quebec Saguenay Rly., 1911, inspr., River St. Charles dredging; 1912, land surveying; 1913, transitman, Dept. of Roads; 1913, i/c of location parties; 1914 to date, chief of laboratory, Dept. of Roads, Parliament Bldgs., Quebec, Que.
References: R. Savary, A. Fraser, J. A. Lefebvre, A. B. Normandin, T. E. Rousseau, E. S. T. Lavigne, H. Cimon, J. P. P. Joncas.

GOODWIN—WILDER CLIFFORD, of 62 Colborn Street, East Dedham, Mass. Born at Belle Isle, N.S., June 19th, 1892; Educ., Corres. and private study in civil and struct'l. engrg.; 1911-12, rodman, mtce. of way, C.P.R.; 1912, rodman and levelman, G.T.P. Rly.; 1913-14, dftsman, City of St. John; 1914-19, overseas, C.F.A.; 1919-22, inspr. and instr'man. on constrn. of breakwater, dry dock and hbr. works, St. John Dry Dock & Shipbldg. Co., St. John, N.B.; April 1922 to date, designer, checker and estimator, for Truscon Steel Co., Boston branch, Boston, Mass.
References: G. Kahn, E. G. Cameron, V. S. Chesnut, G. G. Hare, G. N. Hatfield, D. A. Duffy, N. K. Cameron.

HANKS—ALFRED WILLIAM, of 40 Gladstone Avenue, Windsor, Ont. Born at Wakefield, Yorks, England, July 13th, 1894; Educ., Private study; 1910-12, engr's. office, MacKenzie Mann & Co. Ltd., and clerk and junior dftsman., C.N.R., Winnipeg; 1912-14, rodman, C.N.R. surveys, bridges, constrn. and location; 1914-18, overseas; 1918 (June-July), dftsman., Dominion Bridge Co., Winnipeg; 1918-19, junior inspr. and later divn'l. dftsman., Divn. no. 3, Greater Winnipeg Water District; 1919 (June-Dec.), field dftsman and instr'man., Manitoba Drainage Commission; 1919-22, detailer, Dominion Bridge Co.; 1922-23, estimator and office engr., John A. Patterson, Gen. Contractor, Winnipeg; 1923 (Mar.-July), detailer, Manitoba Bridge and Iron Works; 1923 (July-Nov.), detailer, Dominion Bridge Co., Winnipeg; 1923-24, detailer and checker, Canadian Bridge Co., Ltd., Walkerville, Ont.; 1924-25, checker, Whitehead & Kales Iron Works, Detroit, Mich.; June 1925 to date, checker, Canadian Bridge Co. Ltd., Walkerville, Ont.

References: A. E. West, J. W. Smith, D. L. McLean, H. M. White, F. H. Kester.

HARKOM—JOHN FREDERICK, of 55 St. Famille Street, Montreal, Que. Born at Melbourne, Que., Oct. 6th, 1889; Educ., B.Sc. McGill Univ. 1914; 1906-10, ap'tice, machine shop and drawing office, Canada Foundry Co. Ltd., Toronto, Ont.; 1914-19, overseas. Can. F. A., and Royal F.A. Capt., M.C.; 1919-20, engrg. dept., Canadian Ingersoll-Rand Co., Sherbrooke, Que., design of boilers, hoists, etc.; 1920 (May-Sept.), asst. field engr., Sept. 1920 to May 1921, field engr., for E. G. M. Cape & Co.; 1921 (May-Nov.), i/c of treating plant, Canada Creosoting Co., Sudbury, Ont.; 1922-23, with Thompson-Starratt Co. Ltd., on constrn. of Mount Royal Hotel; 1923-24, field engr., for E.G.M. Cape & Co., on constrn. of Gowans Kent Bldg., Toronto, Ont.; April 1924 to date, i/c Divn. of Wood Preservation, Forest Products Laboratories of Canada, Montreal, Que.

References: E. G. M. Cape, A. R. Henry, F. S. Keith, C. M. McKergow, S. R. Newton, G. E. Templeman, J. B. Stirling.

HINTON—ROBERT E., of 563 Gilmour Street, Peterborough, Ont. Born at Gananoque, Ont., Oct. 28th, 1888; Educ., B.Sc. Queen's Univ., 1913; Eight years, operating in power plants, steam engrg., power plant and line constrn., wiring, etc.; Eight years to date, with the Can. Gen. Elec. Co. at Peterborough, two years in the test dept., and six years as asst. designing engr., in the induction motor engrg. dept.

References: V. S. Foster, B. L. Barns, A. B. Gates, A. L. Dickieson, E. R. Shirley, P. Manning, B. Ottewell, R. L. Dobbin.

JOHN—JOHN SAINT, of Deer Lake, Nfld. Born at Pontypridd, South Wales, July 5th, 1890; Educ., Three years ap'ticeship, South Wales Power Dist. Co., Ltd. Evening classes, tech. school; 1908-09, mining; 1912-14, shift engr., power plant, Cory Bros., South Wales; 1914-16, overseas; 1916-23, efficiency engr., N.S. Steel & Coal Co., Ltd., Wabana, Nfld.; 1923 to date, supt. in charge of constrn., Newfoundland Power & Paper Co., Ltd., Deer Lake, Nfld.

References: A. R. Chambers, H. B. Gillis, C. B. Archibald, F. R. Faulkner, J. B. Gilliatt, J. H. Morley.

KUHRING—PAUL LUDWIG, of Sorel, Que. Born at Toronto, Ont., Oct. 6th, 1890; Educ., Completed 3rd year Arts. Univ. of N.B.; Two summers on mtce. surveys with C.P.R.; 1912-13, student asst., D.P.W., Chatham, N.B.; 1913-20, engrg. clerk, chief engr's. branch, Dept. of Marine, Ottawa, except from 1916-19, when overseas, including 10 mos. with Can. Rly. Troops in France; 1920 to date, junior engr., River St. Lawrence Ship Channel, Dept. of Marine.

References: V. F. W. Forneret, N. B. McLean, A. Laflèche, F. S. Jones, N. Wilson, H. F. Morrisey, G. Stead.

MACKENZIE—JOHN ALLAN, of St. John, N.B. Born at Cornwall, Ont., Jan. 11th, 1889; Educ., Grad., R.M.C., 1909; 1909-11, dftsman. and asst. engr., Quebec Rly. Light & Power Co.; 1911 (July-Dec.), asst. engr., prelim. surveys for Stadacona Hydraulic Co., power development at Seven Falls, Que.; 1912-13, instr'man, on constrn., N.T.C. Rly., La Tuque, Que.; 1914 (June-Sept.), engr., on constrn. of concrete wharves, West St. John, N.B., for E.G.M. Cape & Co., Ltd.; 1914-19, overseas, Major, C.E.F.; 1919-21, engr. and supt., J. A. Grant & Co., Ltd., on constrn. of bldgs. for C.P.R. at West St. John & McAdam, N.B..; 1922 (May-Oct.), 1923 (Apr.-Dec.), 1924 (Mar.-Dec.), and from March 1925 to date, transitman, mtce. of way dept., Brownville Division, C.P.R., Brownville Jct., Me.

References: A. O. Wolff, C. C. Kirby, J. A. W. Waring, J. A. Grant, E. A. Evans, E. G. M. Cape.

MILLER—HARRY EDWARD, of Charlottetown, P.E.I. Born at Charlottetown, Dec. 24th, 1886; Educ., 2 years, Prince of Wales College, Charlottetown. I.C.S. Course in Mapping and Surveying; 1907 to date, with Dept. Public Works, at Charlottetown, as follows: 1907-13, in dist. engr's. office, assting on surveys, inspections, and dfting; 1913-19, acting as asst. to the dist. engr., and from March 1920 to date, asst. engr.

References: J. B. Hegan, W. E. Hyndman, H. H. Shaw, F. B. Fripp, H. F. Laurence.

RUSSELL—ALLAN HUGH, of 21 Lansdowne Avenue, Sault Ste Marie, Ont. Born at Renfrew, Ont., July 12th, 1888; Educ., 2 years science, 1908-11, McGill Univ.; 1907-08, operator and meter inspr., hydro-electric power plant, Renfrew Power Co.; 1909-12, meter dept., and operator in hydro-electric plant, Lake Superior Power Co., Sault Ste Marie, Ont.; 1913-14, asst. to field engr., water power dept., Algoma Steel Corpn., and 1915, senior operator, hydro-electric power plant for same company; 1916-17, dftsman. and field work for Spanish River Pulp & Paper Co., and 1918-1921, asst. to resident for above company in mtce. and constrn.; Oct. 1921 to date, asst. city engr., Sault Ste Marie, Ont.

References: L. R. Brown, A. E. Pickering, W. S. Wilson, C. H. E. Rounthwaite, W. Seymour, R. A. Campbell, C. H. Speer.

RUSSELL—JOHN HARTLEY, of 48 Bedford Park Avenue, Toronto, Ont. Born at Quebec, Que., Jan. 26th, 1888; Educ., Civil Engrg., I.C.S. School of Petrol and Electrical Engrg., England; 1908-09, ap'tice, chief engrs. office, Quebec Rly. Light & Power Co.; 1909-14, instr'man. and dftsman., for Quebec Rly. Light & Power Co., Quebec and Saguenay Rly., Mr. E. A. Evans, Consltg. Engr., Mr. D. S. Barton, Consltg., Engr.; 1919 to date, engr., for Russell Construction Co., Ltd., Toronto, Ont., in charge of constrn., of various bridges, docks, intakes, retaining walls, etc.

References: C. J. Townsend, F. Barber, T. Taylor, R. W. Angus, J. M. Wilson, R. G. Saunders, E. A. Forward.

THORNTON—HENRY EDGAR, of Prince Rupert, B.C. Born at Burton-on-Trent, England, Dec. 2nd, 1886; 1907-08, land surveying, Manitoba; 1908-10, rodman, constrn. dept., C.P.R.; 1910-15, C.P.R. as follows: 1910-13, instr'man. on location and constrn., Prairie and Mountain divns., 1913, res. engr., Weyburn West, 1914-15, transitman, on bridge constrn.; 1918 to date, asst. to divn. engr., mtce. of way, C.N.R., Prince Rupert, B.C.

References: W. H. Tobey, M. A. Burbank, W. S. Fetherstonhaugh, J. R. C. Macredie, C. H. Larson.

TISDALL—FREDERICK, of 85 Brydges Street, Moncton, N.B. Born at London, England, Jan. 26th, 1890; Educ., I.C.S.; hydro-electric plant install'n., Can. Gen. Elec. Co. & Westinghouse Co.; charge of power station, 110,000 volts, Hydro-Electric Commission, Guelph, Preston & Toronto; 17 years with the T. Eaton Co. Ltd., engrg. dept., at present, chief engr. and dept. mgr., Moncton, N.B.

References: J. D. McBeath, F. O. Condon, J. G. Dryden, M. J. Murphy, J. G. MacKinnon.

TURTLE—ALFRED CLAUDE, of 23 Evanson Street, Winnipeg, Man. Born at Birmingham, England, August 26th, 1890; Educ., elec. engr., I.C.S. Three years ap'ticeship, C.P.R., Winnipeg shops; 1914 (Mar-Sept.), electrician, G.T.P. shops, Transcona, and foreman electrician until Sept. 1915; 1915-20, elect'l. engr. in charge of all electr'l constrn., design, mtce., G.T.P.Rly.; 1920-21, electr'l. engr., C.N.R. for G.T.P., equipment; May 1921 to date, shop electr'l. engr., Transcona shops, C.N.R.

References: N. M. Hall, A. W. Lamont, E. V. Caton, A. H. Eager, R. W. Moffatt.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

BEAUDRY—LOUIS, of 4 Laporte Street, Quebec, Que. Born at Three Rivers, Que., June 19th, 1897; Educ., C.E., B.A.Sc., Ecole Polytech., 1921; 1916-19 (summers), Roads Dept., Prov. of Quebec; 1920 (summer), with city of Outremont; 1921-23, in constrn. business, Trépanier & Beaudry, Three Rivers, Que.; Feb. 1923 to date, with the Dept. of Public Works, Prov. of Quebec, Que.

References: A. R. Décary, J. A. Duchastel, A. B. Normandin, A. Fraser, H. Cimon.

BENNETT—GEORGE CLIFFORD, of Toronto, Ont. Born at Waubaushene, Ont., March 20th, 1895; Educ., B.A.Sc. Univ. of Toronto, 1920; 1920 (May-Dec.), office and inspection work, Harkness, Loudon & Hertzberg, Toronto; Dec. 1920 to Apr. 1925, with Lang & Ross, Sault Ste Marie, Ont., six mos., office work, four years, constrn. supt.; Apr. 1925 to date, vice-pres. and mgr., Burk Investments Ltd., Gen. Contractors, Real Estate & Insurance, Toronto, Ont.

References: J. L. Lang, K. G. Ross, T. R. Loudon, G. H. Kohl, C. S. L. Hertzberg, H. E. T. Haultain.

BLEAU—ALPHONSE, of 1426 Aird Street, Montreal, Que. Born at Montreal, Feb. 20th, 1897; Educ., B. A. Univ. of Montreal, 1918, B.Sc., McGill Univ. 1923; 1923 (July-Dec.), chemist and inspr., with R. W. Hunt Co.; 1924-25, constrn. inspr., Electrical Commission, City of Montreal; April 1925 to date, builder and real estate administrator, Montreal, Que.

References: A. Stansfield, C. M. McKergow, A. J. Kelly, G. R. MacLeod, F. B. Brown, J. B. Porter.

BREITHAUPT—CARL L., of 172 Margaret Avenue, Kitchener, Ont. Born at Kitchener, Ont., July 27th, 1896; Educ., B.A.Sc., Univ. of Toronto, 1922; 1917-18, with Can. Signal Co. in England; One summer in lab. of J. H. Heald & Co., Lynchburg, Va.; Four mos. in lab. and plant of C. C. Smart & Son Co., North Wilkesboro, N.C.; Two and one half years to date, chemist for Hastings Tanning Co., Hastings, Ont., and at present, chem. engr. i/c of plant control of the Breithaupt Leather Co., Kitchener, Ont.

References: T. R. Loudon, C. R. Young, M. Pequegnat, W. H. Breithaupt, E. S. Smyth, S. Shupe.

CARTWRIGHT—GEORGE HERBERT, of Quebec, Que. Born at London, England, July 27th, 1893; Educ., B.Sc. McGill Univ., 1922; 1913-14 (summer), rodman, Shawinigan Water & Power Co.; 1915-18, overseas; 1920 (summer), field office, and 1921 (summer), engr., transmission lines, Shawinigan Engrg. Co.; 1922-24, gen. field work and asst. field engr., with above company; Oct. 1924 to date, asst. engr., mtce. of way, Quebec Railway Light Heat & Power Co., Quebec, Que.

References: C. J. Pigot, H. J. Ward, C. R. Lindsey, C. Luscombe, E. Brown.

DAWSON—WILLIAM ASH, of 68 Lincoln Road, Walkerville, Ont. Born at Barrie, Ont., August 16th, 1892; Educ., B.Sc. Queen's Univ., 1923; 1915-16, ap'tice in tool room, National Hardware, Orillia, Ont.; 1916-18, chief inspr., on tools and guages for 5" naval gun mounts, Canadian Linderman Co., Woodstock, Ont.; 1918-19, tool and die maker, Windsor Machine & Tool Co., Windsor, Ont.; 1920-22 (summers), tool and die maker, Tallman Brass & Metal Co., Hamilton, Ont.; 1923 (summer), house bldg. contracts; At present, machine designer for Ford Motor Co., Ford, Ont.

References: L. M. Arkley, L. T. Rutledge, W. P. Wilgar, A. Macphail, D. S. Ellis, A. Jackson.

DYER—JOSEPH WILSON, of Toronto, Ont. Born at Brampton, Ont., Oct. 12th, 1895; Educ., B.A.Sc. (Mech.), Univ. of Toronto, 1923; 1912-13 (summers), toolkeeper, machinist and steel plate worker, G.T.R. Repair shops, Stratford, Ont.; 1920 (5 mos.), fitter on special machines, McKinnon Industries Ltd., St. Catharines, Ont.; 1923-25, engrg. asst. to supervisor of instruction and employment, and from May 1925 to date, asst. to supervisor of bldgs. and vehicles, Bell Telephone Co., Toronto, Ont.

References: T. R. Loudon, C. H. Mitchell, C. R. Young, P. Gillespie, R. W. Angus.

FARNSWORTH—ARTHUR LESLIE, of Sault Ste Marie, Ont. Born at Cookshire, Que., Nov. 23rd, 1895; Educ., B.Sc. McGill Univ., 1923; 1916, ap'tice, Angus Shops, C.P.R., Montreal; 1920 (summer), dfting and design work, St. Maurice Paper Co., Ltd., Three Rivers, Que.; 1921, asst. to res. engr., Jenckes Canadian Co., Ltd., Drummondville, Que.; 1924 (5 mos.), dfting and design work Price Bros., Kenogami, Que.; Feb. 1925 to date, dfting and designing, Lake Superior Paper Co. Ltd., Sault Ste Marie, Ont.

References: H. A. Morey, A. A. MacDiarmid, H. V. Bignell, A. R. Roberts, C. M. McKergow.

GILLEY—JAMES ROYDEN, of Toronto, Ont. Born at New Westminster, B.C., April 3rd, 1894; Educ., B.A.Sc. Univ. of Toronto, 1921; 1914 (summer), rodman, etc., New Westminster Harbour Improvement; 1916-18, overseas; 1919 (summer), dftsman, rodman, etc., Sumas Reclamation Scheme (B.C.); 1920 (Apr.-Sept.), rodman and instr'man., C. N. R. constrn., Kelowna branch; 1923 (May-June), plan examiner, archts. dept., City of Toronto; June 1923 to date, comptroller, Hart House, University of Toronto, Toronto, Ont.

References: C. R. Young, T. R. Loudon, C. H. Mitchell, A. D. LePan, R. J. Marshall.

HARVEY—JOHN P., of Cornwall, Ont. Born at Orillia, Ont., Nov. 28th, 1886; Educ., B.Sc. (Civil), Queen's Univ. 1913; Three years on D.L.S. work as asst. to J. C. Baker, D. and A. L. S., in Alta, and Sask.; 1912 (summer), instr'man., on N. T. C. Rly. at Redditt, Ont.; 1913-14, town engr., Vermilion, Alta., designed water and sewage system; 1914-19, overseas. Can. Eng s.; 1919-24, town engr., Vermilion, Alta., and for three rural municipalities; At present, asst. engr., Dept. Rlys. and Canals, Cornwall Canal, in charge of contract raising banks, roads and lock walls.

References: A. Macphail, W. L. Malcolm, W. P. Wilgar, C. D. Sargent, W. R. Hughson, J. E. Caughey.

HUDSON—GEORGE WILLIAM, of 10 Rennie Avenue, Montreal West, Que. Born at Dunkirk, New York, U.S.A., Jan. 8th, 1897; Educ., B.Sc. (Honours), Queen's Univ., 1920; 1919 (Feb.-Oct.), dftsman., Dominion Foundries & Steel Ltd., Hamilton, Ont.; 1920 (May-Oct.), designing dftsman., with same firm; 1920-23, demonstrator, engrg., physics and mech'l. engrg., Queen's Univ.; 1923-24, designing dftsman., Canadian Westinghouse Co., Hamilton, Ont.; At present supervisor of vehicles, supervising mtce. and operation, The Bell Telephone Co., of Canada, Montreal.

References: L. M. Arkley, W. F. McLaren, D. M. Jemmett, L. T. Rutledge.

JOHNSTON—HARRY WYATT, of 25 Bellingham Road, Outremont Que., Born at Montreal, Oct. 18th, 1896; Educ., B.Sc. (Chem. Eng.), McGill Univ. 1921; Special lectures in struct'l. engrg. etc.; 1917, with Canadian Electro products, Ltd.; 1918-19, overseas; 1920 (May-Sept.), asst. chemist, Canadian Super-Cement Ltd., and from Aug. 1919 to May 1920, special researches for same company; 1921-22, chemist, Messrs. Charlton & Pope, industrial engrs., designed and built special apparatus, conducted researches, etc., (firm dissolved); Appointed consultant to Canadian Prest Air Ltd., to design and erect a plant for manufacture of solidified carbon dioxide by cryogenic methods. Conducted researches for parent organization (Prest Air Corporation), Aug.-Sept. 1924, and from Oct. 1924 to date, chief engr., Canadian Prest Air Ltd., Montreal, Que. (Jan.-July 1923, managing director of Atlas Press Ltd.).

References: F. S. Keith, C. J. Armstrong, H. M. MacKay, C. M. McKergow, J. B. Porter, E. Brown, F. M. Dawson, K. M. Perry, Sir S. Brunton.

KESTEVEN-BALSHAW, Humphrey, of 1053 Yonge Street, Toronto, Ont. Born at Ventnor, Isle of Wight, England, Nov. 20th, 1896; Educ., B.A.Sc. Univ. of Toronto, 1923; 1915-16 and 1919 (Apr.-June), asst. chemist, Dominion Tar & Chemical Co., Ltd, Sydney, N.S.; 1916-19, overseas; 1920 (May-Sept.), chemist and plant asst., Dominion Tar & Chemical Co., Ltd., Sault Ste Marie, Ont.; 1921 (May-Oct.), testing engr., Dept. Public Highways, Ontario; Nov. 1924 to date, with the Consumers Gas Company, Toronto, first in dfting, office, distribution dept., later on outside distribution work, and at present industrial sales engr., on installation and equiping of industrial gas furnaces.

References: J. H. Jenkinson, J. W. Bain, H. K. Wickstead, F. M. Buchanan, C. H. Mitchell, C. R. Young, T. R. Loudon.

LABELLE—GASTON, of 129 Rachel Street, Montreal, Que. Born at Montreal, Dec. 30th, 1895; Educ., C. E., Polytech. School, 1919; 1920, transitman, Quebec Streams Commission; 1921, topographer, Chicoutimi Pulp & Paper Co.; 1922-24, divn. engr. i/c of Drummond & Richmond counties, Dept. of Roads, Prov. of Quebec; At present with the technical service, City of Montreal.

References: T. J. Lafrenière, C. J. Desbaillets, A. Fraser, A. B. Normandin, O. O. Lefebvre, A. Frigon, T. E. Rousseau.

LAJOIE—JOSEPH LOUIS CHARLES, of Pointe aux Trembles, Que. Born at Montreal, May 1st, 1897; Educ., B.A.Sc. Univ. of Montreal, 1918; One year, Federal Dept. Public Works, Three Rivers and Sherbrooke districts; One year, engrg. dept., Imperial Oil Ltd.; Three years, lab. asst., Imperial Oil Refineries, and for the past three years to date, chief chemist, Imperial Oil Refineries, Montreal East, Que.

References: F. C. Mechin, J. E. Letson, A. G. Sabourin, B. GrandMont, A. Frigon, A. Fraser, C. B. Leaver.

LEGATE—JOHN HAROLD, of Belleville, Ont. Born at Owen Sound, Ont., Nov. 11th, 1892; Educ., B.Sc. Univ. of Toronto, 1921; 1915-19, overseas, C.F.A.; 1913 (summer), line work, H. E. P. C. of Ont.; 1914, (summer), constrn. work, at Eugenia Falls for Ambursen Construction Co.; 1920 (summer), asst. engr., Canada Cement Co., Ltd., Belleville Ont., and from 1921 to date with same company, asst. engr., asst. supt., and at present supt., Plant No. 5, Belleville, Ont.

References: A. C. Tagge, F. B. Kilbourn, P. Gillespie, T. R. Loudon, C. R. Young.

LOVELL—WILLIAM EDWARD, of 667 McMillan Avenue, Winnipeg, Man. Born at Toronto, Ont., June 25th, 1893; Educ., B.Sc., (E.E.), Univ. of Man., 1921; 1920 (summer), elect'l., work with Winnipeg Electric Rly. Co., Winnipeg; 1921 (summer), elect'l. work, City Hydro, Winnipeg; 1921-22, demonstrator in elec. lab., Univ. of Manitoba; 1922-23, asst. to special engr. with Manitoba Power Co.; 1923 (May-Sept.), instr'man. and inspr. on transmission line constrn., Winnipeg Electric Co.; Sept. 1923 to date, asst. prof. of elect'l. engrg., Univ. of Saskatchewan, Saskatoon, Sask.

References: E. P. Fetherstonhaugh, J. N. Finlayson, E. V. Caton, F. H. Martin, C. J. Mackenzie, A. R. Greig, G. M. Williams, J. M. Leamy.

MALLOCH—ALLAN CLYDE, of Montreal, Que. Born at Arnprior, Ont., May 3rd, 1893; Educ., B.Sc., Queen's Univ. 1921; 1921 (summer), drill inspr., H.E.P.C. of Ontario, Chippewa development; 1921, dfting dept., C.P.R., to date, and at present, mech'l. dftsman., mtce of rolling stock, mech'l. dept., C.P.R., Montreal, Que.

References: J. A. Shaw, A. N. Ball, N. Malloch, L. M. Arkley, D. S. Ellis, L. T. Rutledge.

MONETTE—IRENEE, of Montreal, Que. Born at Montreal, Nov. 2nd, 1894; Educ., McGill Univ., 1914-17; 1914-15 (summer), Montreal Water Level Commn.; 1916, instrument work, dfting, estimates of work, Cedar Rapids & Power Co.; 1918, gen. cost estimating, Northern Electric Co.; 1922 to date, with the Montreal Dairy Co. Ltd., at present, gen. supt.

References: G. P. Hawley, J. H. Brace, J. O. Bonin, W. H. Eastlake, J. S. Cameron, W. S. Vipond, H. Massue, R. deM. Prevost.

MORIN—CHARLES AUGUSTE, of 2719 Christophe Colomb, Montreal, Que. Born at Montreal, Jan. 9th, 1902; Educ., B.Sc., (Civil), McGill Univ., 1923; Nov. 1923 to May 1924, dftsman., pulp and paper machy.; 1924 (June-Sept.), asst. engr. in consltg. engr's. office; 1925 (Mar.-June), radio publicity dept., Northern Electric Co.; At present elect'l. apparatus dftsman., Northern Electric Co., Montreal, Que.

References: W. B. Cartmel, H. M. MacKay, M. D. Barclay, C. M. McKergow, P. A. Beique.

OAKS—HAROLD ANTHONY, of Sault Ste Marie, Ont. Born at Preston, Ont., Nov. 12th, 1896; Educ., B.A.Sc. Univ. of Toronto, 1922; 1915-19, overseas, Can. Engrs. Pilot and Flt. Commdr., R.F.C.; 1921 (summer), field asst., geol. survey, Mackenzie River Oil Co.; 1922 (summer), Can. Geol. Survey; 1922-23, sampler's and surveyor's asst., Hollinger Mines; 1923, prospecting, Ontario and Quebec; 1924, transitman and inspr., Hollinger Power line constrn., 1924 (July), pilot with Ontario Forestry Branch Air Service; At present, pilot, Provincial Air Service, i/c Orient Bay Station.

References: R. W. Downie, H. E. T. Haultain, J. W. LeB. Ross, K. G. Ross, A. T. N. Cowley, G. F. Hanning.

PRESTON—FREDERICK HENRY, of 450 Park Street, Niagara Falls, Ont. Born at Niagara Falls, May 25th, 1900; Educ., 2 years business course in high school; 1918, chainman, Queen Victoria Park Commission, Niagara Falls, Ont.; 6 mos. with W. C. Jepson, O. L. S.; 1919 to date, levelman, dftsman., and instr'man., with city manager and engr., Niagara Falls, Ont.

References: T. S. Scott, J. H. Jackson, G. D. O'Connor, D. T. Black, J. C. Gardner.

PURCELL—JOHN METCALFE, of 536 East Oliver Street, Owosso, Mich., Born at Cobden, Ont., March 16th, 1896; Educ., B.Sc., (Chem. Eng.), McGill Univ., 1921; 1916, machinist, shell production, Steel Company of Canada. Also with Curtis & Harvey (Canada), Dragon, Que., T. N. T. production; 1917-19, overseas. Flying instructor, R.F.C.; 1922-24, analytical chemist, Anglo-Nfld. Development Co. Ltd., Grand Falls, Nfld.; June 1924 to date, with Steere Engineering Co., Detroit, Mich., first in charge of electro-sherardizing plant, and latterly in charge of electric arc-welding in production of gas machinery, etc.

References: C. M. McKergow, E. Brown, S. A. Neilson, H. S. Windeler, C. V. Christie, E. E. Weibel, R. Ford.

VESSOT—CHARLES ULYSSES, of Montreal, Que. Born at Holyoke, Mass., U.S.A., June 12th, 1897; Educ., B.Sc., 1920, M.Sc., 1922, McGill Univ.; Design and bldg. of flax harvesting machines; Five years teaching. engrg. at McGill University, (three years in charge of shop work) and at present lecturer in mechanics of machines and shop processes.

References: C. M. McKergow, A. R. Roberts, H. M. MacKay, E. Brown, R. DeL. French.

WILSON—JAMES CLARENCE, of Wingham, Ont. Born at Wingham, Ont., Nov. 18th, 1891; Educ., B.A.Sc., Univ. of Toronto, 1915; Summer work: 1912, rodman, recorder, topographer, Winnipeg and Saskatchewan rivers survey; 1913, instr'man, cont. investigation, Lower Saskatchewan reclamation project; 1914, topog'l. survey of portion of Winnipeg river and Pinawa channel in Man.; 1915, (May-Nov.), articled as D.L.S. pupil; 1916-19, overseas; 1920-23, with Dominion Water Power Branch in Man. and B.C., and from Jan. to May 1924, with Quebec branch; 1924 (May-Sept.), with Fraser Brace & Co., Ltd., on constrn. of power house for Newfoundland Power & Paper Co. Ltd., Deer Lake, Nfld.; Jan. 1925 to date, engrg. staff, Laurentide Co., Ltd., Casey, Que.

References: J. T. Johnston, T. H. Dunn, N. Marr, G. G. McEwen, J. R. Bissett, S. S. Scovil.

WILSON—SELWYN HAMILTON, of Hawkesbury, Ont. Born at Buckingham, Que., July 9th, 1895; Educ., B.Sc., McGill Univ. 1922; 1915-19, overseas, Lieut., Can. Engrs. and Artillery; 1921 (summer), Consolidated Mining & Smelting Co., Kimberly, B.C.; 1922 (June-Dec.), precise levelling party, St. Lawrence River Canals; 1922-23, mtce. work, dfting, and designing, Riordon Pulp Corpn., Temiskaming, Que.; 1923-25, asst. to chief forester, St. Maurice Pulp & Paper Co., Ltd., Montreal, Que.; March 1925 to date, mill or mtce. engr., Riordon Pulp Corpn., Hawkesbury, Ont.

References: G. G. Gale, D. W. McLachlan, C. M. McKergow, W. L. Ketchen, A. S. Dawes, A. R. Roberts, R. Yuill.

WRIGHT—JOSEPH AGAR, of 162 Arlington Street, Winnipeg, Man. Born at Newry, Co. Down, Ireland, Oct. 2nd, 1894; Educ., 2nd year engrg. (not completed), Univ. of Man.; Three years in all with Grand Trunk Pacific Rlys., as rodman, etc., summer of 1919, concrete inspr., on culvert work; 1915-19, overseas; 1923 (Sept.-Oct.), leveller, 1924 (June-July), topog'r., C.N.R.; Fall 1924, and from June 1925 to date, instr'man on constrn. of Dunblane-Mower branch, C.N.R.

References: A. J. Gayfer, G. C. Dunn, R. W. Ross, E. P. Fetherstonhaugh, R. W. Moffatt, H. A. Dixon, P. R. Philipps.

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A

ABRASIVES

CANADA. Abrasive Materials in Canada, V. L. Eardly-Wilmot. Abrasive Industry, vol. 6, no. 7, July 1925, pp. 217-218. Details of various deposits; farnorth deposit of garnet furnishes some material for abrasive paper.

STANDARDIZATION. Standardization of Abrasives, H. R. Power. Machy. (N. Y.), vol. 31, no. 11, July 1925, pp. 904-905, 2 figs. Work of standardization accomplished by Grinding Wheel Mfrs.' Assn.; in addition to standards for screens and sizing, manner of laboratory testing, weight of charge required, and type of laboratory sifter for checking grades have been standardized so that every abrasive maker's product is same in size.

ACCIDENTS. *See Materials Handling.*

AERODYNAMICS

D'ALEMBERT HYDRODYNAMIC PARADOX AND. The d'Alembert Hydrodynamic Paradox and Aerodynamic Theories (Le paradoxe de d'Alembert et les théories aérodynamiques), M. Roy. Aéronautique, vol. 7, no. 72, May 1925, pp. 175-179. According to d'Alembert theory, when a perfect liquid flows around a solid immersed in it, under certain conditions, obstacle opposes no resistance to flow; author discusses principal aspects of problem raised by this paradox and indicates means of detecting flaws in theory.

AERONAUTICAL INSTRUMENTS

WING-RESISTANCE MEASUREMENT. The Resistance of Airplane Wings (La résistance des voilures d'avions), R. Lecœuvre. Aéronautique, vol. 7, no. 72, May 1925, pp. 180-182, 3 figs. Describes new apparatus for rapid verifications results of tests.

AIR COMPRESSORS

EFFICIENCY. Maintenance of Air Compressor Efficiency, F. H. Ryan. Can. Machy., vol. 33, no. 26, June 25, 1925, pp. 49-50, 4 figs. Values of two-stage compression; proper lubrication essential; suction screen to eliminate dust; condition of governors important.

EXPLOSION IN AIR RECEIVERS, PREVENTION. Prevention of Explosions in Air Receivers, Wm. F. Parish and Wm. B. S. Whaley. Power Plant Eng., vol. 29, no. 14, July 15, 1925, pp. 755-756. Gas is usually formed in such small amounts that no trouble arises unless it accumulates; explosions are not always prevented by safety valves. (Abstract). Paper read before Metropolitan section of A.S.-M.E.

TYPES AND USES. Air Compressors: Types, Uses and Practical Performance, Chas. L. Hubbard. Factory, vol. 35, no. 1, July 1925, pp. 56-60, 96 and 98, 19 figs. How heat affects efficient compression; types of air compressors.

AIR CONDITIONING

FUMES, GASES AND VAPORS REMOVAL. Some Things Worth Knowing About Removing Obnoxious Fumes, Gases, and Vapors, C. L. Hubbard. Indus. Engr., vol. 83, no. 6, June 1925, pp. 276-280 and 304-305, 20 figs. Discusses methods and equipment that are commonly used for removing these by-products from industrial works.

TELEPHONE EXCHANGE SWITCHROOMS. The Ventilation and Air Conditioning of Automatic Telephone Exchanges, A. Lewis. Commonwealth Engr., vol. 12, no. 8, Mar. 1, 1925, pp. 273-278, 8 figs. Deals with air conditioning of switchrooms of automatic telephone exchanges and describes an air-washing and heating plant, and gives a diagrammatic arrangement of air-treatment plant at Collingwood (Victoria, Australia) telephone exchange; gives hygrometric curves.

AIRPLANES

CONSTRUCTION. Theoretical and Experimental Bases of Aeronautical Construction (Bases théoriques et expérimentales de la construction aéronautique), G. Lepère. Société d'Encouragement pour l'Industrie Nationale—Bul., vol. 124, no. 3, Mar. 1925, pp. 217-233, 10 figs. Discusses airplanes, their engines, screws, instruments used for navigation, etc.; reviews development in construction, laboratory tests and their practical application.

FRAMEWORK, STRESSES IN. An Experimental Investigation into the Properties of Certain Framed Structures Having Redundant Bracing Members, A. J. S. Pippard and J. F. Baker. Aeronautical Research Committee (British), Reports & Memoranda, No. 947, Dec. 1924, 25 pp., 6 figs., on supp. plates. Discusses experiments on a braced hexagonal tube subjected to bending and shear, and experiments on a braced hexagonal tube subjected to torsion.

LIFT AND DRAG OF. Lift and Drag of Junker Monoplane. Comparison of Model With Full Scale Results, D. B. Clark, L. P. Coombes, H. Glauert and A. S. Hartshorn. Aeronautical Research Committee (British), Reports & Memoranda, No. 945, Nov. 1924, 10 pp., 10 figs. on supp. plates. Full-scale determination of lift and drag has been made in usual manner by glides with stopped airscrew, and corresponding model experiments cover range of speed from 25 to 90 f.p.s. with a detailed model to 1-12th scale.

PITCHING MOMENTS. Measurement of Pitching Moments Due to Roll on Wings of Avro 504.K, F. B. Bradfield. Aeronautical Research Committee (British), Reports & Memoranda, No. 944, Nov. 1924, 6 pp., 3 figs. on supp. plates. Moments were measured for angles of incidence up to 33 deg., and rotational rates up to $ps/V = 0.3$, and in some cases up to 0.5; these moments have been calculated from pitching moments measured without rotation.

SPAR DESIGN. Direct Solution of Airplane Spar Design, I. H. Driggs. Aviation, vol. 19, no. 2, July 13, 1925, pp. 34-36, 4 figs. So-called precise method adopted by Air Service and Navy Department, may be so simplified by few very reasonable assumptions as to make it possible to solve directly for location of struts in biplane truss; after beam running load and compression load has been determined in usual manner, very simple calculation gives necessary moment of inertia; with center height given from ordinates of airfoil used, and moment of inertia calculated, remaining dimensions of beam follow easily; advantages of simplified calculation.

WING-RESISTANCE MEASUREMENT. *See Aeronautical Instruments.*

WINGS. Summary of Data on Slotted Wings Obtained in the Wind Tunnel of Messrs. Handley Page, Ltd., H. B. Irving and A. S. Batson. Aeronautical Research Committee (British), Reports & Memoranda, No. 930, Aug. 1924-25, pp., 63 figs. Summary, in tabular form, of outcome of examination of data on slotted wings made as a preliminary to further research work at Nat. Physical Laboratory, giving sketches of each arrangement tried, with any modifications which have been tried.

AIR PREHEATING

BOILER FURNACES. *See Boiler Furnaces.*

AIR PUMPS

EFFICIENCY. Air Pump Efficiency. Mar. Engr., vol. 48, no. 573, June 1925, pp. 225-227. Discusses three types of air pumps and their relative operative merits.

ALCOHOL

AUTOMOBILE FUELS. *See Automobile Fuels.*

COKE-OVEN GASES, FROM. The Manufacture of Industrial Alcohol from Coke-Oven Gases (La fabrication industrielle de l'alcool synthétique dans les cokeries et usines à gaz), F. Vallette. Chimie & Industrie, vol. 13, no. 5, May 1925, pp. 718-721, 2 figs.; also translation in Chem Trade Jl. vol. 76, no. 1987, June 19, 1925, pp. 753-754, 2 figs. Description of process and plant at Béthune; conditions for effective ethylene absorption; separation of ethylene from gases; economics of process; hydrolysis of sulphovinic acid; utilization of dilute sulphuric acid.

ALLOYS

ALUMINUM. *See Aluminum Alloys.*

BRONZES. *See Bronzes.*

FERROALLOYS. *See Ferro-alloys.*

STEEL. *See Alloy Steels.*

ALLOY STEELS

AUSTENITE IN. The Persistence of Austenite at Elevated Temperatures, E. C. Bain. Am. Soc. Steel Treating—Trans., vol. 8, no. 1, July 1925, pp. 14-22, 3 figs. Stronger atomic bonding between unlike atoms, which is necessary for any solid solution, is offered as cause for easier retention of austenite in alloy steels; no separate explanation is required for two classes of alloying elements; temperature to which preserved austenite must be heated for release or decomposition is charted for number of common steels and is offered as measure of its persistence; similarity in effect of temperature elevation and cold work upon austenite is shown; suggests that more violent quenching stresses actually deform austenite grains and cause transformation.

BOLTING MATERIAL. Proposed Tentative Specifications for Alloy-Steel Bolting Material for High-Temperature Service. Am. Soc. Testing Matls.—Preprint, no. 7s, for mtg. June 23-26, 1925, 5 pp., 1 fig. Tentative standard published for purpose of eliciting criticism and suggestions.

ALUMINUM

CORROSION. The Oxidic Sodium-Chloride Test for Aluminum (Die oxydische Kochsalzprobe für Aluminum), F. Mylius. Zeit. für Metallkunde, vol. 17, no. 5, May 1925, pp. 148-154, 7 figs. Oxidic salt test for wire and plate sections; protective action of primary and secondary oxide layers; nature of black coloration; oxidic salt test on large metal surfaces and finished products; attack of oxidic salt solution; it is shown that unprotected technical pure aluminum cannot be termed salt-water-proof, but carefully rolled thin plate attains high degree of passivity through prolonged heating at 300 to 400 deg. in air.

MANUFACTURE AND USES. Aluminum: Manufacture, Properties, and Uses, G. M. Dyson. Chem. Age (Lond.), vol. 12, no. 312, June 6, 1925, pp. 41-42 (Met. Sec.), 1 fig. Discusses metallurgy of aluminum and alloys of aluminum, and describes the metal.

ALUMINUM ALLOYS

AGING OF. The Effect of Artificial Ageing Upon Age-hardened Aluminum Alloys, K. L. Meissner. Metal Industry (Lond.), vol. 26, June 26, 1925, pp. 623-626, 1 fig. Investigations were carried out on two aluminum alloys of class that age-harden at ordinary temperature; fundamental difference between the two alloys was that one contained copper and other not; tests of tensile strength, elongation, and flexibility showed that while no benefit is obtained from this artificial aging of copper-containing alloy, all-round improvement in mechanical properties can be obtained with alloy containing no copper, by artificial aging at temperatures up to 12 deg. cent.

ALUMINUM-IRON. A Note on the Microstructure of Aluminum Iron Alloys of High Purity, E. H. Dix, Jr. Am. Soc. Testing Matls.—Preprint, no. 23, for mtg. June 23-26, 925, 10 pp., 12 figs. Deals with occurrence of iron in alloys prepared from aluminum of high purity; examples of segregation obtained in small chill-cast specimen; it is shown how segregation was eliminated; effect of annealing for one week at temperature close to eutectic temperature; effects on pure iron-aluminum constituent of etching reagents commonly employed in metallography of aluminum alloys.

CASTINGS. Aluminum-Alloy Castings, S. L. Archbutt. Foundry Trade Jl., vol. 31, nos. 461 and 462, June 18 and 25, 1925, pp. 527-528 and 539-544, 18 figs. Experiments described and results obtained indicate possibilities of method of treating aluminum and certain of its alloys, which eliminates, at all events, considerable proportion of dissolved gas and thus reduces unsoundness and to considerable extent removes pin-holing; method suggested consists in allowing molten metal to cool slowly in crucible in furnace until it has just completely solidified; it is then remelted, raised to pouring temperature and cast; discusses properties of different aluminum alloys.

APPRENTICES, TRAINING OF

METHODS. Training the Industrial Apprentice, C. M. Morrin. Am. Mach., vol. 62, no. 26, June 25, 1925, pp. 993-996, 7 figs. Lack of interest in apprenticeship; early methods of teaching trades; advantages to employer and employee; selection and trial period for apprentices; method pursued by Brown & Sharpe Mfg. Co.

SHEET-METAL INDUSTRY. National Apprentice Training Plan. Sheet Metal Worker, vol. 16, no. 11, July 3, 1925, pp. 407-408. Outstanding parts of plan adopted by Nat. Assn. Sheet Metal Contractors and prepared by its Vocational Education Committee.

AQUEDUCTS

WASHINGTON, D. C. City of Washington Builds Nine-Mile Aqueduct. Eng. News-Rec., vol. 95, no. 2, July 9, 1925, pp. 88-93, 13 figs. With new rapid-sand filter plant, covered reservoirs and high-service pipe lines, independent new water supply is provided.

ATMOSPHERE

AIRPLANE STUDIES. Atmospheric Studies from Airplanes (Exploration de la haute atmosphère par avion), F. Lindholm. Aéronautique, vol. 7, no. 72, May 1925, pp. 161-164, 4 figs. Results of aerological soundings in Sweden and their application to altitude records.

AUTOMOBILES

BODY MATERIALS. Extra Thin Plywood Suggested for Light Body Material. Automotive Mfr., vol. 67, no. 1, Apr. 1925, pp. 22-23. Extensive experiments prove thin plywood made from 1/120-in. veneer has remarkable strength, toughness, other desirable body-building qualities.

Brakes (Bremsen), A. Biro. Motorwagen, vol. 28, nos. 12, 13 and 14, Apr. 30, May 10 and 20, 1925, pp. 239-241, 261-263 and 286-289, 4 figs. Obtainable and desirable decelerations; distribution of braking forces and their effects; brake compensation; externally and internally acting brakes; check and band brakes; brake transmissions; direct and servo brakes; hydraulic and pneumatic brakes.

MOTOR BUSES. *See Motor Buses.*

MOTOR TRUCKS. *See Motor Trucks.*

NOISE MEASUREMENT. Automobile-Noise Measurement, H. C. Snook. Soc. Automotive Engrs.—Jl., vol. 17, no. 1, July 1925, pp. 115-124, 16 figs. Description of mechanism of human hearing, according to studies made in interests of telephonic transmission of maximum effectiveness, enumerating and explaining devices developed for evaluating sources of sound and its modes of propagation and amplification; following enumeration of different detectors and auxiliary apparatus in use and comments upon methods employed, it is stated that it seems advisable to base loudness measurements of automobile noise upon difference of energy between measured sound and arbitrary standard of sound which is threshold of normal hearing.

RIDING QUALITIES. Riding-Qualities of Motor Vehicle, R. W. Brown. Soc. Automotive Engrs.—Jl., vol. 17, no. 1, July 1925, pp. 107-114, 12 figs. To approximate road conditions in laboratory, especially designed apparatus was constructed that included accelerometer capable of translating rotary into simple harmonic motion; with this it was possible to determine definitely acceleration at any portion of displacement-time curve; relations found to exist among velocity, acceleration and displacement indicate that measurement of displacement and acceleration, or at least acceleration, of frame and axle is desirable.

SAFE RIDING SPEED. What is Safe Speed, H. C. Dickinson and C. F. Marvin, Jr. Soc. Automotive Engrs.—Jl., vol. 17, no. 1, July 1925, pp. 81-86, 6 figs. Proposes a law that driver will be convinced is essential, will apply where needed, and can be enforced, essentially as follows: "No vehicle shall be operated at speed such that it cannot be stopped within assured clear course ahead".

TRANSMISSIONS. Automatic Gear Changing, W. F. Bradley. Motor Transport (Lond.), vol. 40, no. 1059, June 15, 1925, pp. 693-694, 2 figs. Outlines acting principle of Lavaud gear; results of 2000-mile trial with Lavaud transmission, and comparison with conventional gear-box performance.

Some Recent Work on Unconventional Transmissions, P. M. Heldt. Soc. Automotive Engrs.—Jl., vol. 17, no. 1, July 1925, pp. 127-141, 23 figs. Pros and cons of sliding gear; optimum reduction ratio; belt drive; friction drive; infinite variability; mechanical-drag transmission; hydraulic-drag transmission; hydraulic transmissions; automatic hydraulic drive; advantages and disadvantages of hydraulic transmission; variable-throw transmissions; Lavaud transmissions; Ratchet drives; Weiss transmission; principles of automatic operation; Howard inertia transmission; Constantinesco torque converter; use of gyroscopic principle.

TRANSMISSION NOISES. Transmission Noises and Their Remedy, E. Buckingham. Soc. Automotive Engrs.—Jl., vol. 17, no. 1, July 1925, pp. 62-63. Characteristic sounds and their causes; gear ratios that give harmonious sounds; gear case may be amplifier; excess lubrication causes heating.

WHEEL WOBBLE. Front-Wheel Wobble, A. Healey. Automobile Engr., vol. 15, no. 203, June 1925, pp. 176-179, 7 figs. States principles involved, and shows in tentative way how various features of design influence wheel wobble; makes suggestions.

WEIGHT DISTRIBUTION. Weight—And Its Distribution, W. F. Bradley. Autocar, vol. 54, no. 1546, June 5, 1925, pp. 981-984, 5 figs. How avoirdupois is made up and how it is spread over a modern car; inter-connection of weight and cost.

AUTOMOBILE ENGINES

CARBON FORMATION IN. Factors Influencing Carbon Formation in Automobile Engines, J. W. Orelup and O. I. Lee. Indus. & Eng. Chem., vol. 17, no. 7, July 1925, pp. 731-735, 6 figs. Points out that major factors of carbon deposition in automobile engine are: (1) amount of lubricating oil projected into combustion chamber; (2) kind of oil used; (3) temperature of combustion chamber; and (4) extent of time preceding factors have been in effect; the first is by far the greatest factor.

LUBRICATION. Cylinder and Engine Lubrication, A. L. Clayden. Soc. Automotive Engrs.—Jl., vol. 17, no. 1, July 1925, pp. 58-61. Describes laboratory tests of engine equipped with steam cooling system, object being to study effect upon dilution of high cylinder-wall temperatures; results show that sharp reduction in dilution occurs as boiling temperature is reached, and that amount of dilution at temperatures of 212 deg. fahr., or more, is much less than would have been anticipated from results at temperatures below 212 deg.; high cylinder temperatures reduce dilution to negligible quantity without introducing any apparent disadvantages.

LUBRICATION. Engine Lubrication. Autocar, vol. 54, no. 1549, June 26, 1925, pp. 1111-1114, 9 figs. How it works, and how different systems are used to ensure long life and immunity from trouble in modern power units.

STARTING TESTS. Engine-Starting Tests, J. O. Eisinger. Soc. Automotive Engrs.—Jl., vol. 17, no. 1, July 1925, pp. 52-57, 18 figs. Presents data obtained as result of recommendation of steering committee of Co-operative Fuel Research "that factors contributing to easy starting be investigated"; test procedure consisted in driving engine by dynamometer until conditions became constant, then in turning fuel on and noting time required for starting and amount of fuel used; information obtained is presented in curves and its significance is discussed.

TORQUE CALCULATIONS. Torque Calculations, H. A. Golding. Automobile Engr., vol. 15, no. 203, June 1925, pp. 180-181, 5 figs. Summary based on 4-cylinder gasoline engine, running at various speeds with reciprocating parts of various weights.

AUTOMOBILE FUELS

ALCOHOL. The Future Alcohol Engines (Les futurs moteurs à alcool), R. Fouque. Chaleur et Industrie, vol. 6, no. 60, Apr. 1925, pp. 159-165. Discusses economic and technic side of alcohol as motor fuel in place of gasoline; binary and ternary mixtures; comparison of alcohol and gasoline; etc.

ALCOHOL FROM MOLASSES. Alcohol Motor Fuel from Molasses, E. C. Freeland. Indus. & Eng. Chem., vol. 17, nos. 6 and 7, June and July 1925, pp. 615-621 and 717-720, 1 figs. June: Use of cane molasses for manufacture of motor fuel; equipment needed, methods of manufacture, yields, and cost data, with special reference to manufacture on sugar plantations; reasons for use of alcohol fuels, methods of chemical control, and research problems of industry. July: Use of alcohol and alcohol-gasoline mixtures; alcohol-ether mixtures.

B

BALANCING

ENGINES. The Balancing of Engines, D. Laugharne Thornton. World Power. vol. 3, no. 18, June 1925, pp. 319-328, 10 figs. Shows that effect of ill-balanced engine may give rise to stresses of relatively great magnitude; summary of necessary conditions for balance of rotating and reciprocating parts of engine.

BEAMS

INFLUENCE LINES, APPLICATION OF. Influence Lines Applied to Continuous Beams, W. S. Gray. Concrete & Constructional Eng., vol. 20, no. 6, June 1925, pp. 309-321, 7 figs. For a series of equal spans continuous over supports, method of influence lines readily gives bending moments at the different supports due to any system of loading; method also shows graphically spans which must carry live load in order to produce a maximum moment at any support.

REINFORCED-CONCRETE. Tests of Bond Resistance in Reinforced-Concrete Beams, W. A. Slater. Eng. News-Rec., vol. 94, no. 26, June 25, 1925, pp. 1050-1053, 9 figs. Results of experiments by Bach and Graf in Germany published in 1909 give valuable information for design of reinforcing bars; four American deformed bars among types tested.

BEARINGS, BALL

HISTORY OF. The History of Ball Bearings, G. W. Petre. Commonwealth Engr., vol. 12, no. 8, Mar. 1, 1925, pp. 283-285, 2 figs. Describes early history research and manufacture of ball bearings.

HOISTING MACHINES. Use of Ball and Roller Bearings in Hoisting Machine Construction (Die Anwendung der Wälzlager im Hebemaschinenbau), R. Hänchen. Maschinenbau, vol. 4, no. 10, May 21, 1925, pp. 467-472, 31 figs. Advantages of rolling bearings over sliding bearings; design and construction of ball and roller bearings; their application in field of winch and crane construction.

LUBRICATION. Lubrication of Ball Bearings. Times Trade & Eng. Supp., vol. 16, no. 358, May 16, 1925, p. 219. Importance of suitable media.

ROLLER AND. Ball and Roller Bearings, W. E. Baker. Mech. World, vol. 77, nos. 1999, 2001 and 2002, Apr. 24, May 8 and 15, 1925, pp. 266-268, 297-298, and 312-313, 25 figs. Author focuses attention on fundamentals of pure rolling motion, and attempts to show how this ideal may be approached in practice. Paper read before Manchester Assn. Engrs.

BELT DRIVE

ADVANTAGES. Advantages of Belt Drive Over Direct Connection, C. C. Hermann. Belting, vol. 26, no. 5, June 1925, pp. 17-19, 2 figs. Flexibility an important consideration in power transmission; four types of drives for industrial equipment.

BELTING

RUBBERIZED FABRIC. The Manufacture of Rubberized Fabric Belting, J. Noble. Can. Machy., vol. 33, no. 25, June 18, 1925, pp. 11-13 and 45, 7 figs. Shows elimination of moisture from both rubber and fabric to be essential; Efficiency in power transmission constant goal of industry.

SLIPPAGE. Exhibiting the Visual Comparison of Belt Slippage, V. Sahmel. Belting, vol. 26, no. 6, June 1925, pp. 29-30. Relative slip of ordinary open drives and of short-center drives at various loads and for different initial tensions.

TESTS. Tests Which Show How Service Conditions Affect Belt Capacity, R. F. Jones. Indus. Engr., vol. 83, no. 6, June 1925, pp. 265-270 and 305-306, 8 figs. Gives results of tests in form of tables and charts that will enable operating men to determine how much power a belt will transmit under various conditions, such as high belt speed, using gravity idler, and effect of pulley ratio and center distance.

BLAST-FURNACE GAS

UTILIZATION FOR STEAM PRODUCTION. Power Generation by Blast Furnace Plant, O. C. Callow. Iron & Steel Engr., vol. 2, no. 6, June 1925, pp. 242-246, 8 figs. Deals with burning of blast-furnace gas under boilers to produce steam.

BLAST FURNACES

AUTOMATIC. The Automatic Blast Furnace, F. W. Cramer. Iron & Steel Engr., vol. 2, no. 6, June 1925, pp. 229-237 and (discussion) 237-242, 18 figs. Describes operation of one-man charging arrangement and its advantages.

CARBON USED OTHERWISE THAN AT TUYERES. A Study of Carbon Used in Blast Furnaces Otherwise Than Before the Tuyeres, W. D. Brown. Blast Furnace & Steel Plant, vol. 13, no. 6, June 1925, pp. 236-238, 1 fig. Study of weight of carbon used otherwise than at tuyeres; reaction in furnace; method of calculation of carbon burned before tuyeres; weight of carbon dioxide in top gases.

CHARGING. Vertical-Horizontal Blast-Furnace Chargers, C. E. Raeburn. Iron & Coal Trades Rev., vol. 110, no. 2988, June 5, 1925, pp. 909-911, 6 figs. Description of this type of charger, with particular reference to electric control equipment; hoisting operations.

FUNCTIONS. Recent Views of Blast Furnace Functions, D. Sillars. West of Scotland Iron & Steel Inst.—Jl., vol. 32, part 4, Feb. 1925, pp. 52-59 and (discussion) 60-63. Discussion of views as to manner in which fuel is consumed in blast furnace.

HEAT AND MATERIAL BALANCE. Material and Heat Balance of a Southern Foundry Furnace, Blast Furnace & Steel Plant, vol. 13, no. 7, July 1925, pp. 272-277. During investigation that included observations on temperatures, pressures, and gas sampling across series of planes between tuyere level and stock line of Southern foundry furnace at Holt, Ala., it was found desirable to make material and heat balance, which is reported.

BOILER FEEDWATER

REGENERATIVE HEATING. The Regenerative or Stage Bleeding Cycle, Jos. Razek. Power Plant Eng., vol. 29, no. 6, Mar. 15, 1925, pp. 323-326, 2 figs. Reheating of feedwater in number of stages has decided effect upon economy; relation of stage heating to operation of auxiliaries; use of auxiliary source of power; advantages of regenerative cycle.

BOILER FURNACES

AIR PREHEATING FOR. Conditions Affecting the Use of Preheated Air. Power Plant Eng., vol. 29, no. 14, July 15, 1925, pp. 734-735, 2 figs. Greater pressure is required to give same weight as with cold air; volume of heated air changes in proportion to absolute temperature; handy formulas for computing air problems.

ANTHRACITE-BURNING. Recent Developments in the Burning of Anthracite, W. A. Shoudy and R. C. Denny. Mech. Eng., vol. 47, no. 7, July 1925, pp. 573-579, 12 figs. Anthracite referred to is that of which at least 95 per cent will pass through a 3-16-in. round-mesh screen and less than 20 per cent through a 3-32-in. round-mesh screen; coal is burned on Coxe stokers. Describes successive furnace designs made at Amsterdam (N. Y.) steam station of Adirondack Power & Light Corp.; tests show that with final design stratification can be practically eliminated, as well as ignition troubles, even with low-grade coal; decided improvement has also been made in burning of undersizes.

FUEL RECOVERY FROM ASHES. Recovering Unburnt Fuel from the Ashpit. Eng. & Boiler House Rev., vol. 38, no. 12, June 1925, pp. 526-528 and 530, 5 figs. Particulars of different methods and apparatus.

GRATES. Improvements in Grate Design for Steam Boilers, W. Benedict. Eng. Progress, vol. 6, no. 5, May 1925, p. 152, 2 figs. Folding and turning types of grate made by Neustaedter Eisenwerk, Duisburg, known as Titan grate.

HEATING. Furnace Heating, R. J. Sarjant. Fuel, vol. 4, no. 6, June 1925, pp. 232-244, 10 figs. Utilization of waste heat; waste-heat boilers; boiler testing; heat insulation; recuperation; heat treatment.

REFRACTORIES, USE OF PROPER. Lowering Furnace Upkeep, F. Juraschek. Indus. Mgmt. (N. Y.), vol. 70, no. 1, July 1925, pp. 48-52, 6 figs. How refractories affect problem of power-plant furnace maintenance.

WATER-COOLED. Water-Cooled Furnaces, H. D. Savage. Tech. Eng. News, vol. 6, no. 2, May 1925, pp. 54-55 and 90, 2 figs. Discussion of recent tendency in boiler practice to replace fire-brick refractories with water-cooled tubes.

~ Water-Cooled Furnace Walls, H. D. Savage. Combustion, vol. 12, no. 6, June 1925, pp. 426-430, 3 figs. Advantages of, and progress in, this means of improving furnace efficiency. Paper read before Am. Iron & Steel Inst.

BOILER OPERATION

EFFICIENCY. Some Factors in Boiler Efficiency, W. S. Patterson. Combustion, vol. 12, no. 6, June 1925, pp. 424-425. Some of the more important items of loss in boiler operation which can, to a certain extent at least, be avoided by scientific control.

BOILER FIRING

PULVERIZED COAL. *See Pulverized Coal.*

EXCESS FLUE-GAS TEMPERATURE EFFECTS. Excess Flue Gas Temperature—Its Effect on Boiler Efficiency, J. R. Darnell. Combustion, vol. 12, no. 6, June 1925, pp. 432-434, 2 figs. Discussion occasioned by customary method of basing stoker guarantees at various ratings upon flue gas temperatures.

BOILER PLANTS

IMPROVEMENTS. Power-Plant Improvements Earn 500 Per Cent for Southern Pacific, C. M. Barbour. Power, vol. 61, no. 26, June 30, 1925, pp. 1016-1018, 1 fig. By lagging steam lines, installing stack dampers, and the like, fuel consumption showed astonishing drop; inspector rates plant on appearance and results; exhaust steam is used when possible.

BOILERS

AMERICAN DESIGN AND PRACTICE. The Steam-Boiler Industry in the United States of America (Das Dampfkesselwesen in den Vereinigten Staaten von Amerika), F. Münzinger. Zeit. des Vereines deutscher Ingenieure, vol. 69, nos. 19, 22, 24 and 25, May 9, June 8, 13 and 20, 1925, pp. 653-658, 773-778, 807-813 and 840-844, 34 figs. Impressions of author gathered during visit to United States; principal boilermaking firms; boilermaking in general; water chambers and sections; inclined vs. vertical tube boilers; boiler heating surfaces in large boiler plants; acceptance tests and inspection; modern aims and developments; mercury-vapor boiler; pulverized-fuel furnaces; air preheaters, etc.; investigations and practical experiences; lessons to be learned by German boiler industry.

CORROSION. Explosions of Colliery Boilers from External Corrosion, E. Ingham. Colliery Eng., vol. 2, no. 16, June 1925, pp. 270-271, 3 figs. Common causes of corrosion; importance of proper setting.

FEEDWATER PIPING. Good Feed Piping Prevents Many Boiler Troubles, C. C. Hermann. Power Plant Eng., vol. 29, no. 13, July 1, 1925, pp. 692-693, 2 figs. Flexibility is one of most important considerations when laying out boiler feedwater piping.

HIGH-PRESSURE. The Atmos High Pressure Boiler. Eng. & Boiler House Rev., vol. 38, no. 12, June 1925, pp. 533-537, 3 figs. Details of high-pressure boiler with rotating water tubes; design evolved by J. V. Blomquist of Stockholm.

INTERNAL-COMBUSTION. Internal Combustion Boiler Burns Flame Under Water, C. H. S. Tupholme. Power Plant Eng., vol. 29, no. 6, Mar. 15, 1925, pp. 332-333, 2 figs. Details of Brunler steam-generating apparatus.

LANCASHIRE HAND-FIRED. Some Interesting Tests Made on a Hand-Fired Lancashire Boiler. Eng. & Boiler House Rev., vol. 38, no. 11, May 1925, pp. 480-482, 4 figs. Results of tests showing some remarkable results relating to emission of CO in hand-fired furnaces.

LOCOMOTIVE. *See Locomotive Boilers.*

SURFACE TENSION AND PRIMING. Surface Tension as a Factor in the Priming of Steam Boilers, E. B. Millard and T. E. Mattson. Indus. & Eng. Chem., vol. 17, no. 7, July 1925, pp. 685-686, 2 figs. Capillary rise method was employed to determine at three temperatures surface tension of water, of sodium carbonate solution, and of two samples of boiler water, one of which had caused serious priming and other did not prime; no very large difference in surface tensions of these solutions were found; experiments with small test boiler also failed to establish any connection between surface tension and priming.

BORING MACHINES

SNOUT BORING. The Advantages of Snout Boring on the "Pearn-Richards". Horizontal Boring Machine. Brit. Machine Tool Eng., vol. 3, no. 33, May-June 1925, pp. 270-272, 5 figs. It is claimed that, except in very rare cases, snout boring tool is to be preferred to boring bar for general run of work.

BRAKES

AUTOMOBILE. *See also Automobile.*

DESIGN. Fundamentals of Brake Design, O. M. Burkhardt. Soc. Automotive Engrs.—Jl., vol. 17, no. 1, July 1925, pp. 64-73, 17 figs. Analysis of force relations for simple block brakes is given with intention to make clear that equation so far available for designers are not sufficiently accurate for brakes such as are used on modern motor vehicles and railway coaches; difficulties encountered in adjusting and manufacturing brakes; formulas for study of self-energizing characteristics of brakes; new graphical method for determining arc of contact, based on analysis of pressures and is formulated so that high pressures with their accompanying evils are avoided; advantages of brakes with three shoes; railway type of brakes.

SPECIFICATIONS. Report on Brakes and Brake Equipment. Ry. Age, vol. 78, no. 29, June 20, 1925, pp. 1578-1581, 3 figs. Consideration of brake beam support; recommends changes in beam, head and shoe gages. Report of committee to Am. Ry. Assn.

BRASS

MAGNESIUM AS DEOXIDIZER. Test Magnesium as Brass Deoxidizer, C. V. Nass. Foundry, vol. 53, no. 13, July 1, 1925, p. 527, 1 fig. Experiment to determine effectiveness of magnesium and phosphorus as deoxidizers; magnesium remaining in metal when used as deoxidizer in red brass forms deleterious constitutent, and leaves appreciable amount os oxide in metal, which detracts from its effectiveness as deoxidizer.

BRIDGE DESIGN

GERMAN DEVELOPMENTS. The Art of Bridge Building in Germany, K. Bernhard. Eng. Progress, vol. 6, no. 5, May 1925, pp. 157-160, 3 figs. Points out changes which bridge building has undergone within last decades simultaneously with general trend of modern artistic development.

BRIDGES, HIGHWAY

CANTILEVER. New Cantilever Bridge Designed with Architects' Co-operation, Norman F. Brown. Eng. News-Rec., vol. 95, no. 3, July 16, 1925, p. 107, 1 fig. New Point bridge over Monongahela River at its junction with the Ohio, in Pittsburgh, planned to satisfy requirements laid down by City Art Commission.

GIRDER. Bridge Reconstruction Work of the Ministry of Transport. Engineering, vol. 119, no. 3103, June 19, 1925, pp. 755-757, 30 figs. partly on p. 768 and supp. plate. Details of new Shoreham bridge over Adur River, which is bow-string girder bridge capable of taking heaviest loads to be found on British highways; it has two center and two side spans.

SHORT-SPAN. Two Parkway Bridges Planned by Engineer and Architects, A. G. Hayden. Eng. News-Rec., vol. 95, no. 1, July 2, 1925, pp. 16-19, 6 figs. Short-span bridges being built on Bronx Parkway; bridge over pond built of single-stem mushroom units; rigid-frame girder bridge of unusual outline harmonizes with architecture of nearby dam.

BRIDGES, STEEL

GIRDER, SPECIFICATIONS. The British Standard Specification for Girder Bridges. Engineering, vol. 140, no. 3627, July 3, 1925, pp. 4-6. Examines various paragraphs of specification in detail to find how it varies from ordinary engineers' specifications, and how it meets conditions of modern shop practice.

BRIDGES, SUSPENSION

DELAWARE RIVER. The Towers, Cables and Stiffening Trusses, L. S. Moisseiff. Engrs. & Eng., vol. 42, no. 6, June 1925, pp. 135-147, 10 figs. Main considerations governing design of Delaware River bridge between Philadelphia and Camden.

WIRE-CABLE TYPE. A Rigid Suspension Bridge Design with Wire Cables, D. B. Steinman. Eng. & Contracting (Buildings), vol. 13, no. 6, June 24, 1925, pp. 1377-1386, 7 figs. Details of design for 1600-ft. span at Sidney, Australia; clearance above m.h.w. is 170 ft., total width 158 ft.; specified live load for design of trusses was 12,000 lb. per lineal ft., plus impact.

BRONZES

FOUNDING, METALLOGRAPHY APPLIED TO. The Application of Metallography in Bronze Founding, F. W. Rowe. Foundry Trade Jl., vol. 116, nos. 460 and 461, June 11 and 18, 1925, pp. 491-494 and 513-516, 26 figs. Revealing constituents; eutectics and eutectoids; intermetallic compounds; general characteristics of different constituents; examination of raw materials; alloys of bronze class; phosphor and leaded bronzes; gun metals; brasses.

STEEL AND MANGANESE. New Bronzes (Neue Bronzearten). Zeit. für die gesamte Giessereipraxis (Das Metall), vol. 46, no. 22, May 31, 1925, pp. 93-94. Describes compositions recently placed on market, including steel bronze which as cast has tensile strength of 50 kg. per sq. mm., elastic limit of 20 kg. per sq. mm. with 20 per cent elongation and approaches therefore physical properties of mild steel, remaining superior to it from viewpoint of corrosion; also manganese bronze which forges well at temperature of 800 deg. cent., and is quite similar to Delta and Durana metal.

BUILDING CONSTRUCTION

PROTECTIVE MEDIUMS. The Penalty of Dead Load. Am. Architect, vol. 127, no. 2473, June 3, 1925, pp. 515-517, 5 figs. An important factor in building construction costs is protective mediums applied to structural parts of a building to resist effects of high temperatures; weight of protective medium is a very important factor often overlooked; less weight results in less materia and labour being used, and reduces dead load which structural parts have to sustain.

BUILDING MATERIALS

UNIT STRESSES FOR BUILDING CODES. Unit Working Stresses for Timber, Steel and Concrete for Design of Buildings. Iron Trade Rev., vol. 77, no. 2, July 9, 1925, pp. 66-68. (Abstract.) Report of Building Code Committee, dealing with organization and purposes of committee; requirements tentatively recommended for adoption in building codes; grounds upon which these recommendations are based.

BUSES

COMBINATION TROLLEY AND TRAILER. Trolley and Trailer 'Buses for Shanghai. Motor Transport (Lond.), vol. 40, no. 1058, June 8, 1925, pp. 669-670, 5 figs. Leading features of novel combination of Associated Equipment Co., Ltd., for Shanghai Electric Construction Co., Ltd., giving large passenger capacity.

C

CABLES, ELECTRIC

150,000-Volt, Tests of. 150,000-Volt Cable Tests, A. M. Taylor. Electrician, vol. 94, no. 2455, June 5, 1925, pp. 653 and 662, 2 figs. Determination of dielectric losses on a hexaphase cable-loss varies as cube of applied e.m.f.

Underground. Report of Underground Systems Bureau, Technical Section, N.E.L.A. Jl. of Elec., vol. 54, no. 11, June 1, 1925, pp. 449-452, 7 figs. Contains abstracts for following papers: Duct Line Temperature Measurement, R. Lewelling; Factors Governing Underground Construction; and Cable-Splicing Instruction, P. E. Chapman.

Underground Cable Systems. Elec. World, vol. 85, no. 25, June 20, 1925, pp. 1313-1316, 6 figs. High-tension cable joints of European design installed in New York, Chicago and Boston; progress made in pothead construction; review of 1924 cable failures. (Abstract.) Committee report before Nat. Elec. Light Assn.

CAMS

Chart for Designing and Milling. Chart for Use in Designing and Milling Cams, H. W. Cable. Machy. (N. Y.), vol. 31, no. 11, July 1925, pp. 852-854, 2 figs. Chart employed to determine value of units or increments to which milling-machine table must be set for each advance of dividing head; it gives required dimensions for any throw up to 6 in. and any number of divisions up to 60; method of using chart; chart for determining angle of thrust.

CAR WHEELS

Drop-Forged. Drop-Forged Wheels for Railway Rolling-Stock. Ry. Gaz., vol. 43, no. 1, July 3, 1925, p. 37, 3 figs. These wheels are stiffened by panelling and are put into service with unmachined treads.

Specifications. Report of Committee on Wheels. Ry. Age, vol. 78, no. 29, June 20, 1925, pp. 1590-1593. New cast-iron-wheel specifications generally approved; grinding; manual of wheel-shop practice offered for criticism.

CARS, FREIGHT

Box. Calculations for Single Sheathed Box Car Design. Ry. Rev., vol. 76, no. 25, June 20, 1925, pp. 1164-1169, 7 figs. Report on fundamental methods and assumptions for design purposes. Report of committee to Am. Ry. Assn.

Proposed Design for A. R. A. Standard D. S. Box Car. Ry. Rev., vol. 76, no. 25, June 20, 1925, pp. 1129-1130 and 1172-1179, 17 figs. New design offered in report of committee on car construction of Am. Ry. Assn., relating to steel-frame box car with wooden sheating and lining; description of two sample cars of 40- and 50-ton capacity. See also Ry. Age, vol. 78, no. 29, June 20, 1925, pp. 1566-1573 and (discussion) 1573-1577, 8 figs.

Construction Processes. Interesting Processes in Building Freight Cars, Geo. A. Richardson. Ry. Rev., vol. 76, no. 25, June 20, 1925, pp. 1150-1156, 12 figs. Processes used in construction of steel box cars for Pennsylvania R. R.

CARS, TANK

Specifications. Report of Committee on Tank Cars. Ry. Age, vol. 78, no. 29, June 20, 1925, pp. 1563-1565. Designs of special cars; recommendations for dome covers, outlets and safety valves. Report of committee to Am. Ry. Assn.

CAST IRON

Cold Laps in. Cold-Laps in Cast Iron, J. H. List. Iron & Steel of Can., vol. 8, no. 6, June 1925, p. 123. Causes of cold lap; cases are cited to show that cold lap in casting is bad fault and one that no foundryman can afford to overlook.

Heat-Resisting. Heat-Resisting Cast Iron. A. Levi. Foundry Trade Jl., vol. 31, no. 462, June 25, 1925, pp. 549-554. Author has examined series of scientific studies and sought to derive from them general theory explaining action of high temperatures on gray cast iron; this theory has led to adoptation of certain number of compositions suitable for different types of castings which have to withstand action of heat.

Heat Treatment. Low-Temperature Heat Treatment of Special Cast Irons, J. W. Donaldson. Foundry Trade Jl., vol. 31, no. 461, June 18, 1925, pp. 517-522, 8 figs. Heat-treatment experiments were carried out under following sections: (1) Prolonged annealing tests at 450 deg. cent. and 550 deg. cent. respectively; (2) elevated temperature tests as cast and after prolonged annealing; and (3) growth tests. Method of experimenting and results obtained from each tests are considered separately.

Malleable. *See Malleable Castings.*

Pearlitic. A Note on the Practice and Purpose of Perlit Iron, H. J. Young. Foundry Trade Jl., vol. 31, no. 460, June 11, 1925, pp. 503-506, 9 figs. Review of remarks made by British workers which have appeared in different issues of this journal; properties of perlit iron; author's impressions and experiences.

Standard Arbitration Bar. Cast Iron. Am. Soc. Testing Matls.—Preprint, no. 9, for mtg. June 23-26, 1925, 3 pp. Report of Committee A-3. Outstanding work of committee during year is decision to change dimensions of "arbitration bar" which has been standard of Society since 1905.

CEMENT

Water Imperviousness Determination. Determination of Water Imperviousness or Water Permeability of Cements, E. Anderson. Concrete, vol. 26, no. 5, June 1925, pp. 195-197, 5 figs. Notes on three types of tests that may be employed on cement under consideration in order to determine how waterproof or watertight a concrete structure will be.

CEMENT, PORTLAND

Highway Construction, Requirements for. Requirements of Cement for Modern Highway Construction, A. T. Goldbeck. Am. Soc. Testing Matls.—Preprint, no. 35, for mtg. June 23-26, 1925, 8 pp. Discusses service requirements of concrete in concrete pavements giving most destructive influences as those which produce tensile stresses in pavements as described; properties of cement that might be given further consideration and attitude of various state highway testing engineers on necessity of changes in current specifications.

Sodium and Magnesium Sulphates, Action of. Action of Sodium and Magnesium Sulphates on Constituents of Portland Cement, G. R. Shelton. Indus. & Eng. Chem., vol. 17, no. 6, June 1925, pp. 589-592, 8 figs. Describes preparation, in pure state, of major substances present in normal Portland cement clinker, tricalcium aluminate, dicalcium silicate, and tricalcium silicate, and effects produced on these constituents by solutions of sodium and magnesium sulphates of various concentrations; solids only were investigated and changes brought about by solutions were noted with aid of petrographical microscope.

Specifications and Tests. Cement. Am. Soc. Testing Matls.—Preprint, no. 27, for mtg. June 23-26, 1925, 20 pp. Report of Committee C-1. Manual of cement testing, supplementing standard specifications and tests for portland cement. Bibliography of portland cement.

Detroit. The Trenton Channel Plant of the Detroit Edison Company, C. F. Hirshfeld. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 7, July 1925, pp. 708-718, 17 figs. Plant is second to be built by this company well outside corporate limits of Detroit, the two being connected by 120-kv. tower line arranged for supplying suburban areas and outer part of city; plant has planned ultimate capacity of 300,000 kw.; it contains both d.c. and a.c. house service, turbine-driven units and nearly all important variable-speed auxiliaries are driven by d.c. motors; coal is used in pulverized form, author giving conclusions which led to its adoption.

Development. *See Power.*

Reconstruction. Reconstruction of Bow Power Station. Electrician, vol. 94, no. 2453, May 22, 1925, pp. 594-596, 6 figs. Particulars regarding reconstruction of Bow Road generating station of Charing Cross and City Electricity Supply Co.; how cooling-water problem was dealt with; steam pressure raised and switchgear redesigned.

Reheated Steam, Use of. The Use of Reheated Steam, R. H. Collingham. Electrician, vol. 94, no. 2457, June 19, 1925, pp. 725-727, 5 figs. Notes on recent progress; theoretical cycles available; their practicable applicability in British and American stations.

Steam, Developments. Latest Development in Pacific Coast Steam Plant Practice. Jl. of Elec., vol. 54, no. 11, June 1, 1925, pp. 501-511, 22 figs. Report of Prime Movers Bur., Technical Section, N. E. L. A. Deals with mechanical oil burning furnaces; steam power-plant layout; fire-brick tests, Long Beach steam plant No. 2, including spall, break, warp, and kiln fire tests; test in boiler furnaces of Pasadena Municipal steam plant; test in furnace of San Diego Consolidated Gas & Elec. Co.; station details of Long Beach steam plant No. 2, including main apparatus.

CENTRAL STATIONS

Transportation. Electric Transportation and the Central Station. Jl. of Elec., vol. 54, no. 11, June 1, 1925, pp. 417-426, 8 figs. Report of Transportation Bureau, N.E.L.A. Recommendations; application of electric street trucks, their operation, advantages, future, and operating costs; use of industrial trucks, types in use, operating costs and battery charging load.

CHAIN DRIVE

Detachable Link. Detachable Link-Chain Drives, Geo. G. Dana. Machy. (N. Y.), vol. 31, no. 11, July 1925, pp. 876-878, 2 figs., 2 tables. Determining pitch diameter of sprockets; reasons for increasing pitch diameter of drivers, why pitch diameter of driven sprockets should be made under size; what happens when driver is under size and driven sprocket over size; shape of sprocket teeth; use of tables.

CHIMNEYS

Welded Steel. Constructing Welded Steel Smokestacks, T. C. Fetherston. Boiler Maker, vol. 24, no. 6, June 1925, pp. 151-153 and 170, 6 figs. Comparison of riveted and welded stacks; practical suggestions for carrying out welding operations.

CIRCUIT BREAKERS

Oil. Oil Circuit Breakers. Jl. of Elec., vol. 54, no. 11, June 1, 1925, pp. 459-466, 8 figs. Contains abstracts of following papers, read before N.E.L.A.: Increasing Oil-Circuit Breaker Interrupting Capacity, H. H. Cox; Oil-Circuit Breaker Experiences and Problems, H. S. Minor; Results of Tests on Oil-Circuit Breakers of Pacific Coast Manufacture; Interrupting Capacity of Oil-Circuit Breakers Manufactured on the Pacific Coast, C. C. Long and L. L. Dyer; Short Circuit Tests on Kelman Type Y15 Oil-Circuit Breakers, C. C. Long and L. L. Dyer; High-Tension Oil-Circuit Breakers, R. W. Wilkins, B. D. Dexter and H. T. Sutcliffe.

Oil Type. The Oil Circuit Breaker Situation from an Operator's Viewpoint, E. C. Stone. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 7, July 1925, pp. 756-761, 6 figs.; also (abstract.) in Elec. World, vol. 86, no. 2, July 11, 1925, pp. 57-60, 9 figs. Outline of oil-circuit-breaker situation from operator's standpoint, particularly with reference to interrupting duty, as it appears to-day to author; deals with factors determining interrupting capacity, essential features of breaker design and their functions; factors affecting interrupting duty, relations between interrupting ratings and costs; applications, particularly possibilities for improved practice in future.

CLUTCHES

Locomotive. The Fieux Clutch for Locomotives Engineering, vol. 119, no. 3103, June 19, 1925, pp. 760-761, 5 figs. Apparatus in which special slipping device is incorporated, which is separated from clutch proper; it runs in oil and is entirely automatic in action.

COAL

Analysis. Proximate Analysis of Coal, R. Wright. Elec. Times, vol. 67, no. 1756, June 11, 1925, pp. 709-711, 2 figs. Apparatus necessary, sampling, sizing, testing for free moisture, hygroscopic moisture, volatile matter, fixed carbon, and calorific value.

Carbonization. A New Low-Temperature Carbonization Process for Coal, A. Thau. Fuel, vol. 4, no. 6, June 1925, pp. 259-263, 5 figs. Describes Dobbelstein process, aim of which is undisturbed carbonization of charge combined with continuous operation; details of plant and oven.

Coking and Swelling Constituents. The Coking and Swelling Constituents of Coal, F. Fischer. Indus. & Eng. Chem., vol. 17, no. 7, July 1925, pp. 707-711, 6 figs. It is shown that with increasing geological age of coals relative oily bitumen content of their total bitumen increases, and that its relative content of solid bitumen decreases, while decomposition point of its solid bitumen rises; solid bitumen thus changes, in course of time, forming oily bitumen and solid bitumen of higher decomposition point; as oily bitumen content of total bitumen increases so does tendency of coal to cake and melt, reaching its highest degree with coking coals; solid bitumen, with its higher and higher decomposition point, begins to cause swelling as soon as its decomposition point corresponds with plastic state of coal; points out value of foregoing investigation.

Constitution. The Constitution of Coal, Wm. A. Bone. Chem. & Industry, vol. 44, no. 25, June 19, 1925, pp. 291T-298T and (discussion) 298T-299T, 2 figs. Author seeks to suggest reasons for past failures of research and how work may be carried out to better purpose in future. Notes on maturing of coals; nomenclature; experimental methods; extraction by benzene under pressure; isolation of coking constituents.

Hydrogenation and Liquefaction. The Hydrogenation and Liquefaction of Coal, H. G. Shatwell and A. R. Bowen. Fuel, vol. 4, no. 6, June 1925, pp. 252-255. Hydrogenation and destructive distillation of Arley coal.

Inorganic Constituents. The Inorganic Constituents of Coal, R. Lessing. Chem. & Industry, vol. 44, no. 24, June 12, 1925, pp. 277T-283T. Describes how matter is distributed over coal constituents; mineral matter and constitution of coal; significance of experimental results.

Sampling. Investigation of a Method for the Sampling of Coal Cargoes, F. H. Walker. Chem. & Industry, vol. 44, no. 24, June 12, 1925, pp. 283T-285T. Deals with application of principles laid down by previous investigators, with such modifications as are necessary, to special case of sampling cargoes of gas coal from Northumberland and Durham coal fields.

COAL HANDLING

Equipment. Submerged Storage and Coal Handling Equipment at Philo. (Ohio). Power, vol. 61, no. 25, June 23, 1925, pp. 976-979, 4 figs. Two years coal supply at present capacity of two units is possible in combined submerged and dry coal-storage space; two grades of fuel are handled.

Power Plants. Storage and Conveying of Coal in Boiler Plants (Ueber Lagern und Transportieren der Kesselhauskohle), L. Klein. Maschinenbau, vol. 4, no. 10, May 21, 1925, pp. 481-485, 10 figs. Discusses automatic unloaders; tipple cars; grabs; elevators; band, bucket, cable, skip, and electric conveyors; conveying of pulverized coal; etc.

COAL MINES

ELECTRICAL EQUIPMENT. Old Ben Coal Corporation Effects Large Savings With Modern Electric Equipment, A. W. Spaht and G. E. Marble. Coal Age, vol. 28, no. 1, July 2, 1925, pp. 3-6, 5 figs. Replacement of efficient steam hoists by electrified units justifies itself in 12 mines in Southern Illinois; benefits of diversity factors are realized by transmission line linking up mines.

POWER PLANTS. An Interesting Coal Mine Power Plant, H. A. Woodworth. Nat. Engr. vol. 29, no. 7, July 1925, pp. 305-308, 2 figs. Description of power plant of Bell & Zoeller Mines at Ziegler, Ill. This plant also provides power, light and water to town of Ziegler.

COAL MINING

EXPLOSIVES, USE OF. Coal-Mining Explosives, F. L. Nathan. Instn. Min. Engrs.—Trans., vol. 68, part 6, Apr. 1925, pp. 453-472. Discusses principal factors found to influence results which are nature, length and diameter of gallery; position of cannon; length and diameter of bore of cannon; method of loading cartridges in cannon and of igniting them; nature and composition of inflammable gas-air mixture; and composition and condition of coal dust.

LOADING MACHINES. Long-Face Loader Averages 90 Tons per Man, J. H. Edwards. Coal Age, vol. 27, no. 25, June 18, 1925, pp. 897-900, 8 figs. Loading unit stands on entry while huge scraper, ingeniously guided, gets coal at high speed; safe and economical mining system developed at mine of Pike County Coal Corp., Petersburg, Ind.

MACHINE LOADING. Mechanical Loading at the United States Coal and Coke Company, E. O'Toole. Min. Congress Jl., vol. 11, no. 6, June 1925, pp. 301-302 and 311. First cutting and loading machine was O'Toole machine designed about 1898; latest model is now in use by this company; results obtained through its use. Address delivered at Nat. Exposition of Coal Mine Equipment.

COKE

BLAST FURNACES. Using Fine-Grain Coke in Metallurgical Furnaces (Die Verbüttung von kleinstückigem Koks), A. Wagner. Glückauf, vol. 61, no. 23, June 6, 1925, pp. 700-706, 4 figs. Shows that fine-grain coke can be used to advantage and gives limits of grain sizes in both directions based on practical experience.

COMBUSTIBILITY AND STRENGTH. The Combustibility and Strength of Metallurgical Coke of Larger Grading (Die Verbrennlichkeit und Festigkeit von Hüttenkoks in grösseren Körnung), F. Häusser. Stahl. u. Eisen, vol. 45, no. 23, June 4, 1925, pp. 878-885, 7 figs. Combustibility and its determination; tests to determine influence carbonizing conditions, nature of coal, and iron-containing additions as well as size of coke on combustibility; results show that size of coke has greater influence on combustibility than all other factors; practical importance of this conclusion is emphasized.

COKE HANDLING

ROPEWAYS FOR. Ropeway for Coke Transport. Iron & Coal Trades Rev., vol. 110, no. 2989, June 12, 1925, pp. 957-958, 5 figs. Particulars of ropeway installed for this purpose for Altham Colliery Co., Ltd., Accrington, England; built on bi-cable system, and consists of two-fixed standing or carrying ropes, along which carriers are hauled by means of a separate endless hauling rope; 4520 ft. long overall.

COKE MANUFACTURE

BLAST-FURNACE COKE. Cost of Coke Impurity to Blast Furnace Practice, L. R. Forrest. Steam Coal Buyer, vol. 3, no. 5, May 1925, pp. 23-26, 2 figs. Characteristics of coal which affect its value as a raw material for blast-furnace coke; effect on blast-furnace practice of impurity content of coke and uniformity or lack of uniformity in respect of this feature. Read before Coal Evaluation Committee of South. Ohio Pig Iron & Coke Assn.

BY-PRODUCT. A Novel Canadian Coking Plant, J. L. Landt. Colliery Guardian, vol. 129, no. 3363, June 12, 1925, pp. 1437-1438, 3 figs. Describes plant of Hamilton By-Product Coke Ovens, Ltd.; designed to carbonize about 500 tons of coal per 24 hours, with production of a maximum of about 5500 M cu. ft. of gas accompanied by recovery of tar oils and sulphate of ammonia; unique feature is great flexibility in coke and gas output; 25 Semet-Solvay standard horizontal flued type ovens.

COLUMNS

CONCRETE, FIRE RESISTANCE OF. Fire Resistance of Concrete Columns, W. A. Hull and S. H. Ingberg. U. S. Bur. Standards, Technologic Papers, No. 272, Feb. 25, 1925, pp. 635-708, 16 figs. partly on supp. plates. Fire tests were made of 62 columns under working load, and 16 comparable columns were tested to failure in compression without fire test; thickness of concrete or other material considered as protection was 1½ or 2½ inches; concrete aggregates of a wide range in mineral composition were introduced. Discusses results obtained.

COKE OVENS

BY-PRODUCT. By-Product Coke-Oven Practice, R. A. Mott. Fuel, vol. 4, no. 6, June 1925, pp. 245-251, 6 figs. Design of Coppée ovens.

FLOW OF GASES IN. The Flow of Gases in the Coke Oven, L. H. Sensicle. Gas. Wld, vol. 82, no. 2133, June 6, 1925, pp. 11-13 (Coking Sec.). Gives reasons for author's agreeing with Biddulph Smith's conclusions on the subject. Draws attention to few of the many possible phenomena in coking process and demonstrates difficulty of investigating their causation without recourse to work on oven itself. See also article by G. E. Foxwell on same subject, pp. 14-15; making remarks concerning Dr. Thau's contribution; and reply by T. Biddulph Smith, pp. 15-16, 3 figs.

CONCRETE

ARCHITECTURE OF. The Architecture of Concrete, B. Pite. Roy. Inst. Brit. Architects—Jl., vol. 32, no. 11, Apr. 4, 1925, pp. 229-336 and (discussion) 336-340. Difference in constructive method and its expression in design; resulting architectural forms and possibility and service of ornament; problem of education for design of concrete architecture.

COMMITTEE REPORT. New Joint Committee Report on Concrete, N. M. Stineman. Eng. Wld., vol. 26, no. 6, June 1925, pp. 387-390. Details with working stresses, field control of concrete, aggregates, mixing, protection against heat and cold, design, etc. Presented before 11th Annual Mtg. of Building Officials Conference.

COMPRESSIVE STRENGTH. Effect of Size and Shape of Test Specimen on Compressive Strength of Concrete, H. F. Gonnerman. Am. Soc. Testing Matls.—Preprint, no. 39, for mtg. June 23-26, 1925, 14 pp., 4 figs. Describes compression tests made at 7 days to 1 year on 1755 concrete specimens in study of compressive strength of cylinders of different size and shape, cubes and prisms; data presented show relationship between strengths of various specimens and principal conclusions are given.

MIXING PLANTS, CENTRAL. Central Concrete Mixing Plants, W. E. Hart. Eng. & Contracting (Buildings), vol. 63, no. 6, June 24, 1925, pp. 1387-1391. Details of central plant equipment and operation. From paper in Proceedings of Am. Concrete Inst.

PROBLEMS. Concrete and Concrete Aggregates. Am. Soc. Testing Matls.—Preprint, no. 32, for mtg. June 23-26, 1925, 11 pp. Report of Committee C-9. Subcommittee reports on definitions, laboratory and field tests for concrete, design, tests, specifications, available aggregates, deleterious substances, admixtures, elastic properties, etc. Digest of literature on methods of making flexure and tension tests of concrete.

CONCRETE CONSTRUCTION

INDUSTRIAL BUILDINGS. Concrete in Industrial Buildings, W. E. Hart. Mgmt. & Admin., vol. 10, no. 1, July 1925, pp. 29-32, 5 figs. Where, how and why it may be used profitably; instances of adaptability; concrete for floors and driveways.

CONCRETE CONSTRUCTION, REINFORCED

BOND BETWEEN CONCRETE AND STEEL. Studies of Bond Between Concrete and Steel, D. A. Abrams. Am. Soc. Testing Matls.—Preprint, no. 41, for mtg. June 23-26, 1925, 17 pp., 11 figs. Investigation to determine relation between bond and factors which are known to govern compressive strength of concrete; data presented show load-slip relations for pull-out tests; relation between bond and compressive strength; effect of grading of aggregate, quantity of cement, consistency of concrete and age at test, upon bond and compressive strength; and effect upon bond of oil and hydrated lime as admixture.

CONCRETE BLOCKS

TESTS. Report of Tests on Concrete Block Made in Pittsburgh, Pa. Concrete Products, vol. 28, no. 6, June 1925, pp. 37-43, 9 figs. Describes tests made in October and November 1924 to investigate fundamental relations having direct bearing on economical production of standard quality concrete building units.

CONDUITS

ELECTRIC, QUEENSTON POWER STATION, CANADA. The Conduit System of Queenston Station, J. C. Martin. Elec. News, vol. 34, no. 11, June 1, 1925, pp. 38-40, 6 figs. Particulars of conduit system of Queenston station, Ont., Canada; unit scheme for conduit designation found reliable method of nomenclature; control cables carried in special pans; total of 400,000 ft. of conduit used.

CONSTRUCTION WORK

STEEL. Steel Construction, L. H. Miller. Eng. & Contracting (Buildings), vol. 63, no. 6, June 24, 1925, pp. 1392-1398. Survey of growth of steel construction from its inception 40 years ago, factors which seem to be responsivle for its somewhat arrested development during past 10 or 15 years, description of certain ameliorative steps that are being attempted, and improvement already accomplished.

CONVEYORS

HARD-ROLLED ELECTROLYTIC. Softening of Hard-Rolled Electrolytic Copper, N. B. Pilling and Geo. P. Halliwell. Am. Soc. Testing Matls.—Preprint, no. 24, for mtg. June 23-26, 1925, 23 pp., 14 figs. Detailed study, by means of torsion tests, of rates of softening of hard-rolled copper when reduced various degrees initially and heated at temperatures below 500 deg. cent.; quantitative effect of these variables is shown; results indicate that copper has no minimum temperature of recrystallization but probably softens at very slow rate even at atmospheric temperatures.

MICROSCOPIC INSPECTION OF. Copper and Some of its Alloys under the Microscope, C. Blazey. Chem. Eng. & Min. Rev., vol. 17, no. 200, May 5, 1925, pp. 301-302, 6 figs. Describes method of preparing copper and some of its alloys for photographic plate; method has been well tested by author and can be recommended for both rapid visual inspection under microscope and photographic reproduction.

CORROSION

TESTS. The Evaluation of Corrosion Tests, E. Blough. Am. Soc. Testing Matls.—Preprint, no. 26, for mtg. June 23-26, 1925, 5 pp., 2 figs. Author proposes as worthy of further investigation method that has been used by others, namely, comparing physical properties of metal before and after corrosion; describes tests in which specimens of 5 commercial non-ferrous metals, in form of tension test specimens, were subjected to corrosion in salt spray and tested for tensile strength and elongation after being subjected to salt spray for various periods of time; this method has inherent advantage of disclosing effect of corrosion upon residual metal which is apparently unattacked.

CRANES

BRIDGE SAFETY STOP. Cranes Unaffected by High Winds. Iron Age, vol. 116, no. 3, July 16, 1925, pp. 149-150, 3 figs. Bridge safety stop to hold large travelling structures such as ore and coal-handling bridges and gantry cranes during high winds, developed by Wellman-Seaver-Morgan Co., Cleveland.

CRYSTALS

MAGNETIZATION AND ORIENTATION. Magnetization and Crystal Orientation, W. E. Ruder. Am. Soc. Steel Treating—Trans., vol. 8, no. 1, July 1925, pp. 23-29, 9 figs. Single crystals of silicon steel of varying orientation were tested for magnetic permeability; wide variations were found between magnetization of strips depending upon their crystal orientation with respect to direction of impressed magnetic field; lowest magnetic permeability was obtained when all edges were at 45 degrees with direction of flux; curves and photomicrographs showing change and magnetization as orientation changes.

CUPOLAS

FLUORSPAR AND SLAG FORMATION. Fluorspar and Slag Formation in Cupolas (Flussspat und Schlacken-bildung im Kupolofen), T. Klingstein. Giesserei-Zeitung, vol. 22, no. 11, June 1, 1925, pp. 311-316, 15 figs. Composition of most desirable cupola slags; German fluorspar deposits; limestone and fluorspar; melting tests with addition of increasing quantities of fluorspar; investigations of desulphurizing effect of fluorspar; results and conclusions.

D

DAMS

BRITISH COLUMBIA. British Columbia Dams, E. Davis and E. G. Marriott. Eng. Jl., vol. 8, no. 7, July 1925, pp. 299-306, 26 figs. Principal features of more important dams in British Columbia.

MULTIPLE-ARCH. Multiple-Arch Dam Disintegrates Under Low Temperatures. Eng. News-Rec., vol. 95, no. 1, July 2, 1925, pp. 22-23, 3 figs. California dam on Gem Lake rebuilt to gravity section when water freezes in concrete due to cold penetrating thin slabs.

RESERVOIR. Expending $5,000,000 to Provide Adequate Water Supply for City of Dallas, Texas, R. A. Thompson. Mfrs. Rec., vol. 87, no. 26, June 25, 1925, pp. 88-89, 6 figs. Particulars of Garza reservoir dam to impound 63,000,000,000 gallons; construction involves hydraulic fill dam, puddle core trenches, steel sheet piling, concrete culverts and spillways.

ROCK-FILLED. Design Considerations in Dix River Rock-Fill Dam. Eng. News-Rec., vol. 94, no. 26, June 25, 1925, pp. 1058-1061, 6 figs. Study of experience with rock-fill dams justified use of steep slopes and concrete facing; great spillway capacity removes danger of overtopping; novel closure device; large concrete plug valve.

DIELECTRICS

ABSORPTION MEASUREMENT. A New Method and Means for Measuring Dielectric Absorption, R. E. Marbury. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 7, July 1925, pp. 718-723, 10 figs. In order to further analyze dielectric losses, and study progress of treatment of insulation, device has been developed for measuring dielectric absorption; describes dielectric lag meter and gives test data secured by it.

DIESEL ENGINES

FUEL PUMPS FOR SOLID INJECTION. Fuel Pumps for Solid Injection Engines, H. F. Birnie. Power Plant Eng., vol. 29, no. 14, July 15, 1925, pp. 745-749, 10 figs. Method of fuel injection determines success of atomization.

MECHANICAL TTRANSPORTATION, APPLICATION TO. The Diesel Engine Applied to Mechanical Transport, G. W. Grayson. Commonwealth Engr., vol. 12, no. 8, Mar. 1, 1925, pp. 281-282. Gives data on new fuel injector for Diesel engines, invented by author, and sets out advantages of this engine over ordinary petrol internal-combustion engine used on motor vehicles. Thermal efficiency of Diesel engine is 36 per cent, that of petrol engine 20 per cent; fuel consumption per b.hp. of former is 0.4 pint, of later 0.72 pint.

DOORS

FACTORY. *See Factories.*

E

EDUCATION, ENGINEERING

CO-OPERATIVE. Spread of Co-operative Engineering, Education, A. R. Cullimore, Machy. (N. Y.), vol. 31, no. 11, July 1925, pp. 886-887, 1 fig. Characteristics of plan and how it is carried out at Newark Technical School.

ELECTRIC DISTRIBUTION SYSTEMS

CENTRAL GENERATION. State Versus Federal Regulation, H. Hoover. Elec. World, vol. 85, no. 25, June 20, 1925, pp. 1309-1312. Author opposes centralized control of Nation's power industry and points to advantages of state supervision during its transformation on central generation with inter-connection of system. (Abstract.) Address before Nat. Elec. Light Assn.

ELECTRIC FURNACES

ACID. Electric Furnace Produces Quality Steel, C. N. Dawe. Elec. World, vol. 85, June 27, 1925, pp. 1404-1405, 1 fig. One-ton furnace used by Studebaker Corpn., Detroit, assures high-grade automobile valve heads and proper control of supply; annual saving $17,000; uses acid process and is known as Moore "'Lectromelt" furnace.

BRASS. Notes on Modern Induction Furnace Brass Melting Practice, Geo. F. Hughes and P. L. Green. Brass World, vol. 21, no. 6, June 1925, pp. 205-207, 1 fig. Advantages and disadvantages of induction furnace; best adapted to continuous 24-hr. operation with infrequent changes of alloy; present field of reliable operation of non-ferrous induction furnace is limited to alloys running 90 per cent copper.

ELECTRIC GENERATORS

COOLING. Closed Ventilation Systems for Cooling of Generators. Power, vol. 62, no. 1, July 7, 1925, p. 7. Use of inert gas vs. air in closed cooling systems; generator fire-fighting equipment. (Abstract.) Electrical Apparatus Committee's report to Nat. Elec. Light Assn.

ELECTRIC LOCOMOTIVES

CRANKPIN DESIGN FOR. Crankpin Design for Electric Locomotives, Jos. K. Wood. Am. Mach., vol. 62, no. 26, June 25, 1925, pp. 989-992, 6 figs. Service requirements; investigation of stress set up; development of governing formulas; summary for design to assure correct results.

HIGH-SPEED. Report on High Speed Electric Locomotives, M. Weiss. Int. Ry. Congress Assn.—Bul., vol. 7, no. 4, Apr. 1925, pp. 1019-1083, 33 figs. Report dealing with types used in all different countries, except America. Translated from French.

ELECTRIC MEASURING INSTRUMENTS

SMALL A. C. POWER MEASUREMENT. Apparatus for Small Alternating Current Power Measurement, B. G. Churcher. Jl. Sci. Instruments, vol. 2, no. 8, May 1925, pp. 241-250, 5 figs. Describes equipment constructed for carrying out small value alternating e.m.f. current and power measurements required in course of research work in electrical engineering; design of instruments and arrangements provided for their calibration; results of a series of tests carried out to determine limitations of instruments.

ELECTRIC METERS

CANADIAN ELECTRIC ASSN. REPORT. Meter Committee of Canadian Electrical Assn. Covers Field in Comprehensive Report. Elec. News, vol. 34, no. 12, June 15, 1925, pp. 49-52, 4 figs. Deals with maintained meter accuracy, meter standardization, educational work, installation, three-wire metering, electromagnetic circuit, and describes new developments.

N. E. L. A. REPORT. Report of Meter Bureau, Technical Section, N. E. L. A. Jl. of Elec., vol. 54, no. 11, June 1, 1925, pp. 439-449, 9 figs. Contains Abstracts of following papers: Use of Oil in Meter Bearings, E. A. Ealson; High-Tension Metering for Operating Purposes, W. N. Lindblad; New Development in Electric Meters, J. H. Paget; Proper Sizes of Meters for Various Installations, C. F. Gilcrist; and Effect of Wave Shape on Time-Current Characteristics of Time Relays.

ELECTRIC MOTORS, A.C.

INDUCTION. The Present State of the Problem of Cos Compensation in Asynchronous Motors, B. Aparoff. Elektrichestwo, no. 3, Mar. 1925, pp. 159-164, 17 figs. Describes diagrams usually adopted, construction features of compensated induction motors and different types of compensators. (In Russian.)

ELECTRIC POWER

DISTRIBUTION COSTS. The Distribution on Costs of Power, P. T. Davies. Nat. Elec. Light Assn. Bul., vol. 12, no. 6, June 1925, pp. 375-383, 12 figs. Influence which cost of distribution has on cost of power. Analyzes respective capital investments in the three classes into which property of a hydro-electric power company is usually divided, viz., generating, transmitting and distributing property; comparative economy of light and heavy wire; operating, maintenance, and depreciation expense of power plants, transmission lines and distribution lines; etc.

ELECTRIC RAILWAYS

ROLLING STOCK. Report on Electric Rolling Stock. Ry. Age, vol. 78, no. 29, June 20, 1925, pp. 1560-1562. Future possibilities of steam and electric locomotives; shop facilities required for electric motive power. Report of committee to Am. Ry. Assn.

ELECTRIC TRANSMISSION LINES

FAULTS LOCATION BY RADIO. Location of Faults by Radio Methods Stressed by Overhead Systems Committee. Elec. News, vol. 34, no. 12, June 15, 1925, pp. 57-60, 1 fig. Discusses methods of study; experience with superheterodyne; distribution system records; distribution system losses; joint use of poles by different companies.

PROBLEMS. Transmission Lines, J. A. Sirnit. Elec. Light & Power, vol. 3, no. 6, June 1925, pp. 162-165, 9 figs. Factors determining selection of voltage, design and equipment; features entering into transmission-line problems and affecting ultimate decisions.

ELECTRIC WELDING

LOCOMOTIVE FRAMES. Electric Welding Locomotive Frames, R. P. Palmer. Welding Engr., vol. 10, no. 6, June 1925, pp. 26-27, 1 fig. Early history of frame welding; troubles of locomotive builders; use of plate inserts in frame welding with arc.

ELECTRIC WELDING, ARC

STEEL BUILDINGS. Arc Welded Steel Building, A. C. Bissel, Welding Engr., vol. 10, no. 5, May 1925, pp. 17-20, 9 figs. Office of H. T. Krausch, Engr. of Bldgs., of Chicago, Burlington & Quincy R.R., has designed and built a 40-ft. by 60-ft. one-story mill-type building in which all of the structural-steel members were united by electric arc welding. This building was erected from scrap structural material after several test welds were made to determine efficiency of an arc-welded joint made of this class of material. Describes tests made and results obtained.

STEEL WORKS. Arc-Welding in Steel Mills, R. L. Scollard. Blast Furnace & Steel Plant, vol. 13, no. 7, July 1925, pp. 298-299, 6 figs. Great variety of uses which speed repairs and reduce costs.

ELECTRIC WIRING

POWER-PLANT. Modern Practice in Power Plant Wiring, E. G. Sohlberg. Power Plant Eng., vol. 29, no. 6, Mar. 15, 1925, pp. 338-343, 4 figs. Author claims that except for certain types of conductors, heating rather then voltage drop, is primary consideration in power-house wiring.

ELECTRICAL MACHINERY

HYDROGEN AS COOLING MEDIUM. Hydrogen as a Cooling Medium for Electrical Machinery, E. Knowlton, C. W. Rice and E. H. Freiburghouse. Am. Inst. Elec. Engrs. — Jl., vol. 44, no. 7, July 1925, pp. 724-734, 11 figs. Results of large amount of theoretical study and large number of tests to determine advantages of hydrogen as cooling medium in electrical machinery, conclusions.

PHASE ADVANCERS. Electrical Machinery, F. Creedy. Electrician, vol. 94, no. 2458, June 26, 1925, pp. 748-750, 5 figs. Recent improvements in self-exciting polyphase generators and phase advancers; consideration of different possible designs; properties of series machine.

ELECTRICITY SUPPLY

TARIFFS. The Tariff Problem, M. Jorgensen. Electrician, vol. 94, no. 2455, June 5, 1925, pp. 658-659, 2 figs. Describes kilowatt year system and its beneficial effect on electrical development; design and use of a current limiter.

EMPLOYEES' REPRESENTATION

PLAN. Joint Representation Colorado Fuel and Iron Company, A. H. Lichty. Min. Congress Jl., vol. 11, no. 6, June 1925, pp. 262-264. Outline of plan in force at properties of C. F. & I. by Russell Sage Foundation.

EMPLOYMENT MANAGEMENT

SERVICE DEPARTMENT. The Cost of an Employee Service Department, M. S. Rossy. Indus. Mgmt. (N. Y.), vol. 70, no. 1, July 1925, pp. 4-5. Discusses expenses of each individual item, including dispensary, restaurant, safety work, library, athletics, wholesale store, cobbler shop, housing, and recreation.

ENGINEERS

TRAINING OF POWER-SUPPLY. The Training of Power Supply Engineers, F. G. Bromley. Elec. Rev., vol. 96, no. 2481, June 12, 1925, p. 952. Describes a scheme involving a three-year course of training.

MINING, LITERATURE, FOR. The Mining Engineer's Chestfull of Books, H. J. C. MacDonald. Min. & Metallurgy, vol. 6, no. 223, July 1925, pp. 337-340, 1 fig. Brief list of books, papers, and magazines, which every mine office should have as company property for exclusive use of engineers.

EVAPORATION

STEAM COMPRESSION METHOD. Evaporation by Compressing Steam (Les procédés évaporatoires par compression de vapeur, système Prache et Bouillon), C. Prache. Société d'Encouragement pour l'Industrie Nationale—Bul., vol. 124, no. 3, Mar. 1925, pp. 247-269, 11 figs. Reviews development during last 20 years and describes Prache and Bouillon evaporators and their application for distillation of boiler feedwater, and concentration of animal and vegetable products.

F

FACTORIES

ROLLING STEEL DOORS. The Rolling Steel Door in Industry, M. L. Cornell. Indus. Mgmt. (N. Y.), vol. 70, no. 1, July 1925, pp. 12-15, 4 figs. Its construction, applications and economies.

UTILITIES, WASTE PREVENTION. Attacking the Utility Sector of Factory Overhead, N. L. Sammis. Indus. Mgmt. (N. Y.), vol. 70, no. 1, July 1925, pp. 33-38. Stopping wastes of power, heat, light, water, and compressed air.

WINDOW MAINTENANCE. Getting the Long-Time Dividend from Factory Windows, K. D. Hamilton. Factory, vol. 35, no. 1, July 1925, pp. 42-46 and 80, 15 figs. Phases of window maintenance that make for greater utility.

FANS

MINE. The Choice of an Efficient Fan or Ventilator for a Mine, Jos. Parker, North of England Inst. Min. & Mech. Engrs.,—Trans., vol. 75, part 2, Jan. 1925, p. 28-41, 6 figs. Considers (1) resistance of mine and how far it may change curing life of mine, and in this connection best method of expressing, representing and computing resistance; (2) behavior of fans throughout any change in resistance, or modification therein, and how best to represent and compute relations between resistance, volume of air circulated, and efficiency of fan.

FERRO-ALLOYS

CHEMICAL ANALYSIS. Proposed Tentative Methods of Chemical Analysis of Ferro-Alloys. Am. Soc. Testing Matls.—Preprint, no. 13s, for mtg. June 23-25, 1925, 33 pp. Determination of silicon in ferro-silicon, manganese in ferromanganese, chromium in ferro-chromium, vanadium in ferro-vanadium, tungsten in ferrotungsten and tungsten metal and other determinations.

FILTERS, SAND

WOOD GRATING IN. Wood-Grating in Filters and Cemented Gravel Layer. Eng. News-Rec., vol. 94, no. 26. June 25, 1925, pp. 1062-1065, Symposium giving facts and opinions based on experience and observation at various test and working scale plants, as follows: Corroborates Some Doubts Raised by Milwaukee Experiments, J. W. Ellms; Metal Distributors More Dependable Than Gravel, W. Donaldson; Baltimore Experience with Slat Bottom Type Satisfactory, J. W. Armstrong; Iron Ridge Block Diffusers and Wood Grating Used at St. Paul, J. W. Kelsey; Cemented Gravel Slabs Satisfactory at Toronto and Elsewhere, Wm. Gore.

FLOORS

AMIESITE ASPHALT. Asphalt Flooring Laid in Sub-Zero Weather, L. Carbi. Can. Engr., vol. 48, no. 24, June 16, 1925, pp. 575-577, 6 figs. Particulars regarding paving of Montreal harbor sheds with "Amiesite" asphalt mixture during weather as cold as 25 deg. below zero; specially designed reflecting heaters to warm surface; paving breakers equipped with tamping plates give final compression.

FLOW OF STEAM

VISCOSITY. The Determination of Viscosity of Steam (Die Bestimmung der Zähigkeit des Waserdampfes), H. Speyerer. Zeit. des Vereines deutscher Ingenieure, vol. 69, no. 22, May 30, 1925, pp. 747-752, 9 figs. Viscosity is determined according to flow method from neighborhood of saturation to 350 deg. cent.; derivation of equation for pressure drop in rough pipes.

FLOW OF WATER

OPEN CHANNELS. The Flow of Water in Drainage Channels With Special Reference to the Results of Experiments to Determine the Roughness Coefficient "N" in Kutter's Formula, C. E. Ramser. Iowa Eng. Soc.-Proc., 1924, pp. 9-35 and (discussion) 35-37, 21 figs. Discusses experiments made by U. S. Dept. Agriculture.

FLUE GAS

CALCULATIONS. Flue Gas Calculations, R. Wright. Elec. Times, vol. 67, no. 1753, May 21, 1925, pp. 621-623, 3 figs. Calculations dealing with theoretical pounds of air per pound of coal, theoretical composition of flue gas, volume of gases, and flue gas losses.

FORGING

SWAGING AND. Forging and Swaging (Freiform-schmieden und Gesenkschmieden), K. Meyer. Maschinenbau, vol. 4, no. 11, June 4, 1925, pp. 526-532, 13 figs. Discusses differences, heating arrangements, heating and annealing furnaces, production of dies for swaging, steam and pneumatic hammers, etc.

FOUNDATIONS

CONCRETE MATTRESSES. Some Interesting Foundation Problems Result from Unstable Soils. Ry. Eng. & Maintenance, vol. 21, no. 7, July 1925, pp. 266-268, 5 figs. New York Central utilizes interesting designs of concrete mattresses in connection with work on Castleton cut-off; describes foundation work for two turntables and one large 3-barreled box culvert under heavy fill.

FURNACES, ANNEALING

BUNG LINING. Line Annealing Furnace Bungs, M. F. King. Foundry, vol. 53, no. 13, July 1, 1925, pp. 535 and 540, 5 figs. Monolithic lining adopted by Canadian Steel Foundries, Montreal, consists of crushed old firebrick with high-temperature cement mixed in proportions to make plastic mixture. See also Iron Trade Rev., vol. 76, no. 26, June 25, 1925, p. 1642, 2 figs.

FURNACES, HEAT TREATING

EFFICIENCY, DETERMINATION OF. Determination of Furnace Efficiencies and Heat Treating Costs, C. L. Ipsen. Am. Soc. Steel Treating—Trans., vol. 8, no. 1, July 1925, pp. 36-47. Shows that statement of efficiency of furnace must be based on operating cycle, and demonstrates by example that efficiency of electric furnace chosen for illustration may range from 33 per cent to 78 per cent, depending on cycle and material to be heated; also shows that cost of heat treating depends on many factors other than installation cost of furnaces and cost of fuel.

ELECTRIC CONVERSION FROM OIL-FIRED. Replacing Oil with Electricity, W. J. Walsh. Iron Age, vol. 116, no. 3, July 16, 1925, pp. 145-146, 2 figs. Converting oil-fired heat-treating furnace into electric; relative cost advantages and results.

FUELS

CALORIFIC VALUE. Determination of Calorific Value of Fuels From Their Chemical Composition (Berechnung des Heizwertes der Brennstoffe aus ihrer chemischen Zusammensetzung), R. Vondracek. Montanistische Rundschau, vol. 17, no. 10, May 16, 1925, pp. 317-321. Discusses methods of calculation; shows errors in Dulong and other formulas; gives table of heat of combustion of 26 fuels.

See Alcohols, Coal, Coke, Gas, Peat, Pulverized Coal.

FUMES

REMOVAL. *See Air Conditioning.*

FURNACES

ELECTRIC. *See Electric Furnaces.*

G

GALVANOMETER

MULTI-VIBRATION. The Multi-Vibration Galvanometer, P. Rothwell. Jl. Sci. Instruments, vol. 2, no. 8, May 1925, pp. 251-254, 4 figs. Describes a vibration galvanometer with a number of elements of Campbell type tuned in succession to cover a range of acoustical frequency.

GAS

HEATING VALUE. The Heating Value of Gas, E. R. Weaver. Gas Age-Rec., vol. 55, no. 24, June 13, 1925, pp. 833-834, 838 and 840. Relative usefulness to consumer of gases of different heating value and relation to standard and rates. Pub. by permission U. S. Bur. Standards.

GAS ENGINES

HELIUM POWER PLANT. Generating Units of United States Helium Gas Power Plant (Ft. Worth, Tex.), Z. W. Wicks. Power, vol. 62, no. 1, July 7, 1925, pp. 8-11, 7 figs. Twin 500-hp. gas engines supply power for gas compressors; savings over purchased energy will pay for engines in 4 years; novel cylinder-jacket construction.

GAS WORKS

BY-PRODUCT OVEN COAL GAS PLANTS. Small By-Product Oven Coal Gas Plants, H. J. Rose. Gas Age-Rec., vol. 56, no. 1, July 4, 1925, pp. 5-8, 5 figs. Considers briefly two of the fundamental economic conditions which are causing gas men to choose coal carbonization as main source of city gas supply. Construction and operation of Becker type small gas oven, built by Koppers Company, Pittsburgh, Pa. Paper read before South. Gas Assn.

GEAR CUTTING

PRINTING-PRESS FACTORY. Gear Production in a Modern Printing-Press Factory, H. H. Edge. Am. Mach., vol. 62, no. 26, June 25, 1925, pp. 997-999, 8 figs. Outline of layout of department for turning and boring gear blanks and machines used in cutting 60 kinds and sizes of gears.

GEARS

FINISHING TREATMENT. Production of Gears. Times Trade & Eng. Supp., vol. 16, no. 359, May 23, 1925, p. 246. Notes on finishing treatment, including case hardening, alloy steels, and testing.

INDUSTRIAL POWER TRANSMISSION, FOR. Gearing as a Medium of Industrial Power Transmission, O. N. Stone. Am. Soc. Steel Treating—Trans., vol. 8, no. 1, July 1925, pp. 48-57. Discusses essential points which should be given consideration by gear users from standpoint of design, material and thermal treatments, when specifying conditions under which gears should be produced; brings out importance of closer co-operation between user and producer of gearing which will enable better equipment to be produced by machinery manufacturers.

GRINDING MACHINES

AUTOMATIC. German Grinder Is Automatic, H. Hermanns. Abrasive Industry, vol. 6, no. 7, July 1925, p. 203, 3 figs. Describes tool grinding machine manufactured by Grossenhainer Webstuhl-und Maschinen-Fabrik A. G., Grossenha, Saxony, Germany; used for grinding milling cutters, reamers, taps, etc., both straight and spiral; provisions made for recutting of worn cutters; grinder spindle compensates for heat.

INTERNAL. Heald Semi-Automatic Internal Grinding Machine. Am. Mach., vol. 63, no. 1, July 2, 1925, pp. 33-35, 3 figs. Improved machine, in operation of which many minor movements which have hitherto devolved upon operator are taken care of by automatic mechanism, and sizing is done by means of direct-reading indicator.

H

HAMMERS

ELECTRIC. A New Form of Electric Hammer. Engineer, vol. 139, no. 3626, June 26, 1925, p. 718, 3 figs. New Kango hammer for comparatively light work, such as chipping, stone dressing and wall drilling, but its principle is adaptable to heavier work, and it is hoped to develop it for riveting and other more arduous services.

HEATING

HEATING SURFACES. A Proposed Method for Comparison of Effectiveness of Indirect Heating Surfaces, A. E. Stacey, Jr., and C. M. Ashley. Am. Soc. Heat. & Vent. Engrs.—Jl., vol. 31, no. 6, June 1925, pp. 327-335, 8 figs. Simple system which can be used for comparison between indirect heating surfaces, based on ratio of heat output to power input. Examples of use of this system.

HEATING, ELECTRIC

INDUSTRIAL. Low Temperature Industrial Heating. Elec. Engr., vol 2, no. 2, May 15, 1925, pp. 61-65, 4 figs. Description of construction and functioning of Brown Boveri quick acting regulator and its application to regulating voltages of a.c. generators.

HEATING AND VENTILATION

APARTMENT BUILDINGS. New Application of Old Principles in Heating An Apartment Building. Heat & Vent. Mag., vol. 22, no. 3, Mar. 1925, pp. 47-53, 7 figs. Details of one-pipe gravity-return system and air supply equipment for Hibbard Apartments, Detroit, Mich.

THEATRES. *See Theatres.*

HEATING, HOT-AIR

GRAVITY, LEADER PIPE FOR. Effect of Length of Leader Pipe on Heating Capacity in Gravity Warm-Air Heating System, V. S. Day. Am. Soc. Heat. & Vent. Engrs.—Jl., vol. 31, no. 6, June 1925, pp. 343-348, 7 figs. Discusses two general cases, viz., leaders connecting with second-story pipes, and leaders connecting with first-story baseboard registers; test results.

FANS. Value of Fans in Furnace Heating, C. G. Buder. Am. Soc. Heat. & Vent. Engrs.—Jl., vol. 31, no. 6, June 1925, pp. 349-352, 2 figs. Requirements for ideal fan for use in producing forced circulation in a warm-air furnace; notes on design; etc.

HIGHWAYS

STATISTICS. State and County Highway Statistics. Pub. Wks., vol. 56, no. 5, May 1925, pp. 176-193. Tables giving amount of money spent in 1924 and available 1925 for highway work by states and counties, also kinds of improvement carreid out and cost of each; amounts spent for maintenance of each kind of road by several hundred counties, and equipment of patrolmen and maintenance gangs.

HYDRAULIC MACHINERY

EUROPEAN DESIGN. Recent European Hydraulic Machinery Design, F. Johnstone-Taylor. Power Plant Eng., vol. 29, no. 14, July 15, 1925, pp. 742-745, 8 figs. Propeller and high-head reaction runners, and improved nozzles, are feature of latest practice; new types of va ves; roller sluice gates used in open channels.

HYDRAULIC PRESSES

BRIQUETTING. Fifty-ton Hydraulic Briquetting Press, H. S. Cattermole. Mech. World, vol. 77, no. 2006, June 12, 1925, pp. 373-374, 1 fig. Represents standard type of single-mold press used for making blocks or briquettes of various materials.

HYDRAULIC TURBINES

BANKI LOW-HEAD. Hydraulic Turbine of New Design Developed in England, F. Johnstone-Taylor. Eng. News-Rec., vol. 95, no. 2, July 9, 1925, pp. 72-73, 2 figs. Waterwheel having some special features and suitable for low-head settings and small hydro-electric units.

RIVER TYPE. A New River Turbine (Eine neue Stromturbine), F. Magyar. Zeit. des Oesterr. Ingenieur- u. Architekten-Vereines, vol. 77, no. 19-20, May 15, 1925, pp. 162-164, 7 figs. Design and operation of Suess propeller-type turbine; results of tests at laboratory of Vienna Technical High School, in Danube-channel and Danube-river.

SPIRAL CASINGS FOR. Large Plate Steel Spiral Turbine Casings. Can. Engr., vol. 48, no. 14, Apr. 7-1925, pp. 373-376, 9 figs. Details covering manufacture of spiral casings for the twelve 45,000-hp. turbines being installed at Isle Maligne, Que., for Quebec Development Co.; casings designed for 110-ft. effective head.

HYDRAULICS

PRACTICAL APPLICATIONS. Practical Applications of Hydraulic Principles, R. T. Livingston. Power Plant Eng., vol. 29, nos. 3 and 5, Feb. 1 and Mar. 1, 1925, pp. 189-190 and 294-295, 6 figs. Feb. 1: Explanation of two fundamental laws, from which many other equations can be deduced; friction losses. Mar. 1: Application of laws to Venturi meter, showing how formula is derived.

HYDRO-ELECTRIC DEVELOPMENTS

CANADA. Cascade River Hydro Power Development, J. M. Wardle. Can. Engr., vol. 48, no. 25, June 23, 1925, pp. 595-598, 7 figs. Principal features of a hydro-electric development in Rocky Mountains National Park to supply light and power to Banff, Alberta; two 480-hp. turbines installed; ultimate development, 1440 hp.

SHEET HARBOUR, NOVA SCOTIA. Sheet Harbour Hydro-Electric Power System. Can. Engr., vol. 48, no. 24, June 16, 1925, pp. 583-588, 15 figs. Nova Scotia Power Commission complete two developments in sheet harbour system; developments at Malay Falls and Ruth Falls generate 5550 hp. and 6580 hp. respectively; describes drainage areas; principal construction features.

TACOMA, WASH. Tacoma's Second Municipal Hydro-Electric Scheme, R. G. Skerrett. Compressed Air Mag., vol. 30, no. 6, June 1925, pp. 1269-1272, 9 figs. Particulars regarding Lake Cushman project; consists of an initial development of 50,000 hp. just below a concrete storage dam erected across valley of Skokomish river, of a transmission line over 40 miles in length, and of a substation.

HYDRO-ELECTRIC PLANTS

AUXILIARY STEAM PLANT, WITH. The Operation of Hydro-electric Systems with Auxiliary Steam Plants for Best Economy and Proper Governing. M. White. Engrs. & Eng., vol. 42, nos. 5, May 1925, pp. 119-125, 2 figs. Outlines fundamentals of hydro-electric unit operation as affecting or affected by operation of steam plants and shows that, contrary to popular notion, it is often more economical during low-water season to operate steam plant on base load and take peak or swings of load on hydro-electric plants; relative efficiencies of hydro-electric units· required setting of governors; suggests specification for design of governor of steam auxiliary units for most economical operation with hydro-electric plants.

DIXON, ILL. Largest Seven-Foot Head Hydro-Electric Plant. Power, vol. 62, no. 1, July 7, 1925, pp. 2-5 figs. Presents capacity of plant on Rock River at Dixon, Ill., is 5 units of 800 kva. each operating at 80 r.p.m. on 7-ft. effective head; operated by two men as base-load plant in conjunction with near-by steam plant; space limitations necessitated use of diagonal type of power house.

LAKE ST. JOHN DISTRICT, CANADA. Hydro Plants in Lake St. John District, G. B. Snow. Can. Engr., vol. 48, no. 22, June 2, 1925, pp. 535-539, 7 figs. Some minor developments in Lake St. John and Saguenay districts of Quebec; some of the principal features of Northern Elec. Co.'s plant and developments at Jonquiere, Bagotville and Lac Bouchette.

OPERATION. Operation of Hydro-Electric Units for Maximum Kilowatt Hours, F. Nagler. Engrs. & Eng., vol. 42, no. 6, June 1925, pp. 148-158, 6 figs. Points out magnitude of certain losses that commonly exist in hydro-electric units under conditions of average operation and outlines methods for reducing such losses in order to further primary object of securing maximum number of kilowatt hours from station; possibility of eliminating or greatly reducing losess in turbines and impulse wheels by controlled venting of runners.

I

INDICATORS

DIAGRAMS. The Area of Indicator Diagrams, G. A. Wedgwood. World Power, vol. 3, no. 19, June 1925, pp. 329-332, 6 figs. Results of investigation by writer into methods of determining mean height of indicator card, for which two methods are usually employed, namely, mid-ordinate rule, and measuring of area of diagram by means of ordinary polar planimeter; it is shown that mid-ordinate method is not accurate; points out advantages of roller-and-disk planimeter over polar planimeter.

INDUSTRIAL MANAGEMENT

CONTINUOUS ASSEMBLING. Economic Bases for the Introduction of Continuous Assembling (Betriebs-wissenschaftliche Grundlagen für die Einführung der Fliessarbeit), K. H. Schmidt. Maschinenbau, vol. 4, no. 9, May 7, 1925, pp. 409-415, 11 figs. Origin and bases of continuous assembling in United States and comparison with German conditions; standardizing within shops; flow sheets, time study, etc.

PRODUCTION PLANNING. The Brains of Production, C. B. Gordy. Soc. Automotive Engrs.—Jl., vol. 16, no. 6, June 1925, pp. 604-607 and (discussion) 607-608. Influence of F. W. Taylor; elements of management; quantity and standardization; importance of pre-planning; estimate of production; sales analysis; flow layouts; stock records; maintenance department.

SMALL FACTORIES. Capitalizing the Advantages of the Small Factory, D. S. Cole. Indus. Mgmt. (N. Y.), vol. 69, nos. 4, 5 and 6, Apr., May and June, 1925, pp. 208-212, 291-295 and 360-364, 6 figs. Apr.: How the small shop can survive; necessity for lower overhead costs. May: Importance of a fixed policy. June: Material in small shop.

WASTE. *See Factories.*

INDUSTRIAL PLANTS

LOCATION. Modern Industry Annihilates Space, J. A. Piquet. Indus. Mgmt. (N. Y.), vol. 70, no. 1, July 1925, pp. 6-11, 6 figs. Locating where materials are moved at minimum ultimate cost; gives example of portland-cement plant at Chattanooga, Tenn , which is so well located geographically that it is at same time near its raw materials and fuel, and at one of chief rail-distribution points to the South.

POWER ECONOMIES. Power Economy Through Loading Dispatching, H. A. Richardson. Indus. Mgmt. (N. Y.), vol. 70, no. 1, July 1925, pp. 1-4, 2 figs. Points out that in course of year industrial plant will have consumed certain number of horsepower-hours of power; dividing that number by number of hours worked during year gives average power demand and the closer that demand is kept constant the better the power economy will be.

INDUSTRIAL RELATIONS

EMPLOYEES' PUBLICATIONS. Making a Success of the Works Magazine, E. N. Simons. Mech. World, vol. 77, nos. 2002 and 2004, May 15 and 29, 1925, pp. 311-312 and 345-346. Points out advantages and benefits of such magazines; difficulties common to works magazines.

EMPLOYMENT. *See Employment Management.*

INDUSTRIAL TRUCKS

ECONOMY OF. Conveying in Workshops With Special Reference to Trackless Conveying (Die wirtschaftliche Werkstätten-Förderung unter besonderer Berücksichtigung der gleislosen Flurförderung), Hellmich. Maschinenbau, vol. 4, no. 10, May 21, 1925, pp. 472-477, 6 figs. Comparison of conveying on track and without track; economic conveying in and between workshops, and cost data showing economy.

INSULATION, ELECTRIC

SUSPENSION. High Line Insulation in the West, J. A. Koontz. Elec. Light & Power, vol. 3, no. 6, June 1925, pp. 150-152, 5 figs. partly on 156. Development of suspension insulators; types of shields and insulators; points which should be considered in choosing high-voltage line insulators.

INTERNAL COMBUSTION ENGINES

See also Automobile Engines; Diesel Engines; Gas Engines; Oil Engines.

IRON

METALLURGY. *See Metallurgy.*

VISCOSITY. The Influence of Temperature and Chemical Composition on the Viscosity of Iron (Ueber den Einfluss der Temperatur und der Chemischen Zusammensetzung auf die Viskosität des Eisens), P. Oberhoffer and A. Wimmer. Stahl u. Eisen, vol. 45, no. 25, June 18, 1925, pp. 969-977 and (discussion) 977-979, 11 figs. Method for determination of viscosity; influence of temperature and different elements on viscosity of pure iron-carbon alloys; investigation of viscosity of Thomas and Bessemer pig iron; influence of wind pressure, yield residue and flame formation on pig-iron temperature with series of Thomas charges.

IRON, PIG

HAEMATITE. The Use and Abuse of Haematite Pig Iron. Metal Industry (Lond.), vol. 26, no. 26, June 26, 1925, pp. 633-635, 4 figs. Although many foundrymen have great faith in addition of proportion of haematite to their mixtures to produce strong, close-grained iron, in author's opinion, most that can be said for such practice is that haematite addition will act as diluent of phosphorus; final result, in fact, will often be reverse to that aimed at for carbon content of haematite, and especially condition in which it exists, may often more than offset any benefits from phosphorus dilution, and weak, open-grained iron be produced.

L

LABOR

EIGHT-HOUR DAY. Report on the Eight-Hour Day. W. Clower. Int. Ry. Congress Assn.—Bul., vol. 7, no. 5, May 1925, pp. 1481-1493. Deals with eight-hours day as it applies to classes of manual workers engaged in one form or another in traffic operating, on railways, in both America and British Empire.

LEAD METALLURGY

ORE CONCENTRATION. Concentration of Lead-Zinc Ores of Eastern Canada, C. Parsons. Min. Jl., vol. 149, nos. 4680, and 4681, May 2 and 9, 1925, pp. 353-354 and 377-378. Character and types of ores; early methods of concentration; tonnage flotation tests on run-of-mine ore; gravity concentration of lead, followed by flotation of zinc.

LIGHTING

STREET. A New Criterion of Street Lighting Excellence, L. B. W. Jolley and C. A. Morton. Illuminating Engr., vol. 18, June 1925, pp. 155-160, 10 figs. Discusses a suggested method of preparing design of a street lighting installation.

LIME

STANDARD SPECIFICATIONS. Lime. Am. Soc. Testing Matls.—Preprint, no. 30, for mtg. June 23-26, 1925, 4 pp. Report of Committee C-7. Subcommittee reports on lime for structural purposes, for chemical industries, and for highways.

LOCOMOTIVES

CUT-OFF, CONTROL OF. Back Pressure as an Index to Fuel Economy, R. W. Retterer. Ry. Rev., vol. 76, no. 25, June 20, 1925, pp. 1138-1145, 14 figs. Discussion of factors relating to manual and automatic control of locomotive cut-off as related to fuel conservation. (Abstract.) Paper prepared for Int. Ry. Fuel Assn.

DEVELOPMENTS. The Railway Centenary. Engineering, vol. 119, no. 3104, June 26, 1925, pp. 783-796, 56 figs., partly on supp. plates. Notes on opening of Stockton and Darlington Railway, Sept. 27, 1825, and its subsequent development; examples of practice of first half-century of railways; and consideration few of most recent locomotives.

ELECTRIC. *See Electric Locomotives.*

DIESEL, HYDRAULIC TRANSMISSION FOR. Schneider Hydraulic Transmission for Diesel Locomotives. Ry. Mech. Engr., vol. 99, no. 7, July 1925, pp. 468-471, 8 figs. Combination of mechanical and hydraulic coupling employed; tests show high efficiency.

MINE. *See Mine Locomotives.*

THREE-CYLINDER. Missouri Pacific Tests Three-Cylinder Locomotive. Ry. Age, vol. 78, no. 30, June 27, 1925, pp. 1623-1628, 13 figs. Performance of Mikado locomotive on Altoona testing plant shows good boiler and engine efficiencies. See also Ry. Mech. Engr. vol. 99, no. 7, July 1925, pp. 462-467, 13 figs.

WATER COLUMNS. Standardization of Water Columns. Ry. Rev., vol. 76, no. 26, June 27, 1925, pp. 1216-1217, 1 fig. Recommendations made for future installations. (Abstract.) Report of committee before Am. Ry. Assn.

LOCOMOTIVE BOILERS

FEED SYSTEM. A New Locomotive Boiler Feed System. Engineer, vol. 140, no. 3627, July 3, 1925, p. 20, 3 figs. Describes Dabeg feed pump, outstandings features of which are use of portion of exhaust steam to heat feedwater, and mechanical operation of feed pump by main driving wheels.

FIRELESS STEAMING. Fireless Steaming System at Engine Terminals, L. G. Plant. Ry. Rev., vol. 76, no. 25, June 27, 1925, pp. 1205-1207. Novel arrangement for filling locomotive boilers and aid in fuel conservation and smoke abatement. (Abstract.) Paper read before Smoke Prevention Assn.

LOGGING

OVERHEAD-CABLEWAY METHOD. The Overhead-Cableway Method of Logging, S. Miller. Mech. Eng., vol. 47, no. 7, July 1925, pp. 527-534, 12 figs. First logging cableway; evolution of mechanical slack-puller; portable-spar skidder and its operation.

LUBRICATION

AUTOMOBILE ENGINES. *See Automobiles engines.*

CHOICE OF LUBRICANTS. Lubricants and Lubrication. Times Trade & Eng. Supp., vol. 16, no. 354, Apr. 18, 1925, p. 119. Discusses control of friction, classes of friction, conditions of use, and choice of lubricants.

AXLEBOXES FOR RAILWAY ROLLING STOCK. Report on Reduction of the Cost of Traction; Lubrication of Axleboxes for All Rolling Stock. Tete. Int. Ry. Congress Assn.—Bul., vol. 7, no. 4, Apr., 1925, pp. 859-950, 12 figs. Report dealing with all countries except America and British Empire. Lubrication of stock and coach, locomotive and tender, and roller and ball bearing axleboxes; lubricants.

M

MACHINE TOOLS

SLIDING-KEY FEED MECHANISMS. Sliding Key Feed Gear Boxes, H. C. Town. Machy. (Lond.), vol. 26, no. 662, June 4, 1925, pp. 294-295, 9 figs. Cites examples to show that it is comparatively easy by careful design to surmount any objections that can be raised against this type of mechanism for feed gear boxes.

WORKING, ECONOMIES IN. Machine Tools. Times Trade & Eng. Supp., vol. 16, no. 363, June 20, 1925, p. 346. Discusses minor economies in working, discussing gears in mesh, cam movements, cutting to size, fool-proof devices, and wear of beds.

MALLEABLE CASTINGS

MANUFACTURING PROBLEMS. Malleable Iron, F. H. Hurren. Foundry Trade Jl., vol. 116, nos. 460 and 461, June 11 and 18, 1925, pp. 499-502 and 526. Basic differences between malleable and other castings; silicon requirements; carbon control; graphite precipitation; manufacturing desiderata; chemistry of annealing process; detailed consideration; methods of melting; distortion; cost of annealing; cost of special boxes; lines for future research.

MANGANESE STEEL

Phosphide in. Phosphide in Manganese Steel (Phosphid im Manganstahl), E. Piwowarsky. Stahl u. Eisen, vol. 45, no. 27, July 2, 1925, pp. 1075-1076, 9 figs. on supp. plate. Discovery, through special etching on manganese casting with high phosphorus content, of presence of free phosphide alongside of free carbide; it was observed that by annealing over period of several hours and subsequent hardening, phosphide also went into solution.

MARINE STEAM TURBINES

Geared. The Design of Ahead Reaction Marine Geared Turbines, W. G. Paterson. Mech. World, vol. 77, nos. 1993, 1996, 1998 and 2000, Mar. 13, Apr. 3, 17 and May 1, 1925, pp. 166-168, 216-217, 245-246 and 282-283, 7 figs. Consideration of equation of energy and its bearing upon question.

MATERIALS

Elasticity and Fatigue Breakdown. The Elastic Limit in Tension, and Its Influence on the Breakdown by Fatigue, J. M. Lessells. Instn. Mech. Engrs.—Proc., no. 6, 1924, pp. 1097-1114, 11 figs. Experimental evidence of degree of influence which elastic properties of materials exert on their actual breakdown by fatigue.

Purchase by Specifications. The Purchase of Materials on Specification, D. Harvey. Am. Soc. Testing Matls.—Preprint, no. 63, for mtg. June 23-26, 1925, 9 pp. Advantages of standardization; procedure followed by large manufacturing company in preparing specifications.

Temperature, Effect of. The Effect of Low and High Temperatures on Materials, F. C. Lea. Instn. Mech. Engrs.—Proc., no. 6, 1924, pp. 1053-1096, 25 figs., and (discussion) pp. 1115-1168, 14 figs. Statical tests at temperatures ranging from—80 to 1000 deg.-cent. in testing machines of ordinary chacracter to determine elastic properties, breaking strengths, and other data generally obtained by tests at ordinary temperatures; hardness tests determined statically and dynamically at various temperatures; repetition tests at temperatures varying from 15 to 800 deg. cent.

MATERIALS HANDLING

Accidents, Causes of. Causes of Accidents in Material Handling, D. S. Beyer. Blast Furnace & Steel Plant, vol. 13, no. 6, June 1925, pp. 239-242, 2 figs. Statistics on materials handling; human side of problems; age as it affects accidents.

Portable Lifting Equipment. Portable Lifting Tackle, W. Dahlheim. Eng. Progress, vol. 6, no. 5, May 1925, pp. 149-151, 6 figs. Portable staple elevators and dray ladders for hand and automatic operation.

MATHEMATICS

Hydraulic Problems, Solution of. Simple Solution of Hydraulic Problems, R. W. Angus. Eng. & Contracting (Water Wks.), vol. 64, no. 1, July 8, 1925, pp. 81-85, 2 figs. Shows practical treatment of well-known problems by arithmetic. Paper read at International Mathematical Congress at Toronto.

METALLURGY

Ferrous Metals. Principles of Metallurgy of Ferrous Metals for Mechanical Engineers, L. Cammen. Mech. Eng., vol. 47, no. 7, July 1925, pp. 559-565. Determination of properties of metals; physical tests; chemical analysis; determination of structure of steel and iron by microscopy and reflection photography; photomacrographs and photomicrographs; X-ray photography; determination of corrosion resistance, electrical properties, physical constants, stability, machinability and erosion resistance. Bibliography.

METALS

Endurance Properties. Endurance Properties of Metals, D. J. McAdam, Jr. Mech. Eng., vol. 47, no. 7, July 1925, pp. 566-572, 18 figs. Recent investigations; endurance range of steel; endurance properties of non-ferrous metals; effect of cold-working and annealing on endurance and other properties; influence of chemical composition.

Fatigue. Fatigue of Metals by Direct Stress. P. L. Irwin. Am. Soc. Testing Matls.—Preprint, no. 21, for mtg. June 23-26, 1925, 10 pp., 9 figs. Discusses new apparatus designed as improvement to direct stress fatigue-testing machines, together with endurance limits obtained as compared with those resulting from flexural stresses.

Plasticity. Theory of Plasticity of Solids (Essai théorique sur la plasticité des solides), M. Brillouin. Annales de Physique, vol. 3, Mar.-Apr. 1925, pp. 129-144. Discusses definition of plasticity; equations for plastic state; gliding deformation in metal working; brittleness.

MINERALS

Separation, Dielectric. Dielectric Mineral Separation, B. W. Holman. Eng. & Min. Jl.-Press, vol. 119, no. 26, June 27, 1925, p. 1047. Possible applications of a process developed in a laboratory scale in England.

MINES

Electricity in. Electricity in Mines, E. I. David. Instn. Elec. Engrs.—Jl., vol. 63, no. 342, June 1925, pp 521-536 and (discussion) 537-570, 11 figs. Deals with general problem of power production at mines, giving briefly essential differences between coal-mine power plant and normal power plant; modern methods of supplying 4 main power-cousuming units at mines, with particular reference in each case to question of utilization of synchronous motors; advantages and disadvantages of a.c. and Ward-Leonard control for electric winders; results of progressive conversion of several mines from steam to electric drive for various main units and effect of supplying compressed-air power from central station in similar way to electric power.

MINE SHAFTS

Supporting Sides of. Supporting the Sides of Shafts. Sci. & Art of Min., vol. 35, no. 18, Mar. 28, 1925, 276-277, 5 figs. Objects of shaft lining; temporary and permanent liniug; temporary lining in surface rocks; erecting lining; etc.

MINING

Safety Problems. Researches on Safety Problems in Mining, E. Troup. Instn. Min. Engrs.—Trans., vol. 68, part 6, Apr. 1925, pp. 447-452. Discusses safety problems confronting mining industry and researches into these problems in progress.

MOLDING METHODS

Gray-Iron Girders. Moulding a 20 ft. Girder in Green Sand, F. C. Edwards. Metal Industry (Lond.), vol. 26, no. 24, June 12, 1925, pp. 583-585, 3 figs. Method employed in molding gray-iron girder casting; importance of facing sand; molding operations; finishing and assembling.

Hand and Machine. Systematic Procedure in Hand and Machine Molding (Systematisches Arbeiten in der Hand- und Maschinenformerei), J. Petin. Giesserei-Zeitung, vol. 22, no. 8, Apr. 15, 1925, pp. 219-228, 29 figs. Preparation and execution of work; hand molding with relief pattern plates and lifting devices; machine molding.

MOLYBDENUM

Nova Scotia. Molybdenite Deposit Near New Ross, Nova Scotia, C. W. Cook. Economic Geology, vol. 20, no. 2, Mar.-Apr. 1925, pp. 185-188. Geology of deposit located about 25 miles from Windsor and 4 miles from New Ross, in Lunenburg Co.

MORTARS

Properties. Analytical Properties of Set and Hardened Mortars, E. E. Butterfield. Am. Soc. Testing Matls.—Preprint, no. 40, for mtg. June 23-26, 1925, 9 pp., 2 figs. Tests by which cement content may be calculated from determination of calcium oxide in hardened mortars proportioned by method of mortar voids or with inundated sand with average variation of less than 1 per cent.

MOTOR BUSES

Electric Drive for Gasoline-Propelled. An Electric Drive for Gasoline-Propelled Motor buses, H. S. Baldwin. Soc. Automotive Engrs.—Jl., vol. 17, no. 1, July 1925, pp. 95-106, 24 figs. Beginning with description of first application of electric drive to motor buses in United States, author follows course of its progress up to present time; electric drive in England; modified form of drive with storage battery; development of electric power plants; electric-drive vehicles at Philadelphia; single-vs. double-motor drive; advantages of electric drive.

Operation. Three Factors Which Affect Safety, H. K. Bennett. Bus. Transportation, vol. 4, no. 6, June 1925, pp. 277-278. Right methods of selecting and dealing with drivers, constant inspection of equipment and installation of safety devices on buses all contribute to safe operation demanded by public.

MOTOR TRUCKS

Obsolescence. When Does a Motor Truck Become Obsolete? Soc. Automotive Engrs.—Jl., vol. 16, no. 6, June 1925, pp. 601-603. Discussion of paper by F. W. Davis. Printed in Journal, Dec. 1924.

Producer-Gas. Producer-Gas Trucks (Les camions à gazogène), G. Koenigs. Société d'Encouragement pour l'Industrie Nationale—Bul., vol. 124, no. 3, Mar. 1925, pp. 201-216, 22 figs. Describes types of Motor trucks which took part in competition in 1923 arranged by Automobile Club of France, making 100 km. for 14 days and carrying 3½ or 5 tons, including Renault, Dewald, Delahage, Berliet and Levassor.

N

NICKEL

Malleability and Metallography of. Malleability and Metallography of Nickel, P. D. Merica and R. G. Waltenberg. U. S. Bur. Standards, Technologic Papers, No. 281, pp. 155-182, 10 figs. Details of investigation taken up in summer of 1921 for purpose of ascertaining why ordinary cast nickel is not malleable when not treated with magnesium, and what is mechanism by which magnesium treatment produces malleability in such nickel.

NICKEL METALLURGY

Refining. Raising Tank-House Efficiency in the British America Nickel Refinery, F. E. Lathe. Eng. & Min. Jl.-Press, vol. 120, no. 1, July 4, 1925, pp. 5-9, 3 figs. Compares copper and nickel refining; outline of Hybinette process, employed by British America Nickel Corp. at Deschenes, Quebec, which consists in electrolysis of a slightly acid nickel sulphate solution supplied to diaphragm cells with iron cathodes; methods adopted by this company to increase current efficiency in nickel tank house.

NICKEL PLATING

Solutions, Control of. Control of Nickel Solutions, H. B. Maxwell. Metal industry (Lond.), vol. 26, no. 24, June 12, 1925, pp. 577-578 and 582, 2 figs. Described method of acidity control of nickel solutions by drop ratio tests of *pH* value.

O

OFFICE MANAGEMENT

Production-Control Reports. Production Control Reports, F. L. Rowland. Taylor Soc.—Bul., vol. 10, no. 3, June 1925, pp. 168-170. First step in increasing efficiency of office departments.

OIL

Specific Heat. Specific Heat-Specific Gravity-Temperature Relations of Petroleum Oils, Wm. R. Eckart. Mech. Eng., vol. 47, no. 7, July 1925, pp. 535-540, 3 figs. Comprehensive study of available data, showing influence of specific gravity upon value of specific heat at different temperatures; chart for use of petroleum engineers in designing equipment.

OIL ENGINES

Four-Cycle, Lubrication of. The Four-Cycle Oil Engine. Lubrication, vol. 11, no. 4, Apr. 1925, pp. 37-48, 21 figs. Describes operating principles and lubrication and lubricants.

OIL FUEL

Diesel, Centrifugal Treatment of. Centrifugal Treatment of Diesel Fuel Oils, L. H. Clark. Motorship, vol. 10, no. 6, June 1925, pp. 442-444, 2 figs. Method avoids difficulties due to impurities, widens range of suitable fuels and improves engine operation.

Water Gas. Liquid Fuels from Water Gas, F. Fischer. Indus. & Eng. Chem., vol. 17, no. 6, June 1925, pp. 574-576. Various known reactions with CO and various catalysts are discussed with regard to their possible use in devising process for production of syuthetic fuels; processes are finally developed for formation, first, of synthetic methanol, then of mixture of synthetic alcohols called synthol, and finally from synthol of mixture of products similar to benzine or gasoline, called synthin.

OIL SHALES

Oil Production from. Producing Oil from Swedish Shale, A. Gradenwitz. Eng. & Min. Jl.-Press, vol. 119, uo. 25, June 20, 1925, p. 1000. Discusses method suggested by S. V. Bergh, Swedish mining engineer, involving destructive distillation of shale with subsequent burning of coke residue in one (separate) continuous process, with carefully controlled temperature.

OIL TANKS

Fire Boilovers. Oil-Tank-Fire Boilovers, H. H. Hall. Mech. Eng., vol. 47, no. 7, July 1925, pp. 540-544, 8 figs. Conditions that must exist if burning oil tank is to boil over, and which are never found in gasoline and light-refined-oil storage.

OPEN-HEARTH FURNACES

Pressure Control. Open-Hearth Pressure Control. G. R. McDermott. Blast Furnace & Steel Plant, vol. 13, no. 6, June 1925, pp. 230-233, 5 figs. Performance in open-hearth furnace before and after installation of turbo-blower and constant-volume air governor on gas producer which supplies gas to open-hearth furnace.

P

PACKING

Paper-Feeding Mechanisms. Feeding Devices for Automatic Machinery, A. A. Dowd. Machy. (N. Y.), vol. 31, no. 11, July 1925, pp. 859-863, 8 figs. Problems encountered in designing feed rolls; design of feed rolls; layout of paper feeding mechanism; conveying and stacking equipment.

PAPER MACHINERY

Wood Grinders. High-Powdered Wood Grinders (Grosskraftschleifer), F. Hoyer. Zeit. des Vereines deutscher Ingenieure, vol. 69, no. 22, May 30, 1925, pp. 756-759. Efficiency formula; factors influencing economy; high-power machines; advantages and disadvantages of different designs; advantages of electric drive.

PAPER MANUFACTURE

Grinding. Continuous Grinding, J. F. Heaney. Paper Trade Jl., vol. 81, no. 1, July 2, 1925, pp. 60-64, 9 figs. Data on advantages of continuous grinding; description of caterpillar grinder design of to-day and way these grinders have to be installed in modern pulp mills. Paper read before Am. Pulp & Paper Mill Supts.' Assn.

Pulp Manufacture. Pulp From Different Parts of the Tree, E. Hägglund. Paper Trade Jl., vol. 81, no. 2, July 9, 1925, pp. 45-47, 1 fig. Comparative investigations on yield and properties of pulps prepared by sulphite process from moist and air-dried woods from different parts of three trunk. Translated from Papierfabrikant, vol. 23, no. 17.

PAPER MILLS

Newsprint-Mill Wastes. The Waste Problem at Newsprint Mills, V. P. Edwarde. Paper Trade Jl., vol. 80, no. 24, June 11, 1925, pp. 58-60. Deals with economical disposal of waste sulphite liquor and proper handling of paper machine waters. Paper read before Am. Pulp & Paper Mill Supts.' Assn.

Power Problems. Power Problems for the Plant Engineer, R. W. Leeper and H. S. Taylor. Paper Trade Jl., vol. 80, no. 24, June 11, 1925, pp. 55-57. Factors entering into economical generation, distribution and utilization of energy. Paper read before Am. Pulp & Paper Mill Supts.' Assn.

PATTERNS

Joints for. Patterns Gain Strength When Proper Joints Are Used, W. G. Ewalt. Foundry, vol. 53, no. 13, July 1, 1925, pp. 536-540, 13 figs. Points out necessity for good joints; considerable warping, shrinking and swelling must be taken into consideration, as well as action of joints made of hard and soft woods; patterns should be made as light as possible consistant with strength.

Plates. Pattern Plates, B. Shaw and Jas. Edgar. Mech. World, vol. 77, nos. 1998, 2000, 2003 and 2007. Apr. 17, May 1, May 22 and June 19, 1925, pp. 247-248, 278-279, 330-331 and 390-391, 37 figs. Shows how pattern plates are prepared, and how they are used to produce best results when machines are not available.

Parting. When Should Foundry Patterns Be Parted? Mech. World, vol. 77, no. 2005, June 5, 1925, pp. 362-364, 19 figs. Reasons for parting; cylindrical shapes; top lifts; distortion of divided patterns; making mold joint; alternatives in parting; where parting is necessary.

Storage and Handling. Making Patterns a Business Asset, E. H. Trick. Foundry, vol. 53, no. 13, July 1, 1925, pp. 509-511, 2 figs. Methods employed by Alamo Iron Works, San Antonio, Tex., for storage and handling of patterns; new pattern storage building consisting of 5 stories and basement was erected; patterns are arranged by floors and by racks.

PEAT

Composition. Composition of Peat and the Lignin Theory (Torfzusammensetzung und Lignin-theorie), J. Marcusson. Zeit. für angewandte Chemie, vol. 38, no. 16, Apr. 16, 1925, pp. 339-341. Shows that it is unnecessary to assume that lignin is essential for formation of humic acid from peat, and its formation under natural conditions from carbohydrates is indicated by fact that pure sphagnum peat practically free from lignin yields 41 per cent of humic acid.

PIERS

Sinking Foundation. Well-Drilling Methods Applied to Sinking Foundation Piers. Eng. News-Rec., vol. 95, no. 3, July 16, 1925, p. 106. Large cylinders put down with church drill in soft ground; method tried in Rutherford, N. J.

PILES

Driving. Subaqueous Pile Driving at Portland, Ore. Eng. News-Rec., vol. 95, no. 2, July 9, 1925, pp. 53-54, 1 fig. Compressed air used in operation of 7½-ton hammer 65 ft. below surface; leads hinged and braced to under side of scow.

Marine Borers, Protection from. Summary of Marine Piling Investigation, A. A. Fries. Military Engr., vol. 17, no. 93, May-June 1925, pp. 237-239, 6 figs. Particulars of investigation including toxicity study of relative effectiveness of various poisons against marine borers, and dealing with protection of piling already in place and protection of new structures.

PIPE

Autogenously-Welded. Production of Autogenously Welded Pipe (Die Herstellung autogen gesch-weisster Rohre), K. Krekeler. Maschinenbau, vol. 4, no. 11, June 4, 1925, pp. 539-542, 7 figs. Discusses processes in production of pipe; describes pipe welding machine; cost data for comparison with seamless drawn pipe.

PIPE, CAST-IRON

Centrifugally-Cast. New Method of Producing Cast Iron Pipe (Un nouveau procédé de fabrication des tuyaux de fonte), P. Doat. Revue Universelle des Mines, vol. 6, no. 6, June 15, 1925, pp. 306-312, 5 figs. Describes De Lavaud machine for centrifugal casting; structure and mechanical tests of pipe, their advantages.

PIPE, WROUGHT-IRON

Bends, Manufacture of. New Pipe Bending Process. Welding Engr., vol. 10, no. 5, May 1925, pp. 21-22, 4 figs. Describes method of producing wrought iron pipe bends for welded connections, which has been in operation on a commercial basis in Germany for about four years.

POWER

Developments. A Review of the Development of the Electric Light and Power Industry 1920-1930, D. Cowan. Elec. World, vol. 85, no. 26, June 27, 1925, pp. 1391-1400, 3 figs. Review and forecast of industry; lower power costs; growth of superpower; utilization of central-station energy; administration and financial development; financial requirements; public relations and national problems arising from electric light and power development in past 10 years.

PRESSES

Hydraulic. Hydraulic Presses and Their Application in the Industries (Les presses hydrauliques, Leur emploi dans les industries mécaniques), A. Lambrette. Technique Moderne, vol. 17, no. 5, Mar. 1, 1925, pp. 141-148, 20 figs. Design and operation of various types of presses used in production of railway wheels, for adding and removing tires, etc.

Power. Power Presses—Their Use in Industry, E. V. Crane. Forging—Stamping—Heat Treating, vol. 11, no. 6, June 1925, pp. 213-217, 3 figs. For duplicate production of metal parts in large quantities, it is claimed there are few if any general types of tools which compare favorably with power presses.

POWER FACTOR

Improvement. How Power Factor Was Improved by Using Rotary Converter as Synchronous Condenser, R. W. Drake. Indus. Engr., vol. 83, no. 6, June 1925, pp. 262-264 and 305, 4 figs. Tells now a lightly-loaded rotary may be made to furnish considerable leading current and gives graphs showing amount of corrective current that may be obtained in either case.

Phase Compensation, T. Ellis. Electrician, vol. 94, no. 2453, May 22, 1925, pp. 590-592 and 601, 9 figs. Use of induction motors and a.c. exciters in relation to power factor improvement; description of methods by which they can be applied.

PROJECTILES

Drift of, Theory of. The Theory of the Drift of Projectiles, E. T. Hanson. Lond., Edinburgh & Dublin Phil. Mag. & Jl. Sci., vol. 49, no. 293, May 1925, pp. 786-793. An extension of Particular Integral of approximate equations of motion is discussed. Shell is considered to be a rigid spinning body acted upon by three forces at right angles to one another passing through center of gravity, and by three couples about axes at right angles to one another which intersect at center of gravity.

PULVERIZED COAL

Boiler Firing. Pulverized Coal Firing at the Labuissiere Central Station (Le chauffage au charbon pulvérisé à la centrale électrique de Labuissière des Mines de Bruary, Pas-de-Calais), A. Martin. Génie Civil, vol. 86, no. 23, June 6, 1925, pp. 555-558, 3 figs. Describes plant of two sets of 16 boilers of 194 sq. m. surface each; pulverizing and coal-handling plant; comparative data of firing one set with ordinary coal and other with pulverized coal.

Systems Installation, Regulations for. Pulverized Fuel Regulations. Combustion, vol. 12, no. 6, June 1925, pp. 430-431. A digest of regulations of Nat. Board of Fire Underwriters regarding installation of pulverized-fuel systems, recently, issued in pamphlet form.

PUMPS, CENTRIFUGAL

Combined Electric Motor and. Combined Electric Motor and Pump. Engineer, vol. 139, no. 3624, June 12, 1925. p. 662, 3 figs. Simple pumping set, called Mopump, comprising electric motor with centrifugal pump secured directly to body.

PUMPS

Dredge, Maintenance of. Dredge Pump Maintenance, J. H. Polhemus. Eng. & Contracting (Gen. Contracting), vol. 63, no. 6, June 17, 1925, pp. 1327-1330, 2 figs. Comparison of wear of lined and unlined pumps. Report of Commission of Post of Portland, Ore.

PYROMETERS

Potentiometer. The Leeds and Northrup Potentiometer Pyrometer. Gas Jl., vol. 170, no. 3241, June 24, 1925, p. 1023, 2 figs. Brief description of apparatus and its application to gas industry.

R

RADIO COMMUNICATION

Mines. Wireless Communication in Mines E. E. Bramall. Instn. Min. Engrs.—Trans., vol. 69, part 2, May 1925, pp. 179-184, 3 figs. Results of investigation of transmission and reception of wireless messages in coal mines.

RAILS

Breaking of. Reports Nos. 2, 3 and 4, on the Question of Breaking of Rails, and Rail Joints. Int. Ry. Congress Assn.—Bul., vol. 7, no. 5, May 1925. Initial causes of breaking of rails and means employed to reduce number of these breakages, as much from point of view of method of use as from that of specification of material employed; most economical and efficient arrangement of rail joints. Report by C. J. Brown on conditions in Great Britain, pp. 1163-1287, 28 figs.; Report by Merklen and Cambournac on conditions in France, pp. 1289-1401, 95 figs.; Report by J. Willem, on conditions in all other countries except America, pp. 1403-1463, 48 figs.

Expansion. Take Proper Account of Rail Expansion, Chas. W. Baldridge. Ry. Eng. & Maintenance, vol. 21, no. 7, July 1925, pp. 271-272. Points out that tight rail causes sun kinks; how to calculate sizes of shims required; there is no advantage in laying rail tight.

Joints, Welding of. Seam Welded Rail Joints, R. B. Fehr. Iowa Eng. Soc.—Proc., 1924, pp. 72-82. Advantages of carbon arc process; causes of stresses in seam welded joints; improvements in joint structure; improvements in welding process; decreased localized stresses; development of method of testing joints; repeated impact tests.

RAILWAY REPAIR SHOPS

Cars. Report on the Design of Shops and Engine Terminals. Ry. Age, vol. 78, no. 29, June 20. 1925, pp. 1548-1549 and (discussion) 1549-1550. Suggestions as to layout of facilities in modern car-repair shops. Report before Am. Ry. Assn.

Street-Railway. Keeping Montreal's Tramway System Efficient, A. Murphy. Can. Machy., vol. 33, no. 27, July 2, 1925, pp. 13-17, 10 figs. Describes operations at Youville shops of Montreal Tramways Co.; equipped for all types of repairs in connection with rolling stock of a street railway; unusual facilities for impregnating, dipping and baking.

RAILWAY SIGNALLING

Development. Signalling. Ry. Gaz., Special No. June 22, 1925, pp. 97-101. Describes development of railway signalling. (In English and French).

RAILWAY TIES

Uniform Grading. Promoting Uniform Grading of Ties. Ry. Eng. & Maintenance, vol. 21, no. 7, July 1925, pp. 269-271, 5 figs. Technical re-grading of sample lots secures good results on Reading & Central of New Jersey.

RAILWAYS

Origin and Development. The Origin and Development of the Railway. Ry. Gaz., Special No. June 22, 1925, pp. 7-10. Discusses origin and development of railway, showing origin of all principal companies. (In English and French).

REFRACTORIES

Boiler Furnaces. *See Boiler Furnaces.*

Combustion Products, Effect of. Attack on Refractory Materials of Combustion Products (Aantasting van vuurvaste materialen door verbrandings-producten), D. J. Van Wijk, Jr. Chemisch Weekblad., vol. 22, no. 2, Jan. 10, 1925. Resistance of fireclay depends on absence of shrinking, low porosity after firing, and high alumina content; content of other oxides must be as low as possible.

RESISTANCE TO TEMPERATURE CHANGES. Present State of Knowledge of the Resistance of Smelting Industry Refractories toward Changes of Temperature, W. Steger. Ceramist, vol. 6, nos. 1 and 2, Apr. and May, 1925, pp. 374-383 and 452-469, 9 figs. Method of measuring resistance of ceramic products to changes of temperature—rapid methods and mathematical methods; results obtained by methods described with firebrick, silica brick and magnesite brick. Construction and manipulation of apparatus for measuring coefficient of expansion; measurements on firebrick. Translated from German.

STANDARD SPECIFICATIONS. Refractories. Am. Soc. Testing Matls.—Preprint no. 31, for mtg. June 23-25, 1925, 7 pp., 2 figs. Report of Committee C-8. Report on industrial survey of malleable iron industry and by-product coke ovens.

REFRIGERATION

DOMESTIC, ELECTRIC. Electric Domestic Refrigeration, B. J. George. Nat. Elec. Light Assn. Bul., vol. 12, no. 6, June 1925, pp. 363-366, 1 fig. Its economic aspects and its effect upon light bill of residence consumer, gross revenue of power company, and retail sales of ice manufacturer.

REFUSE DISPOSAL

PITTSBURGH, PA. Refuse Collection and Disposal in Pittsburgh, M. Knowles. Eng. News-Rec., vol. 94, no. 26, June 25, 1925, p. 1054. Engineers find record per capita collection under contract and advise continuation of plan with minor changes. (Abstract.) Report made to City of Pittsburgh.

RESERVOIRS

CONCRETE-LINED, CARE OF. The Proper Care of Concrete Lined Reservoirs, R. E. McDonnell. Fire & Water Eng., vol. 77, no. 24, June 17, 1925, pp. 1249 and 1280-1281, 2 figs. Suggestions as to methods of construction and maintenance. How to avoid leakage; methods of waterproofing.

RIVETING

THEORIES. The Two Theories for Calculation of Riveting (Le due teorie per il calcolo delle chiodature), V. Piatti. Rivista Marittima, vol. 58, no. 5, May 1925, pp. 301-316, 15 figs. Discusses riveting lap and but joints; theories of Schwedler, Castigliano and Bach; fundamental formulas used in England, Germany and France.

ROADS, ASPHALT

PAVING MIXTURES. A Practical Method for Determining the Relative Stability of Fine-Aggregate Asphalt Paving Mixtures, P. Hubbard and F. C. Field. Am. Soc. Testing Matls. — Preprint, no. 51, for mtg. June 23-26, 1925, 11 pp., 4 figs. Laboratory test for determining stability, or resistance to displacement, of asphalt paving mixtures, primarily of sheet-asphalt type; it is being used to study and improve existing paving mixtures and specifications for such mixtures.

ROADS, BITUMINOUS

PAVING MIXTURES. A Stability Test for Bituminous Paving Mixtures, W. J. Emmons and B. A. Anderton. Am. Soc. Testing Matls.—Preprint, no. 53, for mtg. June 23-26, 1925, 10 pp., 8 figs. Outlines investigations of stability of bituminous paving mixtures which have been in progress at Bureau of Public Roads for past 3 years, and describes test developed to correlate service behavior with laboratory determinations; series of curves are given which indicate that test is sensitive to variations in composition of bituminous mixtures and is adapted to investigation of both fine and coarse-graded types.

ROADS, CONCRETE

CEMENT-CONCRETE. Cement Concrete Pavements, L. Belknap. Concrete, vol. 26, no. 6, June 1925, pp. 209-212. Modern developments in methods of constructing and maintaining. Paper read at 11th Annual Conference on Highway Eng. at Univ. of Mich.

ROADS, EARTH

LIME ON USE OF. Dirt Roads Improved by Lime Mixed with Surface Soil, E. J. McCaustland. Eng. News-Rec., vol. 96, no. 26, June 25, 1925, p. 1055. Test roads in Missouri show less mud and fewer ruts; maintenance made easier; theory of action unexplained. (Abstract.) Paper read before Nat. Lime Assn.

OILED. Quality of Oil for Surface Oiling of Earth-Roads and Streets, F. L. Sperry. Am. Soc. Testing Matls.—Preprint, no. 50, for mtg. June 23-26, 1925, 9 pp., 2 figs. Describes series of service tests for determination of suitability of various types of commercial petroleum road oils for purpose of surface oiling earth roads and streets; outstanding conclusion is that certain types of cracked and paraffin-base oils that have been traditionally considered as unsuited or inferior for road-oiling purposes are well suited for use on earth roads and streets.

ROADS, GRAVEL

MAINTENANCE. Maintenance of Gravel Roads, J. T. Donaghey. Eng. & Contracting (Roads & Streets), vol. 64, no. 1, July 1, 1925, pp. 11-18. Describes practice in state of Wisconsin. Paper read at Conference on Highway Engineering at Univ. of Mich.

ROADS

MAINTENANCE. Road Maintenance in Michigan, G. C. Dillman. Eng. & Contracting (Roads & Streets), vol. 64, no. 1, July 1, 1925, pp. 27-32. Discusses present day program on which $15,000,000 is being spent. Paper read at Conference on Highway Engineering at Univ. of Mich.

RELATION OF AUTOMOBILE TIRE WEAR ON. Relation of Road Surface to Automobile Tire Wear, H. V. Carpenter, Eng. & Contracting (Roads & Streets), vol. 64, no. 1, July 1, 1925, pp. 33-39, 4 figs. Results of tests to determine relation of tire wear and gasoline consumption to different types of roads and different speed of travel. From Bul. of State College of Wash.

ROLLING MILLS

BLOOMING MILLS. Designing and Operating Blooming Mills, W. H. Bailey. Iron Trade Rev., vol. 76, nos. 22 and 23, May 28 and June 4, 1925, pp. 1390-1391 and 1454-1455, 5 figs. Of three types of blooming mills used in United States to reduce ingots to semi-finished commodities, two-high reversing bloomer leads in number of installations; advantages and disadvantages of three types, namely, two-high reversing, three-high non-reversing or multiple-stand tandem type are discussed. Paper read before Am. Iron & Steel Inst.

ROLLS

HARD CHILLED. Why Hard Chilled Rolls Become Rough, H. Harris. Blast Furnace & Steel Plant, vol. 13, no. 7, July 1925, pp. 287-288. Experienced sheet and tin roller explains his 30 years of observation.

RUBBER

HOSE AND BELT DUCKS. The Effects of Stresses on Hose and Belt Ducks. H. P. Gurney. India-Rubber Jl., vol. 69, no. 24, June 13, 1925, pp. 11-18, 2 figs. Describes effects of various types of stresses on distortion of hose and belt ducks, both before and after fabrication into hose and rubber belting; and upon basis of observed characteristics, to suggest possible directions in which it would appear, theoretically at least, improvements in mechanical fabrics might be made.

S

SAND, MOLDING

CONTROL OF. Proper Sand Control Reduces Loss, A. A. Grubbs. Iron Age, vol. 115, no. 26, June 25. 1925, pp. 1841 and 1881-1882. Decrease in molding-sane cost less important than gain in production of good castings; periodic tests essential. Paper read before Pittsburgh Foundrymen's Assn.

SAWS

TIE-SCORING. Accurate Adzing of Ties Secured By New Scoring Machiue. Ry. Eng. & Maintenance, vol. 21, no. 7, July 1925, pp. 273-274, 4 figs. Power-drived saw unit developed on Delaware, Lackawanna & Western facilitates track work.

SCREWS

STANDARDS. Report of Austrian Industrial Standards Committee (Oesterr. Normenausschuss für Industrie und Gewerbe). Sparwirtschaft, no. 4, Apr. 1925, pp. 33-38 (O. N. I. G.), 8 figs. Proposed standards for countersunk screws, round-head screws, oval-head screws, and cylindrical screws.

SEWAGE DISPOSAL

IMHOFF TANKS. Accident to Imhoff Tank Unit at Fort Worth, Texas, J. B. Hawley. Eng. News-Rec., vol. 95, no. 2, July 9, 1925, pp. 54-55, 3 figs. Breaks in sloping bottoms of settling compartment attributed to gas pressure in vents, with possible water hammer.

SLUDGE DIGESTION. Purification of Sewage-Sludge Digestion, W. Gore and G. G. Nasmith. Can. Engr., vol. 48, no. 24, June 16, 1925, pp. 579-581, 3 figs. Results of experiments of sewage purification by modified activated sludge process; high purification secured and new sludge produced which has essential properties of both activated and Imhoff sludge; application of process to existing plants.

TREATMENT, LIME IN. Lime in Sewage Treatment, T. C. Schaetzle. Pub. Wks., vol. 56, nos. 5 and 6, May and June 1925, pp. 171-172 and 201-203, 2 figs. Result of investigations by Maryland Bur. Sanitary Eng. to determine effect of lime treatment on odors from sludge and its drying qualities.

SEWERS

PIPE, DESIGN OF. Points in the Design and Construction of Pipe Sewers, A. G. Dalzell. Eng. News-Rec., vol. 95, no. 1, July 2, 1925, pp. 20-21, 3 figs. Improved methods urged to meet changing conditions; examples of Canadian and Washington practice and suggested modifications.

SHAFTS

END-SQUARING MACHINE. Butler Shaft-end Squaring Machine. Brit. Machine Tool Eng., vol. 3, no. 33, May-June 1925, pp. 258-259, 2 figs. Special machine for shaft-end squaring, designed for forming, by straddle milling, squares or hexagons on ends of shafts or screws.

SHOVELS

ELECTRIC. Claims Made for Superiority of Electric Shovel, D. J. Shelton and D. Stoetzel. Eng. Wld., vol. 26, no. 6, June 1925, pp. 377-379. Operating costs; working time; types of electric equipment used; shovel auxiliaries; advantages of direct current; advantages of alternating current.

SMOKE

ABATEMENT. The Smoke Nuisance in Towns and Its Abatement, J. G. Elsworthy. Surveyors' Instn.— Jl., vol. 4, Pt. 10, Apr. 1925, pp. 195-225 (Trans. Sec.). Discussion.

SPECIFICATIONS

MATERIALS. *See Materials. Purchase Ry Specification.*

STANDARDIZATION

INDUSTRIAL BENEFITS. The Benefits to Industry Resulting from Standardized Practice, F. J. Schlink. Mech. Eng., vol. 47, no. 7, July 1925, pp. 592-593. Gains due to standardization are systematizing of business, enlargement of markets, better service to consumer, and reduction of direct and indirect expense.

MACHINE-SHOP PRACTICE. Engineering Standards, E. Buckingham. Mech. Eng., vol. 47, no. 7, July 1925, pp. 555-556 and 556-559. Evolution in machine-shop practice; standardization of fits and tolerances and of screw threads.

STAYBOLTS

SCREW TAPS, EXPERIENCE WITH. Recent Experiences with Staybolt Screw Taps and Their Effects on Different Staybolt Systems (Neue Erfahrungen mit Stehbolzengewindebohrern und ihre Einflüsse auf die verschiedenen Stehbolzen-Systeme), A. Tross Hanomag-Nachrichten, vol. 12, no. 140, June 1925, pp. 105-107, 2 figs. Results of experiences and tests made by Hanover Machine Construction Co. (Hanomag) show that staybolt problem can only be solved by increasing size of diameter tolerances and by drifting to compensate.

STEAM

MERCURY VAPOR-STEAM CYCLE. The Mercury Vapor-Steam Cycle, J. Balsbaugh. Tech. Eng. News, vol. 6, no. 2, May 1925, pp. 50-51, 68, 70 and 72, 7 figs. Discussion of economic limitations of steam and economic possibilities of mercury vapor-steam cycle.

STEAM ACCUMULATORS

POSSIBILITIES IN LARGE PLANT. The Possibilities of Accumulators in a Large Modern Steam Plant, F. C. Evans. Combustion, vol. 12, no. 6, June 1925, pp. 416-422, 10 figs. A study of advantages and disadvantages of substitution of steam accumulators for a part of boiler-room equipment in order to allow boilers to operate at a nearly constant rate of driving.

STEAM ENGINES

HIGH-PRESSURE. High Pressures in Steam Engines (Les hautes pressions en machines à vapeur), Alb. Schlag. Revue Universelle des Mines, vol. 6, no. 4, May 15, 1925, pp. 212-225, 11 figs. Discusses advantages resulting from going beyond present 25-30 atmos; discussion of whether higher cost of new plants would be justified by resulting economies; production of high-pressure steam.

STEAM-CONSUMPTION CHART. Steam Consumption of Perfect Engine. Power, vol. 61, no. 26, June 30, 1925, pp. 1018-1019, 1 fig. Presents chart which permits rapid comparison of engine performance with standard.

STEAM POWER PLANTS

HEAT BALANCE. Methods of Obtaining a Heat Balance. Power Plant Eng., vol. 29, nos. 13 and 14, July 1 and 15, 1925, pp. 694-695, 7 figs. and 737-739, 11 figs. July 1: Reliability, economy and simplicity are factors to be considered. July 15: States that if two turbines bleed to one heater result may be that one turbine will furnish all the steam.

HIGH-PRESSURE. High-Pressure Steam Plant. Times Trade & Eng. Supp., vol. 16, no. 362, June 13, 1925, p. 321. Particulars of large steam-engine plant working at pressure of 60 atmos. (about 880 lb. per sq. in.) which has been in operation for some months at Tegel works of A. Borsig, near Berlin, Germany; consists of a 800-hp. horizontal tandem compound engine driving by means of a second crank a standard compound compressor.

WOOD-REFUSE-BURNING. Lumber Company Plant Burns Refuse with Coal. Power Plant Eng., vol. 29, no. 6, Mar. 15, 1925, pp. 318-322, 10 figs. World's largest sawmill, cutting mahogany veneers, has power plant consisting of turbine room, boiler room pump room and water-treating room; boilers are fitted with Dutch-oven type of furnaces to facilitate burning of wood refuse.

STEAM TURBINES

COMPOUND. Compound Turbines with Compressed Air (Turbines Compound à air comprimé), E. Leroux. Revue de l'Industrie Minérale, no. 103, Apr. 1, 1925, pp. 143-152, 19 figs. Characteristics and performance of compound turbine; description of 8/12-hp. turbine of 800 to 1000 r.p.m.; calculations.
MARINE. *See Marine Steam Turbines.*
TESTING. Practical Points in Testing Steam Turbines, A. A. Brooks. Power, vol. 61, no. 25, June 23, 1925, pp. 984-986, 3 figs. Discusses most satisfactory testing methods and devices.
RESUPERHEATING STEAM. Thermal Gain Results from Resuperheating, W. E. Blowney and G. B. Warren. Power Plant Eng., vol. 29, no. 13, July 1, 1925, pp. 704-706, 6 figs. Heat consumption of steam turbine may be decreased 6 to 7 per cent as result of resuperheating steam.

STEEL

FAILURES. Failures in Steel Components, E. A. Wraight. Min. Jl., vol. 149, nos. 4682 and 4683, May 16 and 23, 1925, pp. 397 and 420-421, 5 figs. Points out that majority of failures, apart from weakness of design, may be traced to faulty heat treatment.
GHOST LINES. Ghost Lines in Steel. Mech. World, vol. 77, no. 2004, May 29, 1925, pp. 340-341. Discusses nature and effect of appearance of streaks on machined steel surfaces.
METALLURGY. *See Metallurgy.*
MILL INSPECTION. The Mill Inspection of Steel, Chas. McKnight, Jr. Army Ordnance, vol. 5, no. 30, May-June 1925, pp. 775-782 8 figs. Methods of inspection and function of inspector; specifications and tests.
SPECIAL, TESTING OF. Determining Quality of Special Steels by Means of Torsional Oscillating Machine (Gütebestimmung von Baustählen für Sonderzwecke mit Hilfe der Drehschwingungsmaschine) O. Föppl. Maschinenbau, vol. 4, no. 11, June 4, 1925, pp. 515-521, 7 figs. Discusses damping capacity, its determination as a function of tension; application of torsional tests in acceptance tests, their superiority to fracture or elongation tests.
SURFACE CRACKS IN INGOTS. Surface Cracks in Rolling Steel, H. D. Hibbard. Iron Age, vol. 115, no. 26, June 25, 1925, 1837 and 1879-1880, and vol. 116, no. 2 July 9, 1925, pp. 77 and 124-125. Article is outcome of study of cracks, familiary described as "snakes," sometimes met with in rolling steel ingots; causes of snakes and how to combat them; effect of quality of steel.

STEEL, HEAT TREATMENT OF

FUELS AND FURNACES FOR. Fuels and Furnaces for Heat Treating, W. Trinks. Am. Soc. Steel Treating—Trans., vol. 8, no. 1, July 1925, pp. 58-83. Discusses gaseous, liquid and solid fuels, in addition to electrical energy; advantages and disadvantages of each fuel used for heat treating; proper selection of fuel depends not only upon B.t.u. content, but to greater extent upon form value of fuel and quality of heated product; describes methods of recuperation, preheating and compensating or counter-flow principle used for salvaging heat; methods of heat transfer include salt and lead baths, muffle furnaces, and open-chamber furnaces; batch-type and continuous furnaces.
METALLOGRAPHY AND. Heat Treatment and Metallography of Steel, H. C. Knerr. Forging—Stamping—Heat Treating, vol. 11, no. 6, June 1925, pp. 194-201, 6 figs. Practical course in the elements of physical metallurgy. Temperature recorders and controllers; calibration; general precautions; thermal analysis.

STEEL MANUFACTURE

IMPROVED QUALITY. Improved Quality Steel Production, E. Gathmann. Army Ordnance, vol. 5, no. 30, May-June 1925, pp. 785-788, 4 figs. Sets forth fundamentals essential to quality steel production and certain improved ingot molds and appliances whereby tonnage production of sound steel has been made possible and practicable.

STREAM POLLUTION

OIL CONTAMINATION. Oil in Navigable Waters. Shipbldg. & Shipg. Rec., vol. 25, no. 26, June 25, 1925, pp. 9-12. Reports as to extent of oil pollution round coasts and reports on oil separators.
Pollution of Waterways: Fight Against Oil Contamination. Oil Eng. & Finance, vol. 6, no. 107, Mar. 1925, pp. 136-140, 2 figs. Preventive measures for oil discharge; discusses oil-separating plants; describes H. & H. oil separator; etc.

STREET RAILWAYS

POTENTIAL DROP IN RAIL RETURN. Potential Conditions in Electric Tram Rails, R. C. Philipp. Elec. Engr., vol. 2, no. 2, May 15, 1925, pp. 55-57, 6 figs. Necessity for keeping leakage of return current of an electric railway system to a minimum requires a careful study of potential conditions in rails. Describes method of calculating potential drop in rail return, and of working out number and spacing of negative feeders necessary to keep leakage within prescribed limits.

STRESSES

SOIL. A Method of Studying Soil Stresses, M. L. Nichols and J. W. Randolph. Agricultural Eng., vol. 6, no. 6, June 1925, pp. 134-135, 3 figs. Describes plaster cast method which has given indication of much value and which seems to offer possibilities of supplying information necessary for design of lug equipment on a sound basis.

STRUCTURAL STEEL

BENDING. Bending Steel Structural Members, C. C. Hermann. Machy. (N. Y.), vol. 31, no. 11, July 1925, pp. 883-885, 7 figs. Describes bending of structural sections, and some special bending work where small number of pieces required does not make it profitable to construct bending dies.

SUPERHEATED STEAM

TOTAL HEAT AT HIGH PRESSURES. The Total Heat of Superheated Steam at High Pressures, H. L. Callendar. World Power, vol. 3, no. 18, June 1925, pp. 302-312, 4 figs. New Method of measurement including latent heat.

SUPERPOWER

GIANT POWER. Further Studies of Giant Power, C. Penrose. Nat. Elec. Light Assn. Bul., vol. 12, no. 6, June 1925, pp. 367-371, 2 figs. Transportation of coal versus transmission of energy; extract from testimony before Legislative hearing at Harrisburgh on Apr. 7, 1925, in opposition to some 19 hills introduced into Pennsylvania Legislature in support of so-called Giant Power Proposals.

T

TANKS

ELEVATED. Elevated Tank Construction, G. T. Horton. Eng. Wld., vol. 26, no. 5, May 1925, pp. 309-313, 11 figs. Describes evolution of elevated steel tank construction during past 30 years.

TAR

OILS, PHENOL EXTRACTION FROM. Improved Methods for Determination of Phenols in Tar Oils, J. J. Morgan and M. H. Meighan. Indus. & Eng. Chem., vol. 17, nos. 6 and 7, June and July 1925, pp. 626-628 and 696-700, 4 figs. June: New sodium method permits accurate estimation of amount of caustic soda required in practice to extract phenols from given tar oil, which has previously been impossible. July: Investigation of sodium-hydroxide extraction method of removing tar acids from tar oils; partial extraction of tar acids from hydrogas oil. Bibliography.

TELEPHONY

ARTIFICIAL AND UNIFORM TRANSMISSION LINES. Some Artificial Lines and Networks Associated with the Uniform Telephone Transmission Line. Instn. Elec. Engrs.—Jl., vol. 63, no. 342, June 1925, pp. 593-596, 16 figs. Shows that problem of constructing network, impedance of which shall be equal to impedance of infinite uniform telephone line, can be solved exactly by use of number of sections of simple artificial lines; shows also that related networks can be obtained such that when placed in series or in parallel with infinite uniform line, impedance of combination is pure resistance.

TEMPERATURE CONTROL

AUTOMATIC, PNEUMATIC SYSTEMS FOR. Care and Operation of Pneumatic Systems of Automatic Temperature Control, P. A. Riccio. Nat. Engr., vol. 29, no. 4, Apr. 1925, pp. 185-187, 5 figs. Method of producing and controlling humidity.

TERMINALS, LOCOMOTIVE

DESIGN. Report on Locomotive Sheds, G. Forte. Int. Ry. Congress Assn.—Bul., vol. 7, no. 5, May 1925, pp. 1561-1617, 18 figs. Practice in all countries, except America and British Empire. Arrangement of locomotive sheds; installations for inspecting engines, washing out boilers and blowing through tubes, lighting up of engines and getting rid of smoke, loading fuel on engines, and disposal of ashes; mixing of fuels.

TEXTILE MACHINERY

COTTON MACHINERY, TECHNOLOGY OF. Technology of Cotton Machinery. Part I—Calculations on Pickers, A. A. Mercier. U. S. Bur. Standards, Technologie Papers, No. 282, Apr. 2, 1925, pp. 183-212, 9 figs. Detailed methods for making calculations generally used in making adjustments on cotton pickers, as well as other more unusual calculations.

TEXTILE MILLS

PUMPING EQUIPMENT. The Pumping Equipment of Textile Mills, C. L. Hubbard. Textile Wld., vol. 68, no. 1, July 4, 1925, pp. 71 and 73, 2 figs. Purposes for which pumps are used; characteristics of different types and points to be considered in their selection; methods of installation for securing best results; care and adjustment; importance of this element in mill equipment is not always appreciated.

TINNING

COMPOUND. A New Tinning Compound. Metal Industry (London.), vol. 26, no. 26, June 26, 1925, pp. 629-630, 5 figs. Detailed particulars of tinning compound described in earlier issue of same journal; examples of high cleansing and interpenetration properties; practical applications, report of National Physical Laboratory.

TIMBER

PRESERVATION. Timber. Am. Soc. Testing Matls.—Preprint, no. 56, for mtg. June 23-26, 1925, 4 pp., 1 fig. Report of sub-committee on timber preservation.

THERMOCOUPLES

SURFACE TEMPERATURES MEASUREMENT, FOR. Design of a Thermocouple for Measuring Surface Temperatures, J. G. King. Jl. Sci, Instruments, vol. 2, no. 8, May 1925, pp. 260-264, 1 fig. Describes instrument intended for use in measuring surface temperatures of plant such as boilers and retort settings. Tests carried out show that errors do not exceed 5 deg. cent. over a range of about 80 deg. to 160 deg. cent.

THERMOMETERS

STANDARD SPECIFICATION. Thermometers. Am. Soc. Testing Matls.—Preprint, no. 60, for mtg. June 23-26, 1925, 4 pp. Report of Committee D-15. Proposed tentative specifications for A. S. T. M. low-cloud and pour-test thermometers.

THEATERS

VENTILATION AND COOLING. Ventilating and Cooling of Motion Picture Theaters, D. D. Kimball. Architectural Forum, vol. 42, no. 6, June 1925, pp. 393-398, 5 figs. Discusses heating, ventilating and cooling of theaters, making suggestions.

TOOLS

BENDING. A Multiple Bending Tool, W. Richards. Mech. World, vol. 77, no. 2005, June 5, 1925, pp. 355-356, 3 figs. Tool is equipped with eight interchangeable punches which are inserted as required in upper member of tool, while die is made adjustable for various angles.

TRANSFORMERS

CORE TYPE. The Technical and Commercial Aspects of the Distribution of Losses in Core Type Power Transformers, S. A. Stigant and W. B. Garrett Elec. Times, vol. 67, no. 1757, June 18, 1925, pp. 753-757, 9 figs.
INERTAIRE. The Inertaire Transformer, L. H. Hill. Elec. Light & Power, vol. 3, no. 6, June 1925, pp. 114-119, 19 figs. With Inertaire transformer a cushion of inert gas instead of air is maintained above oil; operation of equipment; breathing regulator; initial deoxygenating fittings; blowing out with nitrogen; installation of equipment and maintenance.
LARGE-CAPACITY. Transformers. World Power, vol. 3, no. 19, June 1925, pp. 349-352, 4 figs. Short-circuit tests on 1200-kva. Ferranti transformer; giant transformers.
LEAKAGE REACTANCES OF WINDINGS. Separate Leakage Reactance of Transformer Windings, O. G. C. Dahl. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 7, July 1925, pp. 735-741, 13 figs. Discusses method for determining separate leakage reactances of transformer windings, originally suggested in 1921 by W. V. Lyon; method is applicable only to 3-phase banks of three identical transformers, and makes use of third harmonic electromotive force and current which are introduced into windings by inherent magnetizing characteristics of iron; method may be used both with two-winding and multi-winding transformers; laboratory tests warrant conclusion that separate leakage reactances may be obtained with sufficient accuracy for engineering purposes.
RATIO CONTROL. Voltage Control Obtained by Varying Transformer Ratio, L. F. Blume. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 7, July 1925, pp. 752-755, 5 figs. Describes general principle of changing ratio of power transformers without interrupting load, by means of transformer taps and multiple circuit.

TUBES

CUTTING-OFF MACHINE FOR. Automatic Cutting-off Machine for Tubing. Machy. (Lond.), vol. 26, no. 662, June 4, 1925, pp. 305-06, 4 figs. Small self-contained bench machine for automatically cutting off brass, ebonite, or other forms of light tubing up to 5 in. in length and 1/4-in. outside diam.

Soft-Metal Collapsible. How Collapsible Tubes Are Made from Soft Metal, E. Sheldon. Am. Mach., vol. 62, no. 26, June 25, 1925, pp. 983-987, 9 figs. Tubes are made by extrusion process; tools needed are few and simple; tubes trimmed to length and threaded in later operation.

TURBINES

High-Pressure. Rotary Machinery Capable of Running at Very Great Speeds (La réalisation de très grandes vitesses de rotation), E. Henriot and E. Huguenard. Génie Civil, vol. 86, no. 22, May 30, 1925, pp. 538-539, 2 figs. Description of new type of small turbine capable of running at very great rates of speed, so arranged as to be free of all contact, solid or liquid, with stator, and capable of selecting its own axis of rotation. Paper read before Académie des Sciences, Apr. 6, 1925.

V

VACUUM TUBES

Thermionic Valves. The Development of Valves for Wireless, B. S. Gossling and M. Thompson. World Power, vol. 3, nos. 16 and 18, Apr. and June, 1925, pp. 195-203 and 333-339, 11 figs. Apr.: Distinguishing features; current control; historical review—Edison effect; static characteristics and operating circuits. June: Wartime and recent developments. Bibliography.

VALVES

Steam. Steam Pressure Reducing, Transfer and Limiting Valves. Eng. & Boiler House Rev., vol. 38, nos. 11 and 12, May and June, 1925, pp. 497-498, and 547-548 and 550, 4 figs. May: Describes a single-beat balanced reducing valve, as designed by Steam Fitting Co., Ltd., June: Details of pressure regulating valves designed by Steam Fitting Co., Ltd.

W

WASTE ELIMINATION

Factories. Waste Elimination, H. S. Firestone. Factory, vol. 35, no. 1, July 1925, pp. 35-38, 8 figs. Describes plant program worked out by Firestone Tire & Rubber Co.

WATER

Drinking, Standards for. Drinking Water Standards for U. S. Public Health Service. Eng. & Contracting (Water Wks.), vol. 64, no. 1, July 8, 1925, pp. 73-80. Excepts from report of Advisory Committee on Standards for drinking water supplied to public by common carriers in interstate commerce.

Viscosity. The Coefficient of Viscosity of Water in Absolute Units (Détermination du coefficient de viscosité de l'eau en valeur absolue), Le Roux. Académie des Sciences—Comptes Rendus, vol. 180, no. 12, Mar. 23, 1925, pp. 914-916. By method of rotating cylinder and with utmost precautions series of determinations of coefficient of viscosity was made from 0 to 50 deg. cent.; for this range value drops from 0.0178 to about one-third as much, 0.0057; there is no trace of anomaly near temperature of maximum density; furthermore no effect of velocity upon viscosity amounting to as much as ½ per cent was detected.

WATER GAS

Bituminous Coal as Generator Fuel. Bituminous Coal as Generator Fuel for Large Water-Gas Sets With Waste-Heat Boilers, Wm. A. Dunkley. U. S. Bur. Mines, Tech. Paper 335, 1925, 43 pp., 16 figs. partly on supp plates. Results of previous studies of bituminous generator fuel; particulars of water-gas plant of Coal Products Mfg. Co. at Joliet, Ill., including operation, and results of study of use of bituminous coal in this plant.

WATER MAINS

Laying, Statistics. Water Mains Laid During 1924. Pub. Wks., vol. 56, no. 6, June 1925, pp. 222-225. Statistics received from water works officials since publication of tables in April issue.

WATER SUPPLY

Memphis, Tenn. The New Underground Water Supply of Mempbis, W. Donaldson. Fire & Water Eng., vol. 77, no. 2, June 10, 1925, pp. 1195-1196 and 1222-1223, 3 figs. Air lift system of deep well pumping adopted; largest groundwater supply in country; central power plant and pumping station. Excerpts from paper read before Southeastern Water & Light Assn.

WATER TREATMENT

Methods. Water Treatment in Relation to Heating and Domestic Hot Water Supplies, W. B. Lewis. Domestic Eng. Heat. & Vent., vol. 45, no. 5, May 1925, pp. 79-83, 2 figs. Deals with hardness of water colloidal treatment, hydrological chemistry in general, etc.

WELDING

Fusion. Fusion Welding and Cutting as Practised on the Atchison, Topeka & Santa Fe Railway, E. E. Chapman and H. H. Service. Am. Welding Soc.—Jl., vol. 4, no. 6, June 1925, pp. 25-40. Discusses boiler welding, autogenous welding don'ts, accident prevention in electric and oxy-acetylene welding, oxygen regulators, welding efficiency, tests, tire welding and cutting, equipment, locomotive frame welding, welding crossings rails, welding side frames and couplers.

WELDS

Pressure-Vessel, Inspection of. The Inspection of Welds in Pressure Vessels, S. W. Miller. Am. Welding Soc.—Jl., vol. 4, no. 6, June 1925, pp. 41-45, 5 figs. Discusses inspection of design, material and workmanship.

WINDING ENGINES

Cable Control. Regulating Cables in Winding Engines With Conic Drums (Méthodes générales pour le réglage des câbles dans les machines d'extraction à tambours cylindro-coniques), M. M. Berthoud. Revue de l'Industrie Minérale, no. 107, June 1, 1925, pp. 221-244, 13 figs. Discusses generalization of formulas previously developed for bi-cylindric conic drums so as to apply to any machine with conic drums; gives numerical examples of calculation.

Calculation. Extraction Characteristics at Constant Power (Caractéristiques d'extraction à puissance constante), T. Delsemme. Association des Ingénieurs-Electriciens sortis de l'Institut Electrotechnique Montefiore—Bul., vol. 2, no. 3, Mar. 1925, pp. 111-121, 3 figs. Determination of characteristic curves for a winding engine, assuming constant power on shaft driven by electric motor. Bibliography.

WIND TUNNELS

High-Velocity. High Velocity Wind Tunnels, E. Huguenard. Nat. Advisory Committee for Aeronautics—Tech. Memorandums, no. 318, June 1925, 29 pp., 22 figs. on supp. plates. Their application to ballistics, aerodynamics, and aeronautics. Translated from Technique Aeronautique, nos. 37-38, Nov. 15 and Dec. 15, 1924.

WIRE

Copper. Copper Wire. Am. Soc. Testing Matls.—Preprint, no. 14, for mtg. June 23-26, 1925, 13 pp., 2 figs. Report of Committee B-1. Revised tentative specifications for round and grooved hard-drawn copper trolley wire; proposed specifications for bronze trolley wire.

WIRE ROPE

Specifications. United States Government Master Specification for Wire Rope. U. S. Bur. Standards, Circular No. 208, 1925, 37 pp., 26 figs. partly on supp. plates. Specification No. 297, officially promulgated by Federal Specifications Board on June 1, 1925, for use of Departments and Independent Establishments of Government in purchase of wire rope.

WOOD PULP

Decay, Control of. Control of Decay in Pulp and Pulp Wood, O. Kress. U. S. Dept. Agriculture, Dept. Bul. No. 1298, Apr. 1925, 80 pp., 87 figs. partly on supp. plates. Importance of decay problem in pulp industry; decay of wood; storage of pulp wood; pulping characteristics of decayed woods; chemical properties of sound and decayed woods and pulp from sound and from decayed spruce; storage of pulp; physical properties of pulp decayed in storage; preservation of pulp by chemical treatment. Bibliography.

WOODWORKING MACHINERY

Rafety Code. Safety Code for Woodworking Plants. U. S. Bur. Labor Statistics, Bul. no. 378, Dec. 1924, 18 pp. Code intended primarily to cover hazards of "point of operation" in woodworking machinery from crude lumber to finished product.

Z

ZINC OXIDE

Reduction by Carbon. Reduction of Zinc Oxide by Carbon, G. A. Zeller and B. M. O'Harra. Univ. of Mo., School of Mines & Metallurgy, Tech. Bul., Nov. 1924, 32 pp., 7 figs. Reviews available information concerning temperature at which reduction becomes sufficiently rapid to be measurable and describes an investigation made during winter of 1923-24 in laboratories of Mississippi Valley Experiment Station of U. S. Bur. Mines, to obtain further information as to temperature above which reduction can take place and as to effect of various factors upon rate of reduction.

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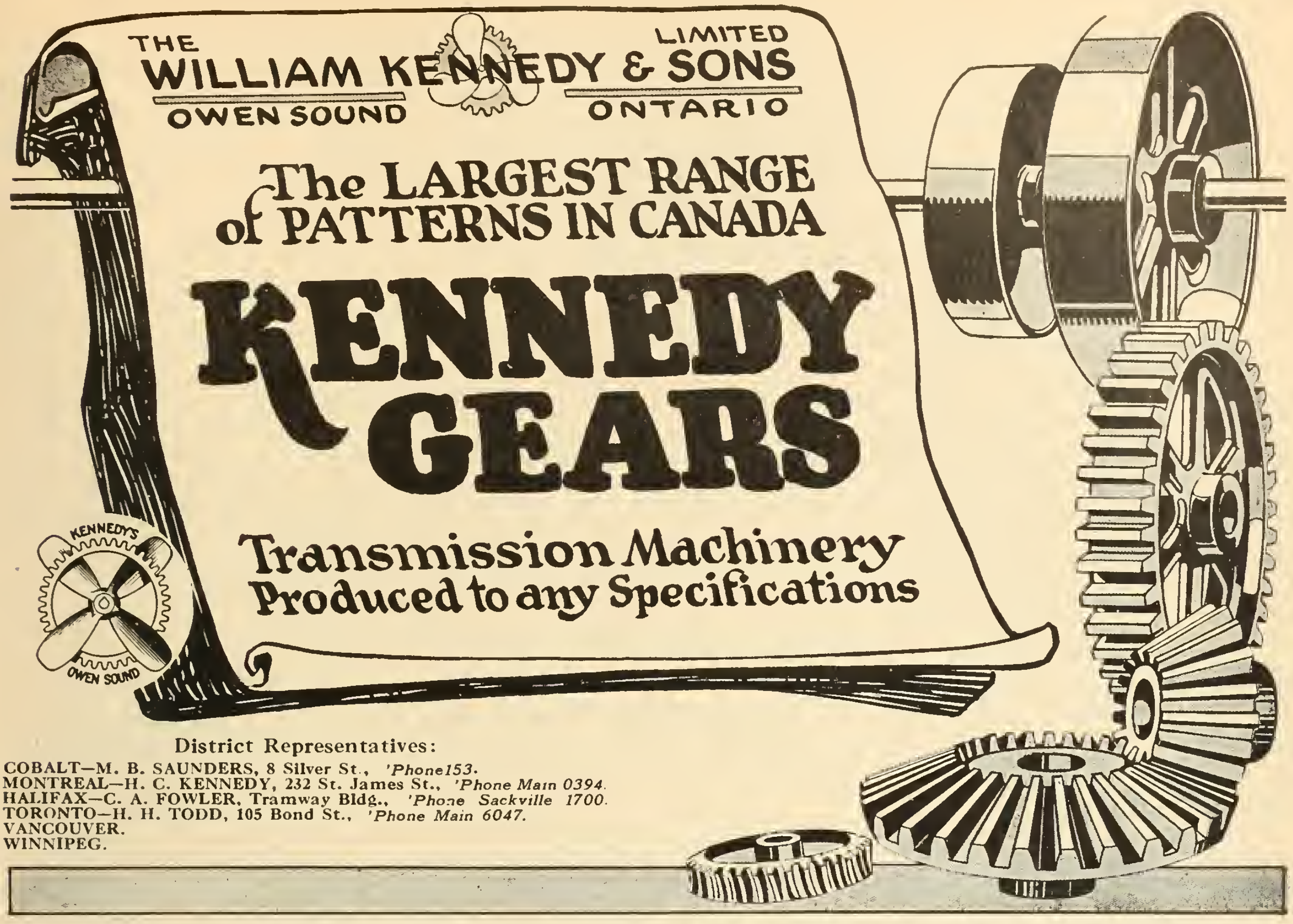
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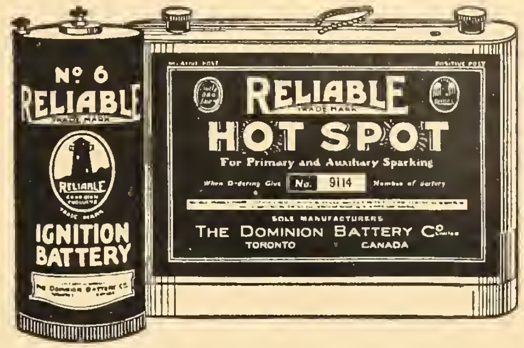

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TORONTO

Purchaser's Classified Directory

A Selected List of Equipment, Apparatus and Supplies

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Lauric and Lamb.
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Knox Mfg. Co.
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Angle Bars:
British Empire Steel Corp., Ltd.
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Riley Engineering and Supply Co., Ltd.
Asbestos Products:
Canadian Johns-Manville Co., Ltd.
Asphalt:
Imperial Oil Ltd.
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Geo. W. Reed & Company
Ash Handling Equipment:
Combustion Engineering Corp., Ltd.
Link-Belt Ltd.
Automatic Air Valves:
Jenkins Bros., Ltd.
Automatic Underfeed Stokers:
Combustion Engineering Corp., Ltd.
Riley Engineering and Supply Co., Ltd.
Taylor Stoker Co., Ltd.

B

Baffle Walls:
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Balls, Steel:
Openshaw & Bennet Ltd.
Barbed Wire:
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Burlington Steel Co., Ltd.
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Bars, Steel & Iron:
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Horton Steel Works Ltd.
Blankets:
Grant-Holden-Graham, Ltd.
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Boilers, Electric:
Dominion Engineering Works, Ltd.
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Combustion Engineering Corp., Ltd.
E. Leonard & Sons, Ltd.
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E. Leonard & Sons, Ltd.
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Babcock-Wilcox & Goldie-McCulloch Ltd.
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Bolts:
British Empire Steel Corp., Ltd.
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Bonds, Rail:
Dominion Insulator & Mfg. Co., Ltd.
Boring and Turning Mills:
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Boxes, Valve:
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Brass, Sheets, Rods, Tubes:
Openshaw & Bennet Ltd.
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Canadian Johns-Manville Co., Ltd.
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Dominion Bridge Co., Ltd.
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F. H. Hopkins & Co., Ltd.
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F. H. Hopkins & Co., Ltd.
Buckets, Orange-peel:
F. H. Hopkins & Co., Ltd.
Bucket Loaders:
Link-Belt Ltd.
Mussens Ltd.
Building Papers:
Barrett Co., Ltd.
Buildings, Steel:
Canadian Bridge Co., Ltd.
Combustion Engineering Corp., Ltd.
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co.,Ltd.
Bus-Supports:
Canadian Line Materials, Ltd.

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Canvas Goods:
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Car Dumpers:
Link-Belt Ltd.
Car Equipment Specialties:
Dominion Insulator & Mfg. Co. Ltd.
Car Pullers:
Link-Belt Ltd.
Car Steps, Safety:
Irving Iron Works Co.
Car Wheels, Chilled Iron:
Canada Iron Foundries, Ltd.
Cars, Dump:
Clare Osborn Ltd.
F. H. Hopkins & Co., Ltd.
Mussens Ltd.
Casements, Steel:
Can. Metal Window & Steel Products, Ltd.
Trussed Concrete Steel Co., of Canada, Ltd.
Castings:
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Superheater Co., Ltd.
Castings, Iron:
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Gartshore-Thomson Pipe and Foundry Co., Ltd.
Wm. Hamilton Co. Ltd.
E. Leonard & Sons, Ltd.
Superheater Co., Ltd.
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N. Slater Co., Ltd.
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Canadian Johns-Manville Co., Ltd.
Cement, Manufacturers:
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Chain Grate Stokers:
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Chains:
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Link-Belt Ltd.
Channels:
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Hamilton Bridge Works Co.,Ltd.
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Horton Steel Works, Ltd.
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Horton Steel Works, Ltd.
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Dominion Engineering Agency, Ltd.
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Knox Mfg. Co.
Clamps, High Pressure Hose:
Knox Mfg. Co.
Clamps, Rock Drill:
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Knox Mfg. Co.
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Dominion Bridge Co. Ltd.
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Griswold & Co., Ltd.
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Pacific Coast Pipe Co. Ltd.
Conduit, Underground Fibre:
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Conduit, Underfloor Duct:
Canadian Johns-Manville Co., Ltd.
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Mussens Limited.
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Couplings, High Pressure Hose:
Knox Mfg. Co.
Couplings, Rock Drill:
Knox Mfg. Co.
Couplings, Steam Hose:
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Couplings, Suction Hose:
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F. H. Hopkins & Co., Ltd.
Link-Belt Ltd.
Cranes, Locomotives:
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Mussens Ltd.
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E

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Enamels, Industrial Lighting:
Dominion Paint Works, Ltd.
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Combustion Engineering Corp., Ltd.
Laurie and Lamb.
E. Leonard & Sons, Ltd.
Riley Engineering and Supply Co., Ltd.
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Mussens Limited.
F. H. Hopkins & Co., Ltd.
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F. H. Hopkins & Co., Ltd.
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Superheater Co., Ltd.

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Fan Engine Regulators:
Riley Engineering & Supply Co. Ltd.
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Superheater Co., Ltd.
Fence Posts, Steel:
Burlington Steel Co., Ltd.
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Flooring, Ventilating:
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G

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H

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I

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J

Joints, Filler Paving:
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K

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L

Ladder Steps, Steel:
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Dominion Engineering Agency, Ltd.
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Mussens Ltd.
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Canadian General Electric Co., Ltd.
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M

Machine Knives:
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N

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Nipples, Pneumatic Hose:
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O

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Oxy-Acetylene Welding & Cutting Apparatus and Supplies:
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Oxygen:
Dominion Oxygen Co., Ltd.

P

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Kennedy & Company, Ltd.
National Iron Corp., Ltd.
Pipe Insulations:
Canadian Johns-Manville Co., Ltd.
Pipe Riveted:
Horton Steel Works, Ltd.
Pipe, Wood Stave:
Pacific Coast Pipe Co., Ltd.
Pipes, Wrought Iron
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Horton Steel Works, Ltd.
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Riley Engineering and Supply Co., Ltd.
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Purchaser's Classified Directory

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William Hamilton Co., Ltd.
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Pulpwood Machinery:
Combustion Engineering Corp., Ltd.
Wm. Hamilton Co. Ltd.
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Riley Engineering & Supply Co Ltd.
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Riley Engineering & Supply Co. Ltd.
Pump Valves:
Jenkins Bros., Ltd.
Pumps:
Canadian Fairbanks-Morse Co., Ltd.
Dominion Engineering Works, Ltd.
General Supply Co., of Canada, Ltd.
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Dominion Engineering Works, Ltd.
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Pumps Oil:
Taylor Stoker Co., Ltd.
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Pratt & Whitney Company of Canada, Ltd.
Punches and Shears:
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R

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British Empire Steel Corp., Ltd.
Burlington Steel Co., Ltd.
F. H. Hopkins & Co., Ltd.
Steel Co. of Canada, Ltd.
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Trussed Concrete Steel Co., of Canada, Ltd.
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Mussens Limited.
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Roofing, Prepared:
Barrett Co., Ltd.
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Barrett Co., Ltd.
Geo. W. Reed & Company.
Roofing, Asbestos and Prepared:
Canadian Johns-Manville Co., Ltd.
Roofs, Asbestos Built up:
Canadian Johns-Manville Co., Ltd.
Roofing, Asbestos Ready-to-lay:
Canadian Johns-Manville Co., Ltd.
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Rope, Wire:
Dominion Wire Rope Co., Ltd.
Mussens Limited.
Rubber Goods, Mechanical:
Jenkins Bros., Ltd.

S

Safes:
Babcock-Wilcox & Goldie-McCulloch Co., Ltd.
Sash, Steel:
Trussed Concrete Steel Co., of Canada, Ltd.
Sawmill Chains:
Link-Belt Ltd.
Sawmill Machinery:
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Saws:
Simonds Canada Saw Co. Ltd.
Scales:
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Screening Equipment:
Combustion Engineering Corp., Ltd.
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Mussens Limited.
Screw Blanks, Lead:
Cumberland Steel Co.
Separators—Steam, etc.:
Riley Engineering and Supply Co., Ltd.
Shaft Couplings, Flexible:
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Sheathing:
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Sheet Metal Work:
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Shingles, Asbestos:
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Shingles, Prepared Asphalt:
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Skip Hoists:
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F. H. Hopkins & Co., Ltd.
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Mussens Limited.
Sleeping Robes:
Grant-Holden-Graham, Ltd.
Smoke Stacks:
Combustion Engineering Corp., Ltd.
Wm. Hamilton Co. Ltd.
Horton Steel Works, Ltd.
Sodas:
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Stokers:
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Stokers, Side-feed:
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Canadian Johns-Manville Co., Ltd.
Switchgears:
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T

Tanks:
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Wm. Hamilton Co. Ltd.
Tanks, Acid:
Horton Steel Works, Ltd.
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Horton Steel Works, Ltd.
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Horton Steel Works, Ltd.
Tanks, Elevated steel:
Horton Steel Works, Ltd.
Tanks, Iron and Steel:
Horton Steel Works, Ltd.
Tanks, Lead Lined:
Horton Steel Works, Ltd.
Tanks, Oil:
Horton Steel Works, Ltd.
Tanks, Steel:
Horton Steel Works, Ltd.
E. Leonard & Sons, Ltd.
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Pacific Coast Pipe Co., Ltd.
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Pratt & Whitney Co., of Canada, Ltd.
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Tie Plates:
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E. Leonard & Sons, Ltd.
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Dominion Engineering Works, Ltd.
Wm. Hamilton Co. Ltd.
Turbines, Steam:
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Turbo Generators:
De Laval Steam Turbine Co.

U

Under-feed Stokers:
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Riley Engineering and Supply Co., Ltd.
Taylor Stoker Co., Ltd.
Union Pipe Couplings:
Dart Union Co., Ltd.

V

Valve Boxes:
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Valve Files:
Jenkins Bros., Ltd.
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Dominion Paint Works, Ltd.
Varnishes, Insulating:
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Valves:
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C. A. Dunham Co., Ltd.
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Valves, Relief:
Riley Engineering & Supply Co., Ltd.
Valves, Rock Drill:
Knox Mfg. Co.
Valves, Steam Throttle:
Knox Mfg. Co.
Valves, Throttle:
Knox Mfg. Co.

W

Washers:
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TENDERS

DEPARTMENT OF RAILWAYS AND CANALS, CANADA

TRENT CANAL

Young's Point Section

Notice to Contractors

SEALED tenders, addressed to the undersigned and marked "Tender for the Construction of Young's Point Section, Trent Canal," will be received at this office until 12 o'clock noon, standard time, on Tuesday, September 8th, 1925.

Plans, specifications and form of contract to be entered into can be seen on or after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Superintending Engineer, Trent Canal, Peterborough, Ont.

Copies of plans and specifications may be obtained from the Department on the payment of the sum of ten dollars. To bona fide tenderers this amount will be refunded upon the return of the above in good condition.

An accepted bank cheque for the sum of $10,000 made payable to the order of the Minister of Railways and Canals, or Dominion of Canada Bonds to the same amount or Dominion of Canada Bonds and accepted cheques, if required to make up the amount, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work at the rates stated in the offer submitted.

The cheque or bonds thus sent in, will be returned to the respective Contractors whose tenders are not accepted.

The cheque, or the cheque and bonds, of the successful tenderer will be held as security or part security for the fulfilment of the contract to be entered into.

The lowest, or any tender not necessarily accepted.

By order,

J. W. PUGSLEY,
Secretary.

Department of Railways and Canals,
Ottawa, August 14th, 1925.

DEPARTMENT OF RAILWAYS AND CANALS

WELLAND SHIP CANAL

Section 6

Notice to Contractors

SEALED tenders, addressed to the undersigned and marked "Tender for Section 6, Welland Ship Canal", will be received at this office until 12 o'clock noon, (Standard Time), Tuesday, September 22nd, 1925.

Plans, specifications and form of contract to be entered into can be seen on or after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Engineer in Charge, Welland Ship Canal, St. Catharines, Ont.

Copies of plans and specifications may be obtained from the Department on the payment of the sum of one hundred dollars. To bona fide tenders this amount will be refunded upon the return of the above in good condition.

An accepted bank cheque on a chartered bank of Canada for the sum of $450,000.00 made payable to the order of the Minister of Railways and Canals, or Bonds of the Dominion of Canada to the same amount or Bonds of the Dominion of Canada with an accepted cheque if required to make up the difference, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work at the rates stated in the offer submitted.

The cheque or bonds thus sent in, will be returned to the respective Contractors whose tenders are not accepted.

The cheque or bonds of the successful tenderer will be held as security or part security for the due fulfilment of the contract to be entered into.

The lowest, or any tender not necessarily accepted.

By order,

J. W. PUGSLEY,
Secretary.

Department of Railways and Canals,
Ottawa, August 8th, 1925.

HARBOUR COMMISSIONERS OF MONTREAL

TENDERS

for

Steel Superstructure

Montreal-South Shore Bridge

Tenders, sealed and endorsed "Tender for Steel Superstructure, Montreal-South Shore Bridge", addressed to the undersigned, will be received up to twelve o'clock noon on

Wednesday, 9th September, 1925,

(Eastern daylight saving time) for the construction of the Steel Superstructure of the Montreal-South Shore Bridge.

Conditions upon which copies of the plans, specifications, etc., may be obtained will be furnished upon application to the undersigned.

The lowest or any tender not necessarily accepted.

T. F. TRIHEY,
Secretary,
Harbour Commissioners of Montreal.

Montreal, 8th August, 1925.

INDEX TO ADVERTISERS

PROFESSIONAL CARDS

The advertiser is ready to give full information.

Not a Sign of Any Dust

VERY satisfactory are the results showing from the application of Imperial Gravel Dust Layer at Montee Sabourin near St. Bruno, Que. This material is purely a dust-laying medium for gravel roads. It resists emulsification, gives satisfactory penetration and is highly waterproofing.

Imperial Gravel Dust Layer is one of seven grades of Imperial products designed specifically for Surface Treatment and Maintenance. In addition, there are three grades of Imperial Dust Layer for earth and clay roads and three grades of Imperial Liquid Asphalt for the higher types of macadam roads. The grading of these products follows our standard specifications which are based on the results of the most recent observations and research by our Highway Engineers. We are prepared to advise fully regarding the proper material for each individual road and also the proper method of application.

IMPERIAL
Asphalt
PRODUCTS

The three views show the Montee Sabourin Road at St. Bruno. Que., before, during and after the application of Imperial Gravel Dust Layer.

Imperial Oil Limited

ROAD ENGINEERING DEPARTMENTS AT

Toronto - Hamilton - Vancouver - Montreal

THE ENGINEERING JOURNAL

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

"TO FACILITATE THE ACQUIREMENT AND INTERCHANGE OF PROFESSIONAL KNOWLEDGE AMONG ITS MEMBERS, TO PROMOTE THEIR PROFESSIONAL INTERESTS, TO ENCOURAGE ORIGINAL RESEARCH, TO DEVELOP AND MAINTAIN HIGH STANDARDS IN THE ENGINEERING PROFESSION AND TO ENHANCE THE USEFULNESS OF THE PROFESSION TO THE PUBLIC"

THE ENGINEERING INSTITUTE OF CANADA FOUNDED 1887

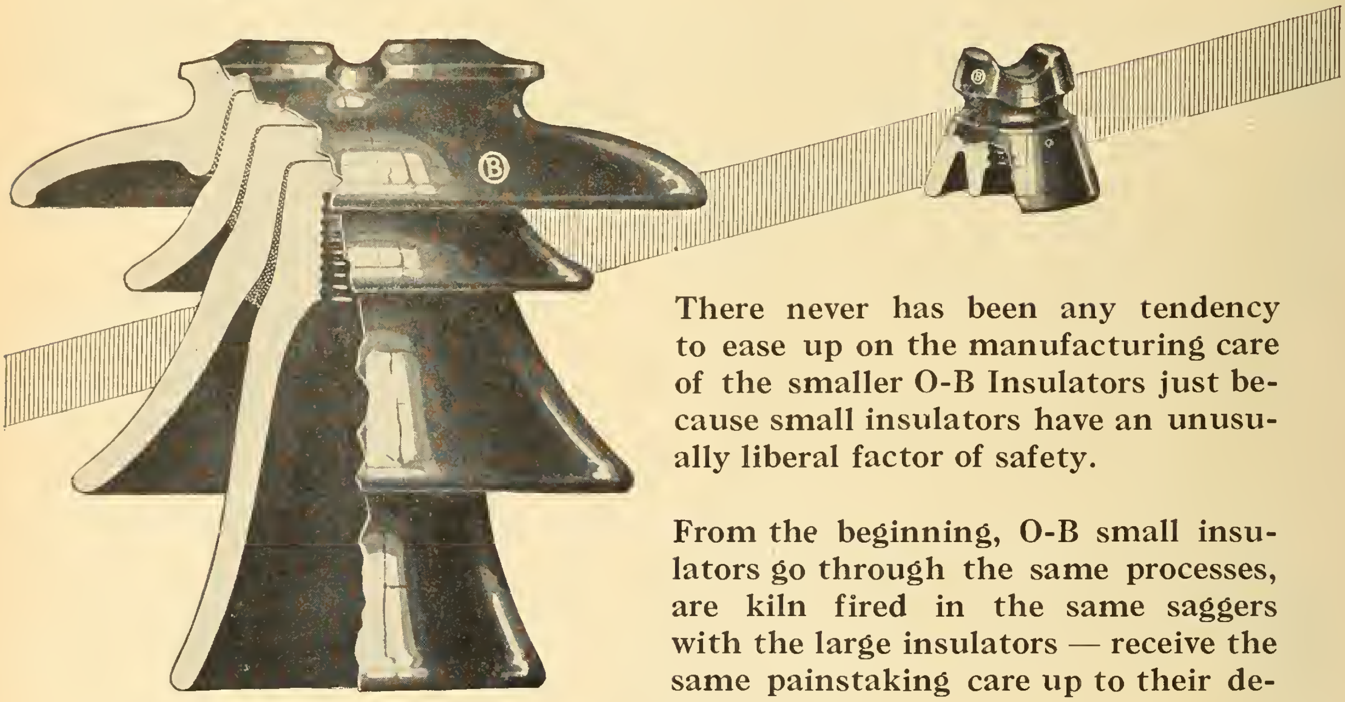
OCTOBER 1925

PUBLISHED MONTHLY BY THE ENGINEERING INSTITUTE OF CANADA

AT 176 MANSFIELD STREET, MONTREAL

Vol. VIII No. 10

The Same Care in Manufacture



There never has been any tendency to ease up on the manufacturing care of the smaller O-B Insulators just because small insulators have an unusually liberal factor of safety.

From the beginning, O-B small insulators go through the same processes, are kiln fired in the same saggers with the large insulators — receive the same painstaking care up to their delivery to you.

Quality built into any insulator is sure to be reflected in increased yearage on the line.

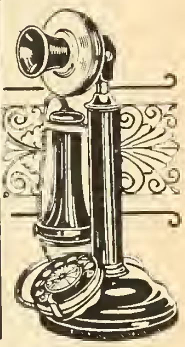
The record in service of the large O-B units is the record of the smaller ones, too.

Dominion Insulator & Manufacturing Co.,
LIMITED
Niagara Falls, Canada

(Manufacturing Ohio Brass Products in Canada)

OB INSULATORS

TIME IS THE TEST



The Art of WELDING

Our Products:

Dominion Oxygen,
Prest-O-Lite
Dissolved Acetylene
Oxweld and
Eveready
Equipment and
Supplies.

Price Lists,
Catalogues,
Information
supplied to
interested firms.

The Art of Welding has become an important factor in reducing costs in metal fabrication: smaller scrap piles are also the rule where the Oxy-Acetylene Welding and Cutting process is employed.

Dominion OXYGEN

DOMINION OXYGEN COMPANY LIMITED.

Prest-O-Lite DISSOLVED ACETYLENE

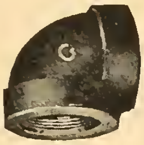
General Offices:
92 Adelaide St. West, Toronto.

Distribution Points: Hamilton, Merritton, Montreal, Oshawa, Quebec, Shawinigan Falls, Toronto, Welland, Windsor, and Winnipeg.

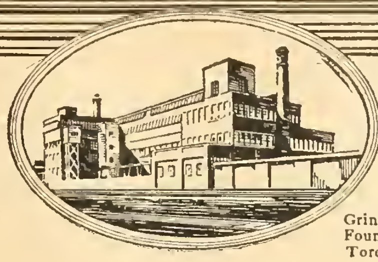
Dissolved Acetylene only at Shawinigan Falls and Winnipeg.

Operating the Welding and Cutting Gas Division of

Prest-O-Lite Company of Canada, Limited



Grinnell
Cast Iron
Fitting



Grinnell
Foundry,
Toronto

Grinnell
Malleable
Fitting

You needn't take our word for it

THERE'S only one way you can find out how much time and labour Grinnell Hangers will save you.

Try them! Buy a dozen and use them on a part of some job. Compare labour expense and the appearance of the finished work where Grinnell Hangers were used, with the same amount of piping installed with ordinary hangers or strap iron

You're the judge and jury. Put Grinnell Adjustable Hangers on trial. See if they aren't the most quickly erected, most easily adjusted hanger you ever used. Compare their sturdy construction, their perfect threading, with others. Get the evidence and you'll see why Grinnell Hangers make better jobs in less time.

Note particularly how easily adjustments can be made not only before but *after* installation. That's the secret of better piping and quicker installation. It's also the reason why the trifling difference in first cost is more than made up by greater efficiency and lower labour expense.

In addition to Grinnell Adjustable Hangers, we can supply Grinnell Malleable or Gray Iron Fittings and Penberthy Brass Valves. Then, also, our ability to render expert and economical service on all phases of pipe fabricating is unexcelled.

Write for the illustration Grinnell Hanger Catalogue; or if it's Fittings you're thinking of, ask us to send you the Revelation Bag of Grinnell Cast Iron or Malleable Fittings. For whatever other information you may wish on Grinnell materials or service, address our Toronto office, 2440 Dundas Street, West.

GRINNELL COMPANY of CANADA, LTD.

TORONTO MONTREAL WINNIPEG VANCOUVER

Hangers Valves Fittings

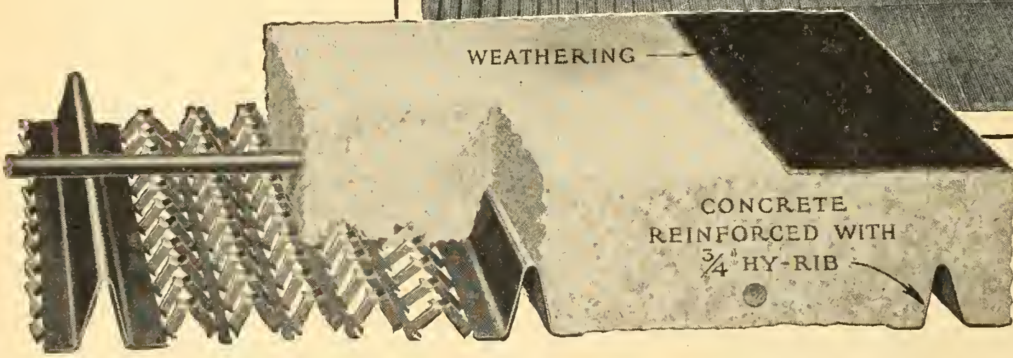
Grinnell
Adjustable
Hanger

GRINNELL

Piping Supplies of All Kinds

Penberthy
Valve

Truscon ¾″ Hy-Rib is easily and quickly applied without any special experience. Concrete is poured upon Truscon ¾″ Hy-Rib. When smoothed and set your roof construction is complete.



Let Truscon ¾″ Hy-Rib Earn More Money For You

You can make and save money for yourself by using Truscon ¾″ Hy-Rib in the construction of walls and roofs. Your laborers can do more work for the time spent on the job and economize in materials as well. No forms are necessary with Truscon ¾″ Hy-Rib and your workmen need no special experience to use it. You furnish the owner a substantial, permanent roof or wall that costs less to build and gives him lasting satisfaction. You build customer goodwill when you use Truscon Hy-Rib.

Walls of Truscon ¾″ Hy-Rib are approximately two and one half inches thick. This means a good many additional square feet of floor space in a structure of any size.

Write for free data book and complete details.

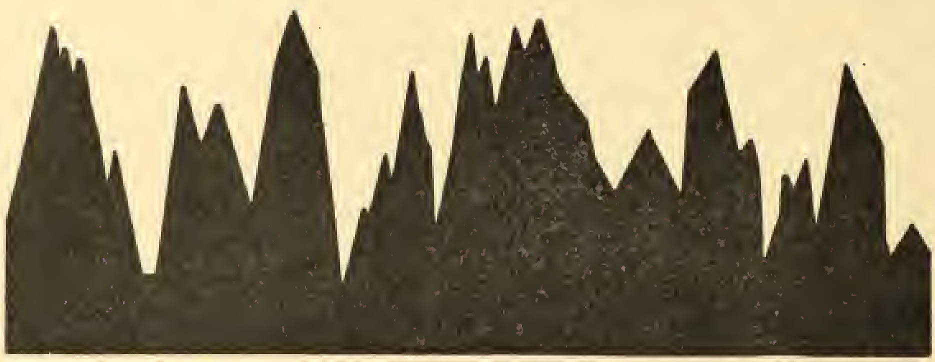
TRUSSED CONCRETE STEEL COMPANY
of Canada Limited, - Walkerville, Ontario

Branches Offices in Montreal, Toronto, Calgary, Vancouver and Winnipeg.

TRUSCON
Made in Canada
3/4″ HY-RIB

RUTHS STEAM

WHY TOLERATE A BOILER LOAD LIKE THIS



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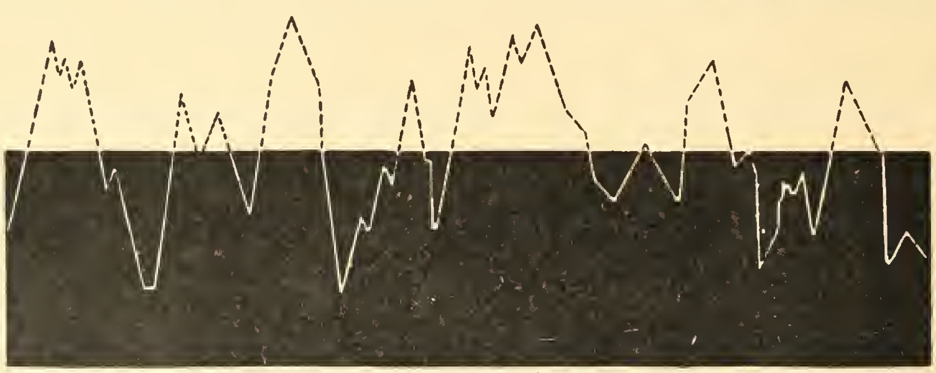
EQUALIZE BOILER LOAD

BY INSTALLING

RUTHS STEAM ACCUMULATOR



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With a Ruths Accumulator, the boilers can supply steam at a constant rate independent of heavy fluctuations in the demand.

COMBUSTION ENGINEERING CORPORATION

POWER PLANT LIMITED EQUIPMENT

STOKERS OF ALL TYPES
PULVERIZED FUEL SYSTEMS
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HIGH SPEED STEAM ENGINES

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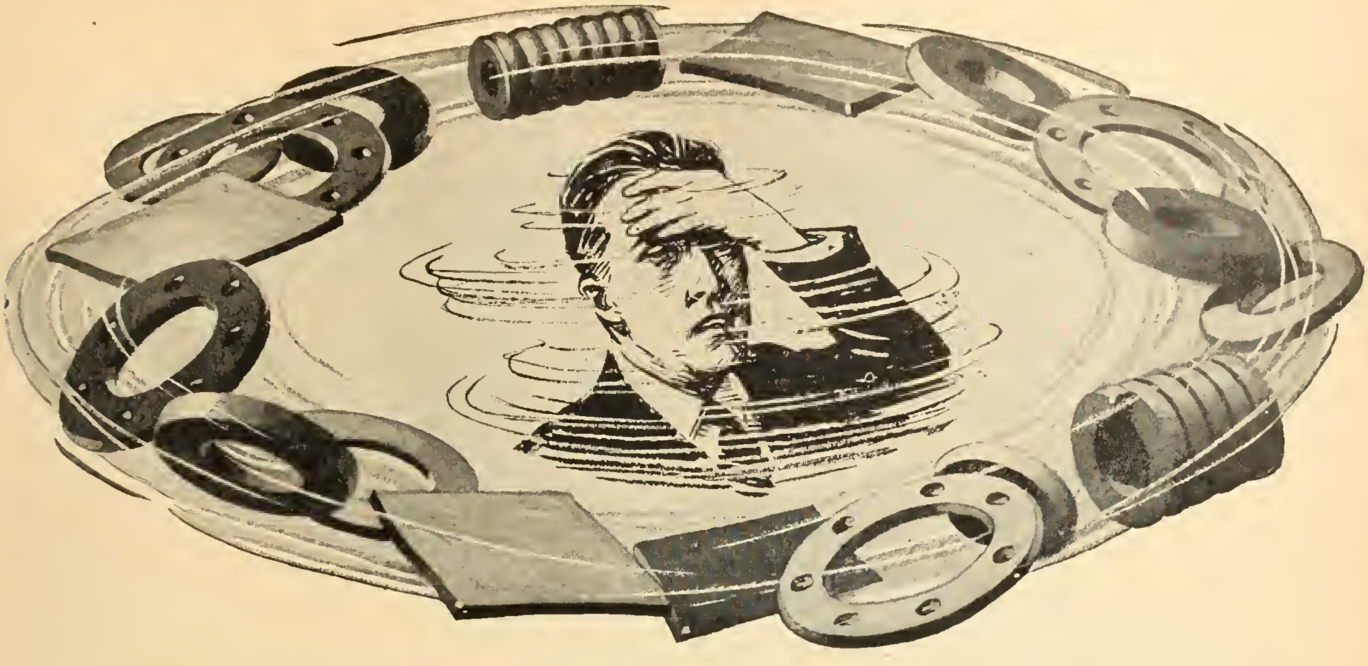
RECORDING INSTRUMENTS
INDUCED AND FORCED DRAFT FANS
DIESEL OIL ENGINES

HEAD OFFICE—TORONTO VANCOUVER, MONTREAL, WINNIPEG



Tank-wagons are available where desired.

The Tarvia Distributor — the herald of smooth, dustless, mudless "all-year" roads.

Tarvia Service
Chapter IV

ROAD officials and engineers know that 7 o'clock means 7 o'clock to a Tarvia tank-truck operator. Dispatched from the plant with railroad precision, Barrett trucks arrive on the job *on time*—ready for immediate operation.

Every distributor is manned by skilled crews—men trained in the scientific application of Tarvia. And here's another important factor—

Every Barrett tank-truck (and tank-wagon) is equipped with the famous Barrett nozzle—patent applied for—which insures the uniform, unbroken distribution of the Tarvia.

Tarvia tank-truck delivery is available where the size of the program justifies it — and on smaller jobs which are located near our factories.

Today, throughout the length and breadth of the Dominion, the Tarvia truck is justly recognized as the symbol of efficient road construction service.

Tarvia
For Road Construction Repair and Maintenance

The Barrett Company
LIMITED
MONTREAL TORONTO WINNIPEG
VANCOUVER ST. JOHN, N.B. HALIFAX, N.S.

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ENGINEERING JOURNAL

THE JOURNAL OF
THE ENGINEERING INSTITUTE
OF CANADA

OCTOBER, 1925

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Vancouver Harbour

A description of the Harbour, Early Investigations and Reports, and the Construction of the Present Works.

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Paper read before the Montreal Branch, The Engineering Institute of Canada, April 9th, 1925.

Vancouver, the principal city of British Columbia, derived its name from Captain George Vancouver, R.N., who, in 1791, had been appointed by the British Government to the command of an expedition to ascertain the existence of any channel of communication between the Pacific and Atlantic oceans within the temperate latitudes of the North American continent.

In the course of this undertaking Captain Vancouver accompanied by Lieutenant Puget found that the supposed strait of Juan de Fuca led into an extensive and winding channel, now known as the gulf of Georgia. Disembarking from their vessels, H.M.S. Discovery and H.M.S. Chatham the explorers proceeded in the ship's boats through a narrow channel, now called the First Narrows, into the calm waters of Burrard inlet, and landed on the south shore, where the city of Vancouver now stands amidst scenes of unsurpassed beauty.

About seventy years later, 1859-1860, Burrard inlet was surveyed and charted by Captain Richards, and in 1891 a more complete survey was made under the direction of W. J. Stewart M.E.I.C., of the Canadian hydrographic department.

In 1865 the first lumber mill was established on the north shore of Burrard inlet, and by 1876 fifty vessels left the harbour laden with lumber.

The most important historical event in the development of the port was the completion of the Canadian Pacific Railway, in 1885-86, from Montreal to Port Moodie, situated at the extreme east of Burrard inlet, which was the original terminal. The first trans-Pacific cargo, which consisted of tea from the Orient for shipment overland, arrived at Port Moodie on September 10th, 1886, and the first trans-continental train from Montreal arrived at Vancouver on May 24th, 1887.

In 1886, the infant city of Vancouver, consisting entirely of wooden buildings was completely destroyed by fire, and only the peninsula now known as Stanley park remains of the magnificent forests which for miles surrounded it. Re-construction, however, was immediately commenced and was very rapid until 1893, when there was a general depression for about four years until the discovery of gold in the Yukon, when Vancouver immediately sprang into prominence as the out-fitting place, since when it has continued to expand until to-day it is the commercial metropolis of British Columbia and contains many fine buildings and beautiful homes, and has a population, including suburbs, of about 225,000.

Description of Harbour

The harbour, opening off the strait of Georgia, includes English bay and False creek, Burrard inlet with the North Arm and Port Moodie and all other tidal waters lying east of a line drawn from Point Atkinson lighthouse southerly to the most western point of Point Grey.

The total area of the harbour is 48.78 square miles; the section west of the First Narrows is 20.20 square miles; Burrard inlet, 13.84 square miles; North Arm, 13.57 square miles; and False creek, 1.17 square mile, and the total shore line is 98 miles.

The weather conditions are most favourable; the harbour is open to navigation all the year round and the greater part is almost perfectly sheltered. Skirting the First Narrows is Stanley park, within which area of one thousand acres is a forest of giant douglas fir and cedar trees, a zoological garden, etc. On the north side are two remarkable canyons, the Capilano and the Lynn. Mountains are in view in almost every direction. To the north are the Cascade mountains and to the south lies the Columbia range.

From its geographical position, the harbour is the Pacific terminus of the great Canadian transcontinental

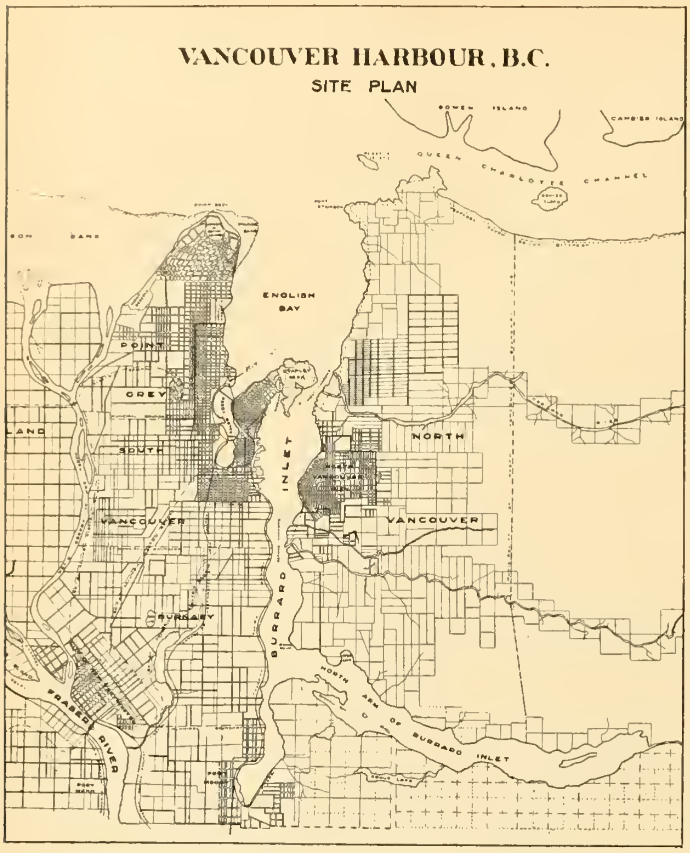


Figure No. 1—General Plan of Vancouver Harbour.

railway system, in addition to which there is a considerable business from the United States over the Great Western, Northern Pacific and the Chicago, Milwaukee and St. Paul railways, all of which have connections with the port. From its nearness to the magnificent forests, fisheries, mines and fruit growing and wheat lands, from the rapid growth of its manufactures and industries and from the fact that it formes the gateway to the east, one could not be otherwise than optimistic as to the future trade of the port if proper facilities and proper equipment for handling cargoes are provided at the earliest possible date.

Tides

There is considerable tidal range at Vancouver which is of rather an extraordinary and unusual character, and it was only after seven years continuous observations, day and night, under the supervision of Dr. W. Bell Dawson, M.E.I.C., superintendent of the Tidal and Current Survey Department of the Naval Service of Canada, that the actual levels of the tides were settled.

At Vancouver and Victoria, B.C., as well as throughout the strait of Georgia generally, the tide is of such a type that the springs and neaps do not appear, and it is misleading to refer to them, as they are effaced by other features in the tide which are there dominant. Therefore in dealing with tide levels there, "average" levels and "extreme" levels are referred to, which are not in accord with the moon's phases but with its declination. It is simply another type of tide and terms such as springs and neaps, which apply in the north Atlantic, do not apply there at all. The charts of Vancouver harbour published by the Admiralty, however, distinctly refer to high water springs and neap tides but there is a note thereon as follows:—

> "The diurnal inequality of the tides is great, causing apparently but one tide in the twenty-four hours on many days. The tide has the peculiarity of rising to nearly the same level at higher high water whether it be springs or neaps, whereas the level of low water varies in the usual manner. In summer the higher high water is at night and in winter during the day."

The tide levels inside the First Narrows vary about four inches from those in English bay.

Extreme low tides occur only twice per annum, in June and again in December or January. The actual levels adopted for all work in Burrard inlet are as follows: — (Above datum line adopted by Canadian Pacific Railway).

Extreme high water	100.00
Higher high water (taken to be equivalent to high water ordinary spring tide as referred to under the Dry Dock Act)	97.77
Average ordinary high water	96.25
Average ordinary low water and levels to which soundings are reduced	84.77
Extreme low water	83.45

Development

In 1912 the author was instructed by the Dominion government to examine into and report on the general conditions and make such recommendations for the future development of the port of Vancouver as seemed to him most suitable to promote its growth and otherwise best serve the interests of the port and of the country. Although there were many most excellent sites for shipping facilities, Burrard inlet seemed to be the natural deep water harbour for ocean shipping. Accordingly the following recommendations were made:—

That the work of widening the First Narrows, so as to give a width of 1,400 feet and a depth of 30 feet at low water, should be proceeded with, which meant about two million cubic yards of dredging; that additional wharfage should be provided along the Vancouver city side of the inlet; that False creek, which extended almost into the centre of the city, should be dredged to a depth of about 20 feet at low water and used for coast-wise traffic, and that the upper end of False creek, extending to about 300 acres, which was then dry at low tide and covered with a few feet of water at high tide, should be entirely filled with material dredged from False creek and the land so reclaimed used as a great central railway terminal to which all the railways entering Vancouver should have access; that the North Arm of the Fraser river, extending from the city of New Westminster to the gulf of Georgia, a distance of about 17 miles and having a width of about 600 feet, should be dredged so as to give a minimum of 10 feet depth at low tide, and that two training walls should be constructed at the mouth of the Fraser river to prevent siltation. The construction of a grain elevator of suitable capacity was also recommended.

At the same time, owing to the greater part of the foreshore rights near the city of Vancouver having been acquired by the large railway companies, it was strongly urged that the harbour of Vancouver should be controlled by one board of administration so as to permit of the systematic development of the port; three alternative systems of port management were suggested: — First, that the harbour should be considered as a national port and taken over by the government and a local harbour commission appointed, similar to that at the port of

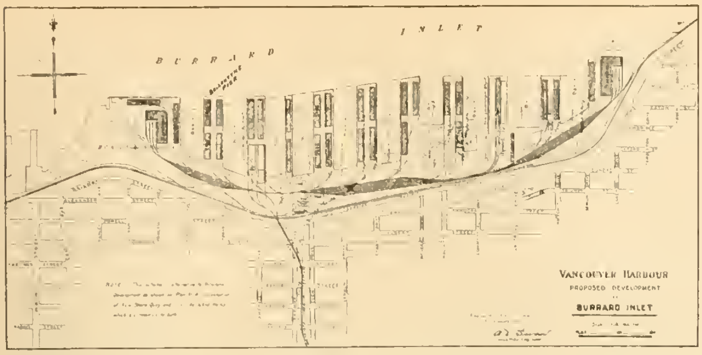


Figure No. 2—Proposed Development of Vancouver Harbour at Burrard Inlet showing location of Ballantyne Pier already constructed.

Montreal; or second, that the harbour should be acquired by the city of Vancouver and managed by a committee of the city council, as at Bristol, England; or third, that the harbour should be controlled as a port trust under the management of a board of representatives appointed by the various interests, such as the city of Vancouver, the railway companies, the shipping companies, the Board of Trade, etc., as at Liverpool, Glasgow, etc.

In accordance with the foregoing recommendation, the government selected scheme No. 1, and by Act of Parliament in May, 1913, the harbour was placed under the jurisdiction of a board of three harbour commissioners, "With powers to regulate and control by by-laws, navigation and all works and operations, and with other necessary powers for the proper development and administration of the port, and to impose rates, fees, and dues for revenue purposes". Nearly all the other recommendations in the report for the development of the port were given effect to, but owing to the war progress was somewhat delayed.

At the beginning of the year 1919, however, the author was again instructed by the government to make recommendations for the further development of Vancouver harbour, and he found that since his former report the total import, export and coast-wise traffic had increased in the year 1917 by 164 per cent over the year 1913. It was therefore recommended that a comprehensive scheme for wharf area, piers, railway terminals, roads, sheds, warehouses and freight handling facilities in general should be designed on a broad basis and constructed by degrees as required, and the following should be proceeded with at once:—

1. A booming ground for lumber should be provided in English bay.
2. A timber export wharf should be constructed.
3. A harbour terminal railway.
4. Provision for six new deep water berths or wharves.
5. Mechanical equipment provided.
6. Equipment for non-inflammable oil storage.
7. Provision of a fire tug.
8. A railway and traffic bridge should be constructed across the Second Narrows so as to connect the city of North Vancouver with Vancouver city.
9. A drydock should be constructed by the government if not arranged for by private interests at an early date.

In connection with the question of recommending a site for further immediate construction of new berthage, it was found the prices asked by private owners for foreshore frontage on the Vancouver city side were almost prohibitive and the author therefore investigated the possibilities of considering some other site as an alternative and selected Kitsilano at the mouth of False creek as having many attractions. The scheme he ultimately prepared for the development of this part of the harbour is shown on figure No. 3. The land at Kitsilano was originally an Indian Reserve and was expropriated by the Harbour Commissioners in 1916. Its area was about 70.3 acres and the price ultimately agreed upon was about $750,000. or $10,714. per acre. The scheme shown when completed would have provided berthage accommodation for twenty-one steamers. The railway accommodation was good and in proportion to the berthage, a large area of land was available on the reserve for warehouses and other industrial development. In order to protect this site and as part of the scheme, a sea wall or breakwater would have had to be constructed, but the inner side of the sea wall would have been available as a shipping berth. The total cost of the complete development at Kitsilano as shown, including land, dredging, embanking, quay walls, sea walls, lighthouse, two-storey reinforced concrete sheds, railway sidings, roads, lighting, equipment and engineering, was estimated at $18,750,000.

For the purpose of comparing the cost of this scheme with the Burrard inlet development, the cost of the wharves and land all complete, but without sheds or equipment, would be approximately $10,750,000. providing 12,000 lineal feet of available quay space, equal to $895. per foot of quay, as compared with the cost of the then new government pier at Burrard inlet of $2,164,640. for the bare wharfage and land, excluding sheds or equipment and providing 1,600 lineal feet of berthage, equal to $1,353. per lineal foot of available quay space. Assuming that the same amount of sheds and equipment was provided at either of the alternative sites the cost of the wharfage and land at Kitsilano would be over 60 per cent cheaper than a similar amount of wharfage at Burrard inlet. As a comparison with the costs aforementioned, the cost of the new wharfage at Victoria, B.C., constructed under contract by the Public Works Department, including the breakwater, but excluding the cost of the land, was approximately $1,364. per foot of

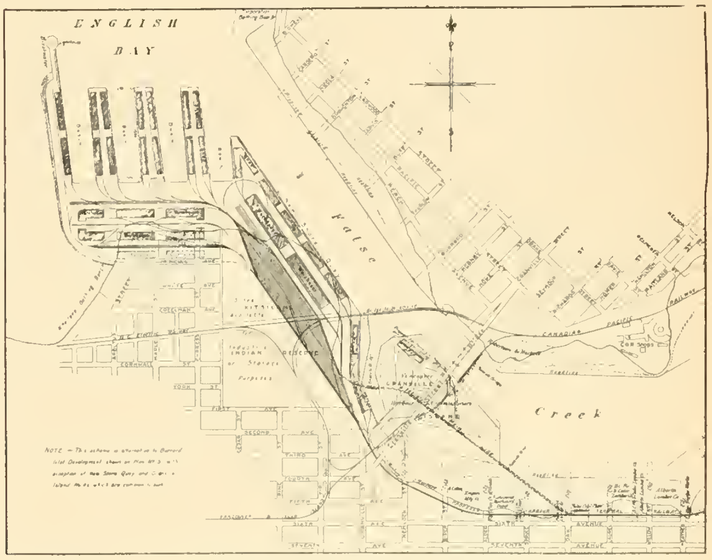


Figure No. 3—Suggested alternative Scheme for development of Harbour located on False Creek.

available quay space. At Kitsilano the area of the Indian Reserve is approximately 70 acres in addition to which there could be provided quay space on the shore wharf and new piers of an additional 68 acres, making 138 acres of land, or approximately 100 per cent more land available for development at Kitsilano than at Burrard inlet. The probable price of the Kitsilano land would have been $10,714. per acre as compared with approximately $41,809. per acre for the land for the government wharf at Burrard inlet. Taking proportionate rates for constructing only part of the berthage at Kitsilano to commence with, six berths could have been provided for approximately $4,500,000. complete, including land, sheds, railway sidings and equipment.

In comparing the two sites, namely Burrard inlet and Kitsilano, the Burrard inlet scheme has the distinct advantage of being nearer the commercial centre of the city than Kitsilano. On the other hand Kitsilano could be constructed at about 60 per cent less cost and provide about 100 per cent more land for industrial development.

The Harbour Commissioners who first held office rather favoured proceeding with the Kitsilano scheme, but before it was definitely decided, a change in government with a corresponding change in the personnel of the commission took place, with the result that the majority of the new commission decided to proceed with the first large pier development at Burrard inlet, and the author was instructed to recommend a suitable site on the main harbour front. In this connection, one of the most important features for study was the provision of the necessary railway connection so as to permit of all the railways entering Vancouver having access to the projected new works. The Canadian Pacific Railway runs practically parallel with the south side of Burrard inlet and consequently cuts off other railways from getting easy access thereto, in addition to which a very large portion of the main harbour frontage nearest to the city, between the railway and the water, was owned outright by the Canadian Pacific Railway. The author concluded that a harbour terminal railway, between the Canadian Pacific Railway and the water, should if possible be constructed by the Harbour Commissioners and operated by them.

At that time the Great Northern Railway had a single track line about a mile long extending from what is now known as the Great Central Railway Terminal, built on land which previously had been a mosquito infested swamp at the head of False creek, and this branch railway crossed the main line of the Canadian Pacific Railway on the level near the Great Northern Railway pier. It must be borne in mind that all the inward and outward cargoes to be handled at this section of the waterfront from all the different railway systems, both Canadian and American, entering Vancouver, with the exception of the Canadian Pacific Railway were handled over this crossing, and therefore it was desirable to construct the first pier as near to this crossing as reasonably could be done so as to avoid having to purchase any more foreshore land than was absolutely necessary to begin with, as the land was valued at from $1,000. to $1,200. per front foot. The author therefore recommended that a site immediately west of the Great Northern Railway Company's existing pier should be selected and a vacant frontage of about 960 feet was purchased. It was proposed that the Harbour Commissioners should either purchase or arrange running rights for their terminal railway over the Great Northern Railway spur line, before referred to, as the site selected offered the shortest railway haul to the central terminal, and was also in close proximity to the present commercial centre of the city.

The substratum of the site being sandstone rock, offered a reasonably good foundation. The site selected also had the advantage that the adjoining site, belonging to the B.C. Mills Company, was offered at a reasonable price, although not purchased, and it appeared that if it was ultimately acquired for future development that the first pier would form one unit of a comprehensive consecutive scheme. The depth of water at a distance of about 1,500 feet out from the shore was about 78 feet below low water level.

As the marine worm, teredo navalis, is very active indeed in Vancouver harbour, it was decided to use concrete in the construction of the new pier, although many of the other piers in the harbour are constructed of créosoted B.C. fir timber, which seems to stand the attack for at least 10 to 15 years. The water in Vancouver harbour is less saline than in the Pacific ocean, due to the fact that it is diluted to a certain extent by fresh waters from rivers running into the inlet, also by the fresh water from the mighty Fraser river being carried back by the current into the harbour proper. Since the fresh water remains on the surface, owing to its lightness, this is of undoubted advantage in that it minimizes any chance of deterioration of the concrete between high and low water. In connection with the

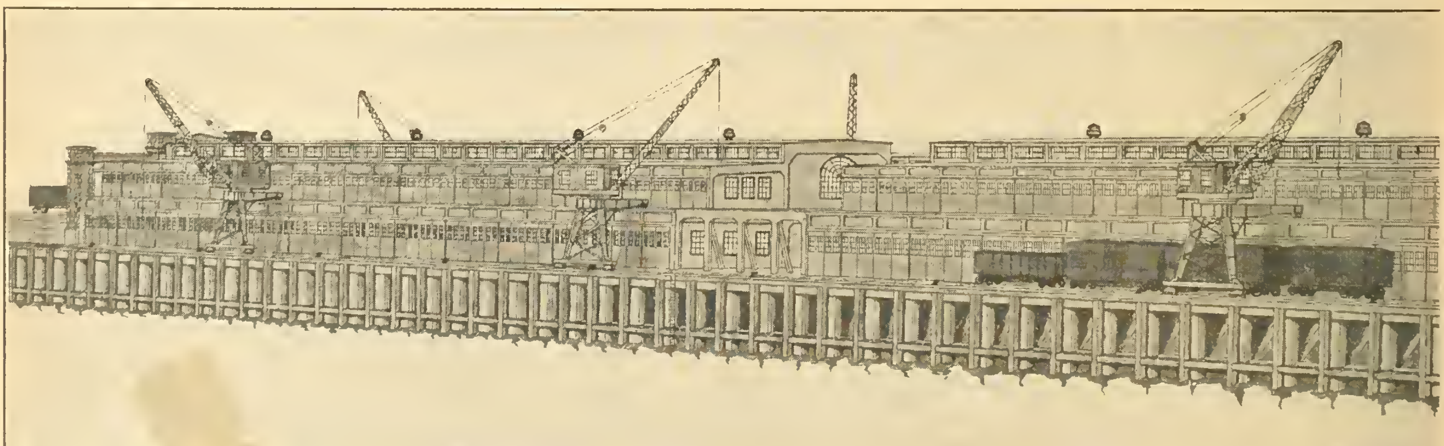


Figure No. 4—New Ballantyne Pier at Burrard different types of construction there is also the difference in fire insurance rates for general cargo passing over the wharf which would have been from $1.75 to $2.50 per cent if the structure were of timber as compared to about $0.25 per cent if the structure were of concrete and reinforced concrete.

Nine alternative designs and methods of permanent construction of the pier were therefore prepared in detail and complete estimates were made as follows:

No. 1-A	Concrete crib pier with cellular block foundations	$6,287,012.00
No. 1-B	Concrete crib pier with rubble foundations	5,381,194.00
No. 2	Reinforced concrete cylinder pier	5,100,930.00
No. 3	Reinforced concrete pile pier	4,658,920.00
No. 4	Cellular block work pier with solid filling	6,305,195.00
No. 5	Composite pier	4,389,718.00
No. 6	Reinforced concrete pile pier with centre of pier solid filled	4,401,563.00
No. 7	Concrete cylinder pier with centre of pier solid filled	4,378,302.00
No. 8	Concrete cylinder pier with centre of pier solid filled with gravel, of increased width	4,451,700.00

It was found there was very little difference in cost between a concrete pile pier with solid fill and a concrete cylinder pier with solid fill, and the author therefore decided to recommend concrete cylinders as they would prove a more substantial structure than piles and would be less liable to damage and deterioration. As finally designed the pier was 1,200 feet long on one side, and 1,075 feet on the other by a width of 341 feet, and there was, in addition, a shore quay of 350 feet in width.

Description of Ballantyne Pier

The heart of the pier was formed of sand and gravel filling about 134 feet wide at the top, with sides sloping at about 1 to 2.4. At the inner berths the basins were dredged to a depth of 35 feet, and at the outer berths there is a minimum depth of 45 feet below ordinary low water level. The floor or deck of the pier consists of reinforced concrete supported by pre-cast reinforced concrete trusses, which are carried on rows of reinforced concrete cylinders resting on rock bottom. There are four rows of those cylinders at each side of the pier at the inner end and three rows at the outer.

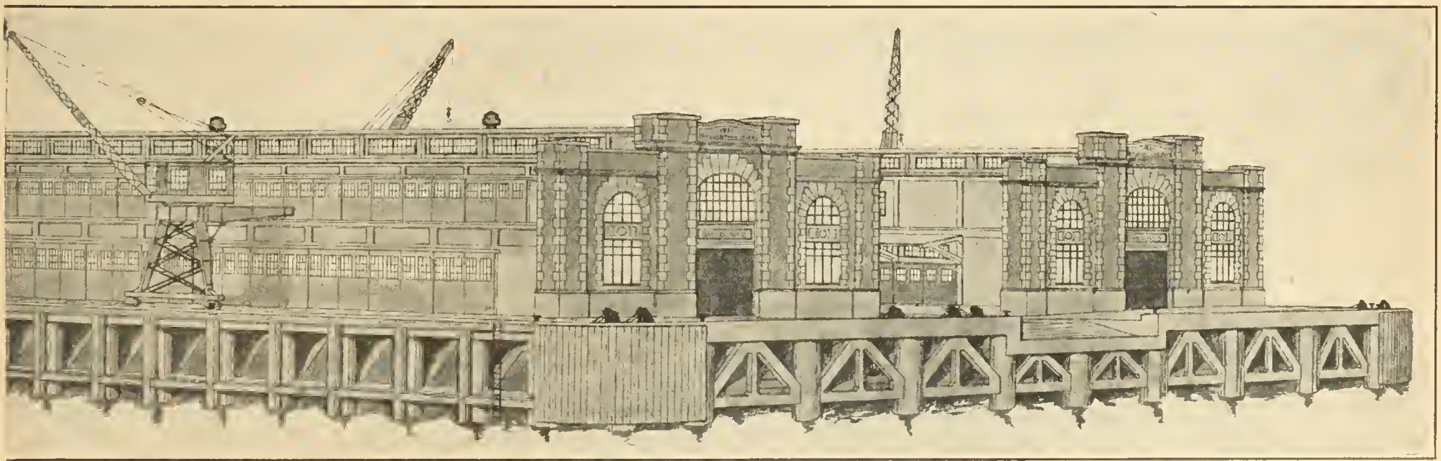
The cylinders were seven feet diameter outside, with a thickness of 9 inches, and there were altogether about 30,000 lineal feet or 5¾ miles, in the piers, containing about 25,000 cubic yards of concrete. They were cast in lengths varying from 4 feet to 17½ feet. In addition to the circular reinforcing, longitudinal rods were provided which projected at each end of the cylinder and were threaded so that various sections of the cylinder could be bolted together with nuts and clips, thus furnishing continuous steel reinforcing from top to bottom of any desired length. The forms used for the cylinders were of steel; the concrete of the cylinders is in proportion of 1 : 1½ : 3 throughout, and particular attention was paid to the grading of the aggregate.

The transit sheds are built about 30 feet back from the cope line of the pier so as to provide space to accommodate railway tracks along the front of the sheds. There is also a single rail laid at cope level to support the vertical leg of the semi-portal cranes which span the two tracks, the other crane support being carried on a platform at the level of the second storey. The transit sheds, three of which are 500 feet long and one 400 feet, are all of reinforced concrete, two storeys in height by 110 feet in width, with a loading platform at the back of the sheds. Between the sheds along the middle of the pier there is accommodation for three railway tracks and a roadway for vehicular traffic. The ground floor of the sheds at the front is at the same level as the cope of the pier and is constructed on an easy gradient from the front to the back so as to obtain the requisite height to permit of direct loading into railway cars. The level of the tracks and roadways between the sheds is practically the same as that of the cope.

Mechanical equipment for handling cargoes is provided and consists of a number of semi-portal electrical cranes spanning the two railway tracks in front of the sheds and capable of handling cargo either to or from either floor of the sheds and the hold of the largest steamer afloat, whilst inside the sheds, motor trucks, electrical conveyors and elevators are provided for the rapid handling of cargo.

Contract No. 1—Dredging and Filling

The first contract let was for dredging the basins on both sides of the pier and for filling the shore quay and forming the hearting of the pier for about 1,200 feet out. Tenders were invited and that of the lowest tenderer, Grant and MacDonald Ltd., dredging contractors, Vancouver, amounting to $513,121. was accepted, three other tenders being received varying from $795,000. to $969,000.



Inlet — Perspective View from Northeast.

This contract was commenced in September, 1920, and completed in November, 1921, but work had progressed sufficiently to permit contract No. 2 being commenced in March, 1921.

The quantities of material comprised in the dredging and filling contract were approximately 81,000 cubic yards of soft dredging consisting of mud, silt and sand, of which quantity about 12,000 cubic yards were used as fill, 86,000 cubic yards of rock varying from a very soft sandstone to a very hard concrete-like conglomerate, and 615,000 cubic yards of filling, of which about 80,000 cubic yards were in the shore quay fill and the remainder in the pier hearting. The rates for these items were 32 cents for the soft dredging, whether used as fill or not, \$2.98 for the rock and 36½ cents for the filling.

The plant used by the contractors consisted of a 3½ cubic yard dipper dredge, a 2½ cubic yard dipper dredge with a very long dipper stick which enabled it to operate at 45 feet below low water, two clamshell dredges, two single unit drills, two tug boats and five dump scows. In addition a suction dredge was rented for a time.

The rock dredging was carried out by two drills and the two dipper dredges, the smaller one being principally engaged on the deeper outer portion of the work, owing to its long dipper stick. The softer part of the rock was drilled with a special arrangement called a bull drill. This was mounted on a pile driver and consisted of a timber casing which travelled in guides in the leads of the pile driver, and which was lowered until it rested on the bottom. Inside this casing there was a long steel drill about 3 inches in diameter, the lower end being of drill steel welded to the shaft. The upper end of the drill was enlarged, and below the enlargement was a loose collar which was attached by means of two short chains to the ordinary pile driver hammer above it in such a manner that there was about three feet between the hammer and the top of the drill when the chains were tight.

In operation, the hammer was lifted taking with it the drill at the full extent of the chains. The whole arrangement was lifted clear of the bottom and then dropped and after the drill struck bottom the hammer followed, striking a blow on the drill as in driving a pile. The drill and hammer were then lifted again and the process repeated. The effect was that the drill was driven in the same way as a pile except that between every blow it was lifted in the hole and thus prevented jamming. The arrangement was very cheap to operate and in practice could rapidly put down holes from eight to ten feet in the soft rock. The holes were loaded and fired in the usual manner. These drills were not capable of dealing with the harder portions of the rock, for which work two single unit steam drills were used also operated from the pile drivers. The spacing of the holes varied from about seven feet to three feet centres according to the nature of the rock, and generally the work was carried out in three lifts.

The filling was dredged from the neighbourhood of the Second Narrows by the larger dipper dredge, fitted with a six cubic yard bucket for the purpose, and transported to the pier, a distance of about 2½ miles, in dump scows. The material consisted of a coarse clean gravel varying in size from sand to small boulders about half a cubic foot in volume. This material stands permanently at a slope of about 1 to 2.4 under water.

The elevation of the top of the pier hearting is 4 feet above high water. The bulk of the material for this hearting was dumped in place by the scows which, making use of the tides, brought it to about 3 feet above low water. Above this level the bank was built up by two clamshell dredges, working one on either side of the bank and lifting material from the tow of the fill at the outer end and depositing it on the bank behind. The shore quay fill, carried to a height of 7 feet above high water, was in too shallow water to permit of any of it being dumped direct and consequently a bank was thrown up at the seaward face of the fill by the clamshells, and the area behind filled in by a suction dredge which took material from the pier hearting before the latter had reached low water level, this material being replaced by the dump scows.

The entire contract was completed and all claims settled for about \$1,000. less than the original tender.

Contract No. 2

Tenders were invited for contract No. 2, which included the whole of the concrete work of the pier and a short piece of the shore quay wall, and the construction of the two storey reinforced concrete sheds with paved roadways, railways and trackage. The lowest tender as submitted by the Northern Construction Company, Ltd. and J. W. Stewart, of Vancouver, was accepted at a figure of \$4,403,324., four other tenders being submitted ranging from \$4,596,804. to \$7,335,922.

The first work undertaken was the pre-casting of the concrete cylinders, and for this purpose the contractors leased about thirty acres of level filled land at North Vancouver, about two and a half miles across Burrard inlet from the site of the works. The general layout of the yard was such that the sand, gravel and cement were all delivered by water, this material being handled from the scows by means of a travelling timber gantry crane operating a one-yard clamshell bucket, which delivered either direct to bins over the mixer or to storage on either side.

Mixing Plant

The mixing plant consisted of overhead bins which discharged into measuring boxes and thence into the hopper of a one-yard Smith mixer, which discharged into buckets on cars. A twenty-ton stiff leg derrick crane was used for the cylinder fabrication, the cylinders being arranged around it in the form of a circle. The concrete for the trusses, piles, beams, etc., was distributed in conical buckets, the trains carrying the latter running on standard gauge tracks, hauled by a gas locomotive. The concrete was delivered direct from the mixer to the cylinder forms by derrick, which was also used to set up and take down steel forms, reinforcing, steaming tarpaulins, as well as to handle the concrete cylinders and load them on cars for removal to the skidways.

In commencing the construction of the cylinders, tamping of the concrete in the usual manner by hand was adopted, but this was soon altered to tamping by two small air hammers which vibrated the outer steel shell of the form while the concrete was being poured. This was found to produce a more dense mass with a better skin than that obtained by hand tamping. Steam curing was resorted to so as to enable the forms to be removed and sections handled as soon as possible after the concrete was poured. Steam was turned on through two jets, one on the inside and one on the outside of each cylinder after the forms were filled and covered over with a canvas tarpaulin something in the nature of a tent. The cylinders were steamed for four hours, after which the covers were removed and the forms stiffened. In cold weather the steaming covers were replaced and an additional four-hours steaming given. Four days after pouring, the cylinder sections were placed on a car operating on a depressed track so that the floor of the car was level with the skidway and the cylinder sections were rolled on to the skidways where they lay during the curing or setting process for from two to three months before being used in the pier. The trusses, fender blocks, struts, sheet piles and walings, etc., were cast on platforms surfaced with sheet iron inside sectional wood forms lined with steel, and the steel reinforcing rods were left projecting beyond the concrete in the units so as to tie them properly together and form a bond in the completed structure. The trusses were cast four high, one on top of the other, so as to save space, a wooden form covered with sheet steel being placed between each truss. All the steel for the reinforcing steel cages and other parts was bent by a large motor driven power bender.

Tests

All cement for works was tested at the cement plant before being shipped, the bins being sealed by inspectors after acceptance. All cement had to comply with the specifications of the Canadian Engineering Standards Association.

All sand was tested for organic impurities, grading and comparative strength with standard sand. The sand used was of good quality and in almost every case gave higher results in 1:3 briquettes than standard sand.

Gravel was tested for grading.

Compression tests of the concrete were made at regular intervals during the work, to check quality of work. The usual times of test were at ages of seven days and twenty-eight days. One set of cubes was made for tests over longer periods and this may be taken as typical of the 1:1½:3 concrete: Cubes 6 by 6 by 6 inches, cured in air along with the cylinders for twenty-eight days; one set then broken and the remainder placed in the sea. The results were as follows:—

Age 28 days	average 3,858 lbs. per sq. in.
Age 2 months	average 4,110 lbs. per sq. in.
Age 4 months	average 4,410 lbs. per sq. in.
Age 7 months	average 4,682 lbs. per sq. in.
Age 13 months	average 5,192 lbs. per sq. in.

The usual average at seven days was 2,000 pounds per square inch.

In addition to the above a number of blocks 36 by 6 inches have been made with a one-inch steel bar in the centre. These have been placed between high and low water to determine the effect of sea water on the various mixes used. Up to the present they are less than three years old and there is nothing to report.

Sinking Cylinder Piers

The cylinder piers, of which there were 413 in the pier proper and 57 additional in the shore quay, consisting of pre-cast sections bolted together, were placed in position and eventually sunk by the use of specially constructed cylinder drivers carried on timber falsework or staging. The sections of the cylinders when loaded up at the yard were towed across the inlet on scows and lifted therefrom by a floating derrick and built up in the lead of the driver as the cylinder was forced down through the material to bed rock or to suitable foundation. The drivers were capable of handling sections of cylinder bolted together weighing up to 85 tons.

In many instances, as the cylinder drivers were the only machines available to set the cylinders, after the cylinder had been sunk a considerable distance the driver was moved to another cylinder and sinking operations were completed by what is known as a skid derrick. This permitted of more rapid and expeditious work of the drivers, of which there were five. As the cylinder

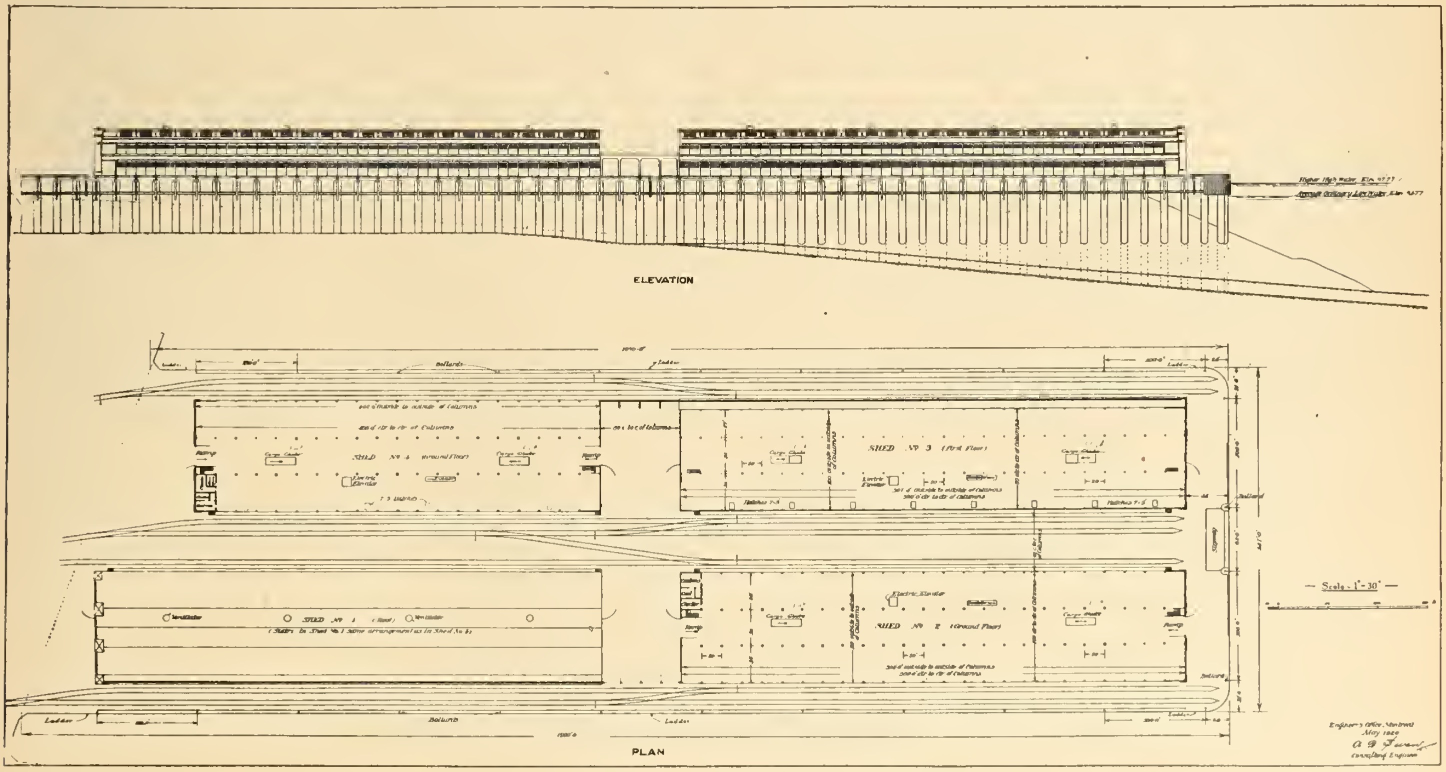


Figure No. 5—Ballantyne Pier — Plan and Elevation.

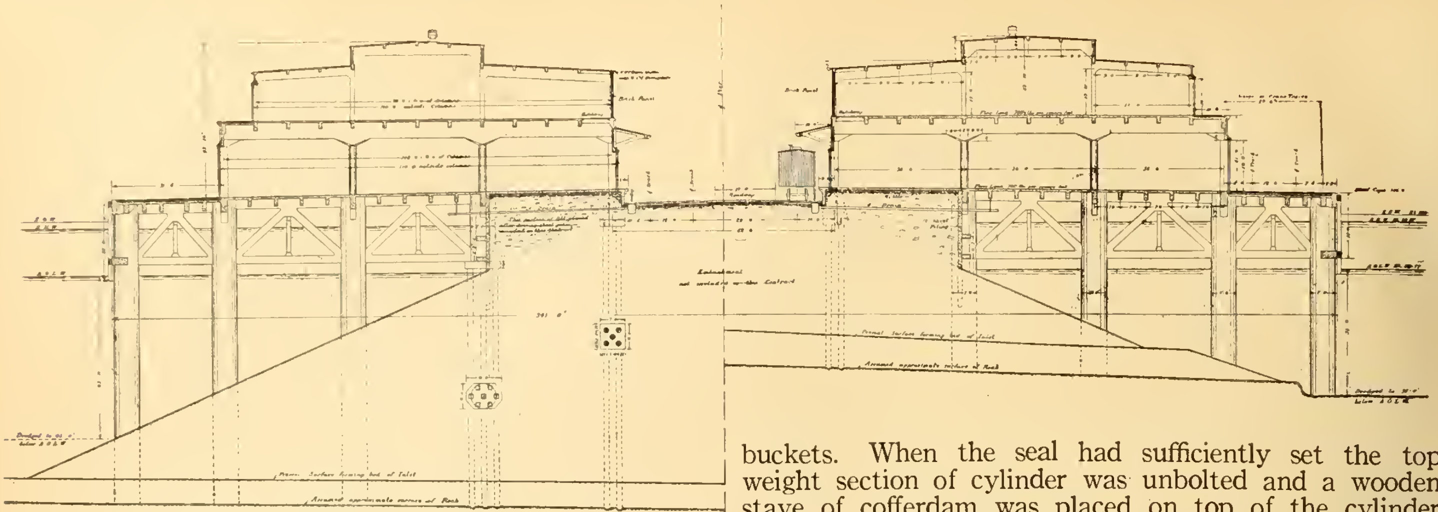


Figure No. 6—Ballantyne Pier Cross-sections at Outer Berth West Side and Inner Berth East Side.

sunk, the material was excavated from the inside with orange peel buckets in the usual way, and six- and twelve-ton special cast-iron rings were used as kentledge when necessary to overcome friction. In some cases 240 tons additional weight was added to the cylinder giving a skin friction of about 375 pound per square foot. High pressure water jets were used where the material encountered by the cutting edge could not be excavated by the orange peel.

Water for the jets was supplied by two Worthington turbine pumps driven by a 650-h.p., motor placed between them. These were capable of maintaining a constant pressure of 200 pounds per square inch. The stand-by pump was an Allen three-stage pump driven by a 440-h.p., motor. Boulders were lifted out with a hoist after being drilled by a diver and pins and shackles inserted. The cutting edges of the cylinders were of two types depending on the loading and the nature of the foundation to which the cylinders were to be sunk. One type of shoe was 17 feet 6 inches long, and the other was 9 feet in diameter and only 5 inches in length.

The maximum applied load on any cylinder was 500 tons, and the unit pressure allowed on the hard conglomerate was about 14 tons per square foot, and on the softer conglomerate and sandstone about 8 tons per square foot. The cylinders were built up in the lead of the driver by the floating derrick placing a length of cylinder on the top of the cutting edge section so that the joint could be waterproof and the two sections bolted tightly together, and this operation was repeated with each section as the sinking process continued until the top of the cylinder was about high water level. When the necessary lengths were all in place and connected an additional 15-foot length was added without the joint being waterproof, in order to give increased weight and also to permit of the material from the orange peel bucket being discharged free from the actual completed cylinder; this 15-foot top length was afterwards unbolted and used in a similar manner on subsequent piers.

When the cylinder was finally sunk to a suitable foundation and approved by the resident engineer, who had to make all examinations inside these cylinders in a diving dress, the loose material inside the cylinder was cleaned out by a diver and a seal of rich concrete, generally deposited by means of under-water concrete buckets. When the seal had sufficiently set the top weight section of cylinder was unbolted and a wooden stave of cofferdam was placed on top of the cylinder so as to bring it well above high water mark; the cylinder was then pumped dry, cleaned and inspected and finally filled with mass concrete in proportion of either 1 : 3 : 6 or 1 : 4 : 8 up to a level of a little above low water mark.

The next stage of the work was the setting of the reinforced concrete trusses on the top of the filled cylinders, and, in the case of the front row, the fender beams. The trusses were lifted and set into position by the skid derricks and where the end of the trusses rested on the cylinders, that part of the cylinder was very carefully filled and rammed with mass concrete in proportion of 1 : 1½ : 3.

It will be seen from figure No. 6, that owing to the great depth of the fill, rows four and five were carried on piles, and the original design allowed for these to be either of concrete or timber as might be subsequently decided. A number of concrete piles, 16 inches square by from 35 to 60 feet long, were prepared and an attempt made to drive these piles through the gravel fill; this however, was found to be almost an impossibility.

The hammer used for driving the piles was a No. 2 Warrington steam hammer. In this the steam lifts the moving part and then leaves it to fall by its own weight, the moving part weighing 3,000 pounds. The hammer has a 36-inch stroke and delivers from 60 to 80 blows per minute. A wooden block with a rope cushion or cushion of sawdust and shavings was used between the block and the pile. The piles were only set about 1 inch to 20 or 30 blows and there was considerable rebound in the driving. The water jet was used but without success, as the jet seemed to wash out the sand from the gravel leaving a bed of stones. In handling the 45-foot piles, they were slung from four points so as to avoid any undue tension.

Very soon after driving commenced, minute hair cracks were discovered in the pile. It was thought at first that these cracks were due to strains in preliminary handling, but making minute microscopic inspection failed to reveal any indication of cracks in the piles previous to driving. Another probability was that there was too much concrete cover over the steel for the size of the pile, the piles being 16 by 16 inches in order to provide 2½ inches cover, the main steel being only 9¾ inches centre to centre. Accordingly, under slight bending or contraction strains, the concrete at the outer fibres may not have been sufficiently supported by the reinforcing steel, and if this assumption was correct, this was probably the cause of minute surface cracks developing. The trouble with the concrete piles was not that they could not be driven but that they could not be driven without cracking them. As soon as sufficient cushion was used to save the piles, they would not drive.

A second attempt was made to drive them with what is known as an Arnott hammer weighing 25,000 pounds, the moving part weighing about 2,800 pounds, and the steam delivering a blow also, making the effective blow 7,500 pounds. The stroke is 22 inches and it strikes from 100 to 120 blows per minute. It was found that long timber piles up to 55 or 60 feet could be driven quite successfully. Consequently they were used, and in the fourth row, at about the level of low water, the timber piling was surrounded by pre-cast concrete sheet piling so as to permit of the mass concrete being carried well below low water and at the same time prevent any possibility of the tops of the timber piles being exposed and rotting at about that level. This was found to be quite satisfactory.

The timber piling was driven and capped for these two inside rows of piles so as to keep pace with the sinking of the cylinders, and the concrete cap carried up working between tides. After the trusses, fender blocks and top cylinder lengths were grouted into their proper position and the walings for the sheet piles placed in their slots, forms were fastened around the cylinders at the points where the units entered, and the steel reinforcements thoroughly cleaned. Many of these units weighed as much as 25 tons. Before filling the outside row of cylinders with concrete to the level of the deck girder slots, reinforcing of old rails was added so as to increase the bond.

In order to retain the solid fill supporting the floor of the third bay of the shed between columns four and five, reinforced concrete tongued and grooved sheet piling was driven; a single acting No. 2 Warrington steam hammer, working in conjunction with a water jet being used.

The Main Deck of the Pier

The main deck of the pier was poured usually in lengths of 40 feet, construction points being formed at the middle of the bays. The minimum covering of concrete over the steel was 2½ inches and very careful supervision was exercised in this work to make sure that the steel reinforcement was not disturbed during concrete operations, which were carried on simultaneously from a floating plant with a chute and a land mixer working in conjunction with side dump carts hauled over a narrow gauge track by gasoline locomotives. The mixture used throughout the main deck section was 1:1½:3 concrete. The sand and gravel were all fresh water washed and the gravel screened and graded, the largest size gravel passing through a 1¼-inch ring. Compressive tests were made on all pours of the deck and the average compressive strengths were as follows:

7 days from 1,880 lbs. to 2,330 lbs.
28 days from 3,020 lbs. to 4,835 lbs.

Construction of the Sheds

The two-storey transit sheds, four in number, are entirely of reinforced concrete with certain brick panelling. The principal forms were designed of steel so as to provide of speedy erection and stripping, and the forms for the main girders of the first floor were carried on steel trusses. Owing to the fact that the price of steel and labour was high, however, whereas lumber was cheap, it seems to the writer questionable whether it would not have been better to have adopted timber forms throughout. The main columns were constructed of 1:1½:3 concrete, whilst a 1:2:4 mix was used for the remainder of the sheds. Here also compressive tests were made of all pours. Tests of the 1:1½:3 columns gave much the same results as for the deck, given above, while the 1:2:4 concrete average values were:

7 days — 1,500 lbs. per sq. in.
28 days — 2,500 lbs. per sq. in.

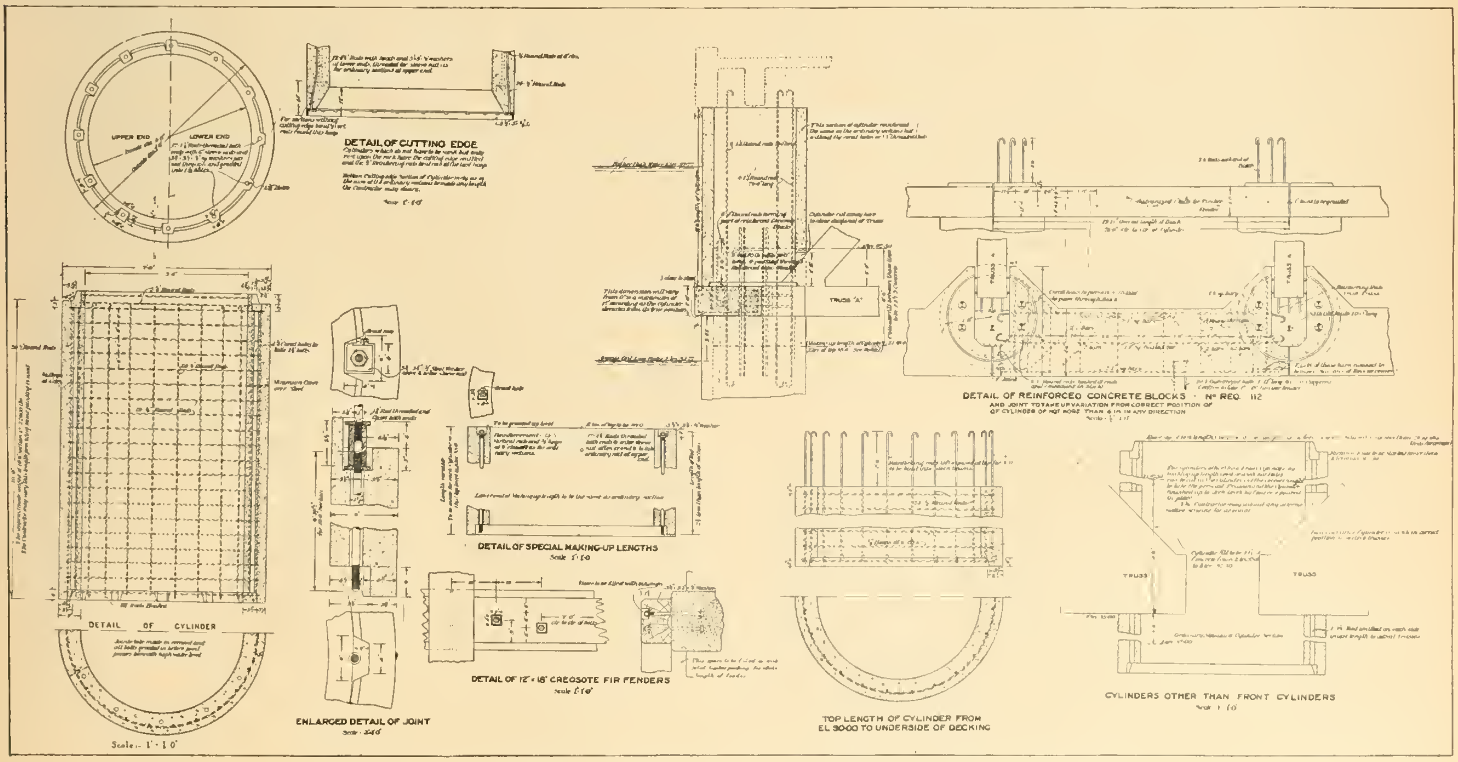


Figure No. 7—Ballantyne Pier Details of Cylinders and Fender Beams.

Tests

Various tests were made from time to time to see if loading calculated on was justifiable:

1. A timber pile with a designed load of 30 tons, was loaded with 54 tons. The settlement after application of the load was ½ inch, which was all regained after removal of the load at the end of 48 hours.
2. A reinforced concrete pile, which could not be driven beyond 18 feet penetration, was loaded with 72 tons and settled 1/20 inch. The designed load in this case was 50 tons.
3. Several cylinders were subjected to test loads. Cylinders selected for tests were some in which it had been found difficult to obtain as satisfactory a foundation as the average cylinder has. A typical example is one which was loaded with 342 tons for 24 hours without settlement. The shoe was 7 feet in diameter and penetration in gravel fill was 31 feet. This gives a pressure of 8.9 tons per square foot due to superimposed load alone. It is probable that skin friction accounted for the weight of the cylinder itself, which weighed 230 tons.
4. A bay of deck was loaded with gravel to the full amount of 750 pounds per square foot without any sign of deflection.
5. The lower crane beam was subjected to a test load of 27 tons, placed to correspond to the position of crane carriage, imposing maximum bending moment, and no sign of deflection was observed.

The ground floor of the transit sheds is covered with a bituminous mixture called Asbestophalt, which consists of a mixture of 14 per cent bitumen, 8 per cent carded asbestos and 78 per cent of sand carefully graded between a No. 8 mesh and a No. 200 mesh screen. The whole was mixed mechanically at a temperature of 300° F., and conveyed in motor trucks to the work from a central mixing plant in the city. It was spread so as to give a thickness of 1 inch when thoroughly rolled, and was capable of carrying traffic as soon as it had cooled. So far as the author is aware this material had not been used to any extent before in Canada, but before deciding to use it in the sheds, a small area was laid in one of the busiest streets in Vancouver, and observations extending over several months gave very satisfactory results. The quay space in front of the sheds between the rails was covered with bitulithic paving. On completion the interior of the sheds was finished with two coats of cold water paint consisting of 7 per cent glue, 10 per cent china clay, 83 per cent best air-floated English whiting, put on by sprays.

Electrical Supply

The whole of the cranes, transporters, elevators and other cargo handling facilities are all electrically driven. The current is supplied from outside the property by the British Columbia Electric Company, the current being 2,300 volts, 3-phase for service, transformed to 115–250 volts, single-phase for lighting and 550 volts, 3-phase for power. The transformer room and switchboard room are located in the corner of shed No. 4. The C. H. E. Williams Company, Ltd., were the electrical contractors, and they constructed approximately 20 miles of conduits, 90 miles of insulated wire and 1¼ mile of trolley wire. The offices in the various sheds are all electrically heated. The total contract amount for the complete electrical installation, plus engineering and inspection charges is $158,287.

Sprinkler System

The sheds are equipped with fire extinguishing apparatus of the Grinnell type, which consists of a dry pipe system of 4,370 Grinnell automatic sprinkler heads. The total cost of the sprinkler installation was $75,761. As the buildings are almost entirely of reinforced concrete, the reason for installing the sprinkler system was to obtain reduced insurance rates, more particularly on the cargo. If this sprinkler protection had not been installed, the rate on the buildings would have been 25 cents per $100. and on the contents 85 cents per $100., whereas with automatic sprinkler equipment installed the insurance on the buildings was reduced to 10 cents per $100. and on the contents to 30 cents per $100. It was estimated that the net annual saving on insurance by installing the sprinkler system was about $10,000.

Cranes

Semi-portal electric cranes were provided along the front of the sheds spanning the two railway tracks. The loading dimensions of the cranes are as follows:—

Capacity 6,000 lbs.
Test load 7,000 lbs.
Minimum outreach from face of quay 20 ft.
Maximum outreach from face of quay 45 ft.
Height of rise above quay level revolving type 60 ft.
Height of rise above quay level straight line type 45 ft.
Depth below quay level 60 ft.
Centres of tracks 27 ft. 6 ins.
Current available 550 volts, 3-phase, 60 cycles alternating.
Hoisting speed 6,000 lbs. 175 ft. per minute.
Hoisting speed 3,000 lbs. 300 ft. per minute.
Slewing speed 1½ revolutions per minute.
Travelling speed 100 ft. per minute.
Wheel loads in the worst condition of loading in the case of the front pier rail not to exceed 60,000 lbs. for a single wheel, and 36,000 lbs. if two wheels are used 5 feet apart. For the rail on the upper story of the sheds, the loads not to exceed 32,000 lbs. and 20,000 lbs. respectively.

Fenders are provided and fixed to the cranes so as to prevent any two cranes being placed too close together.

Four cranes were supplied by Peacock Bros., Montreal, of the Stothert and Pitt of Bath type, two by Babcock and Wilcox, and the original intention was to supply two only of a comparatively new type of crane known as the Modern Method straight line type, manufactured by the Colby Steel and Engineering Company, Vancouver. It was later decided, however, to increase the number of the straight line type to seven, as it was found feasible to add a supplementary grain conveying gallery on to the boom of the crane, so that these straight line cranes when not in use for handling general cargo could be used for grain loading, or vice versa. As the author believes the design is entirely new, the following description and drawing of the crane as shown on plan is given:

The machines are of steel construction throughout. The cranes have an ultimate capacity of 10,000 pounds, and average working capacity of 6,000 pounds, and a high speed gear device for handling 3,000 pounds. The hoisting speed on the 6,000-pound load is 175 f.p.m., while on the 3,000-pound load, the hoisting speed is 300 f.p.m.

The cranes are moved along the face of the dock to any desired point, under their own power, all controlled by the operator in the cab, through the combined hoist and power unit. On these cranes only one motor is

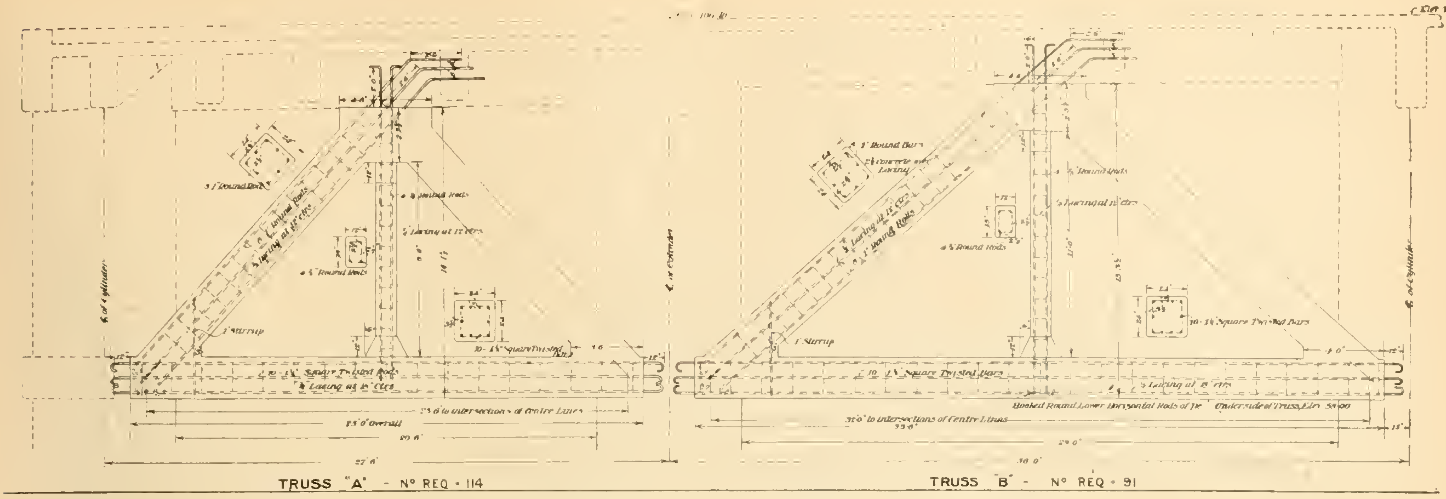


Figure No. 8—Ballantyne Pier — Details of Pre-Cast Trusses.

used. The straight line or trolley movement of the load hook along the boom in connection with the hoisting motion, constitutes the main movement in the process of transferring cargo. The crane travels along the pier for placement in a favourable position relative to the ship's hatches. Occasionally a combination of the travel and swinging motions may be employed for moving heavy loads direct between the ship's hold and railroad car or motor truck for the purpose of placing loads at a distance from the regular handling zone.

Electric Freight Elevators and Escalators

Each of the sheds is equipped with one electric freight elevator. The purpose of these elevators is to transfer electric or other types of small trucks from the one floor to the other, and they are not intended for teams or heavy carriages as the upper floor of the sheds is only intended to carry 350 pounds per square foot.

The freight elevators were designed to handle a maximum load of 18,000 pounds, with cars 18 by 12 feet, large enough to permit electric or gasoline freight trucks and trailers to be run on and off. The cars have gates at each end so that the trucks may run right through, and fireproof doors and standard safety appliances are provided.

In order to avoid the use of a penthouse projecting above the ordinary level of the shed roofs, the cables are anchored to dead men on the upper floor and pass on sheaves underneath the car to the elevator machine also on the upper floor but on the opposite side to the anchorages, so that the car practically rests in the slack of the main cables between the anchorages and the machine. The counterweights travel inside the shaft and their cables pass over sheaves which are located just beneath the shed roof. These elevators are driven by 35-h.p., torque squirrel cage induction motors.

One escalator is provided in each shed to transfer general freight from the pier deck floor to the upper floor. These escalators are capable of handling packages about 5 feet in width and up to 1,000 pounds in weight, at 60 feet per minute speed. Each is operated by a 1½-h.p. Lancashire motor placed on the first floor of the sheds.

A number of electric capstans of the usual type have been provided in different locations for hauling railway cars when necessary.

Grain Elevators

New grain elevators of reinforced concrete, having storage capacity of one and one-half million bushels, have been completed, and other grain elevators for private owners are in course of construction.

Operation

The principal business of the grain elevator plant is to receive grain from the car unloading shed, clean, store and ship it to ocean boats via shipping galleries on Ballantyne pier and at the jetty gallery to the east of the elevator plant.

Receiving

Grain is received in the car unloading shed which contains twelve pits each capable of receiving one car per one-half hour. It is carried on three belt conveyors through tunnels to the receiving house where it is elevated, weighed and discharged to conveyors running over the storage bins.

If it is desired to clean the grain, it is discharged directly from the scales to garners over the cleaning machines, the cleaned grain being spouted to re-elevating legs weighed and discharged to conveyors running over the storage bins.

Cleaning

The cleaning equipment consists of sixteen No. 12 separators which clean the grain, if desired, as fast as it is received. The screenings, from all the separators, are collected by screw conveyors and elevated by a small leg, (in the centre of the receiving house), to bins.

For separating wheat from oats, a double Carter-disc machine is provided, which is fed from a garner that can be supplied with grain from receiving leg No. 1 or from the transfer belt which is fed from the shipping legs, and thus can be reached from any part of the storage house.

Cleaning Grain in Storage

Grain is drawn from a storage bin, conveyed to the shipping leg, elevated to the top floor of the shipping house, spouted to the transfer belt *T1*, from which it may be spouted to the oat garner, one of the separator garners or to transfer belt *T7* in the receiving house and distributed to any of the other garners. After the grain is run from the upper garner through the separators, it is spouted into the boot of a cleaner leg, elevated above scales, weighed and spouted to the bin floor belt, either direct or by means of transfer belt *T7*, and returned to the storage bins.

Shipping from Storage Bins through Scales to Shipping Galleries

Grain is drawn from a storage bin, conveyed to a shipping leg, elevated above scales, weighed and spouted through the lower garner to the shipping conveyors leading to the shipping galleries.

Returning Residue from Shipping Garners

After grain is ordered stopped and there remains any in the garners or scales, it may be spouted from the lower garner to the shipping leg, elevated to the top floor of the shipping house, spouted to transfer belt *T1* in storage and from there it may be spouted to storage belt *T2* or to transfer belt *T7* in the receiving house, from which it may be discharged to anyone of the storage belts *T3*, *T4*, *T5* or *T6*, and may be returned to the bin whence it came.

Turning over Grain in Storage

Grain is drawn from a storage bin, conveyed to the shipping leg, elevated to the top floor of the Shipping House, spouted to transfer belt *T1* and from there spouted to the bin floor belt *T2* or to transfer belt *T7* of the receiving house from which it may be spouted to the bin floor belts *T3*, *T4*, *T5* or *T6* and returned to the bin whence it came.

Shipping to Cars

Grain may be loaded to railroad cars by means of a spout receiving grain from the end of the transfer belt in the shipping house.

Foundations

The foundation consists of concrete cylinders bearing on hardpan. The cylinders are in general 7 feet in diameter, enlarged at the bottoms to give bases 13 feet in diameter. The bearing pressure on the hardpan is approximately 10 tons per square foot. The outer row of columns of the shipping house rest on the inner row of the cylinders which form the foundation of the concrete wharf.

Receiving, Storage and Shipping Houses

The receiving house is of reinforced concrete and is supported partly on the storage bin walls and partly on independent columns. The principal equipment consists of three receiving legs, four 2,500-bushel scales each with one 1,500-bushel garner above and four 1,000-bushel garners below, sixteen Monitor No. 12 style "B" receiving separators, one No. 2523-A double Carter-disc oat separator, two cleaning legs, one screenings leg, one oat leg and four screw conveyors. Provision is made for the future installation of screenings separators. There is also one passenger elevator.

The storage house consists of 56 circular bins, 20 feet in diameter and 100 feet high, each of 23,500 bushels capacity; 42 interspace bins each of 5,000 bushels capacity; 15 interspace bins each of 2,500 bushels capacity,— making a total capacity of 1,560,000 bushels.

The storage house is entirely of reinforced concrete except for the beams supporting bin floor. The bin floor consists of a 2½-inch concrete slab, resting on steel beams, but not anchored to same in any way. Each bin has individual ventilation to the outside air. There are two monitors over the storage roof. In the basement there are eight 36-inch belt conveyors with a spout and leader from each bin.

In the storey over bins there are five 36-inch belt conveyors, each with a two-pulley tripper feeding the bins. In the storey over bins, there is also one 36-inch belt conveyor receiving grain from the shipping legs and delivering to the north end of the receiving house.

The shipping house is of reinforced concrete and is supported partly on the storage bin walls and partly on independent columns. The principal equipment in the shipping house consists of six shipping legs and six 1,200-bushel hopper scales with 2,000-bushel garners above and 5,600-bushel garners below.

There has been installed a dust collecting system for conveying dust from cleaning machines, floor sweeps, all belt conveyor head spouts and all elevator boots to dust collectors located outside the buildings. The dust from the collectors is to be spouted to housed-in receptacles from which it will be carried away. The dust collecting system extends throughout the receiving, storage and shipping houses.

There has also been installed a compressed air system for blowing dust out of motors and assisting in general cleaning in inaccessible places. The compressed air system extends throughout the receiving, storage and shipping houses.

All power is electric. The current for motors is 550 volts, 60 cycles, 3-phase. The current for lighting is 110 volts, 60 cycles, single-phase.

A complete electric lighting system is installed throughout the elevator plant. Heating of weighman's offices is by electric heaters.

Drives to the receiving, cleaner and shipping elevator legs are double reduction, double helical gears. Drives to the screenings and oat legs are double reduction, silent chain and roller chain drives without friction clutches. Drives to screw conveyors and Carter-disc separators are light double leather belt with friction clutches for the conveyors only. Drives to screw conveyor countershafts are ⅞-inch manilla transmission rope. Drives from countershafts to warehouse separators are double leather belts with friction clutches. Drives to fans and air compressors are Whittle belts.

The engineers for the grain elevators are the John S. Metcalfe Company, Limited.

Increase in Shipping

As showing the very rapid increase of business of the port, the number of ocean-going vessels entered inwards from foreign ports in the year 1923 increased 68 per cent over the year 1921. For the same period the net registered tonnage increased 51 per cent, whilst the cargo shipped to foreign ports increased 193 per cent, and there is an even greater corresponding increase for the first quarter of the year 1924 over the year 1923.

In regard to shipments of lumber, there has been 550 per cent increase in cargo shipments in the past five years, the amount rising to 521,000,000 feet.

In the author's report to the government on this harbour in the year 1912, he stated that in his opinion the grain crop from the province of Alberta and at least part of Saskatchewan could, and ought to be shipped more profitably from Vancouver than by having the long rail haul to the eastern ports. It is only recently, however, that this actually has been given effect to, and apparently the area of grain acreage likely to ship from

Vancouver has very materially increased, as in five-year periods the average acreage under wheat in the three western provinces was:—

	1911 to 1915	*1916 to 1920*
Manitoba	2,830,000 acres	2,748,000 acres
Saskatchewan	6,617,000 acres	9,748,000 acres
Alberta	1,650,000 acres	3,550,000 acres

From this it will be seen the Alberta acreage has increased about 120 per cent, and for 1923 the Alberta acreage increased a further 62 per cent to 5,628,000 acres.

In addition to the foregoing works, several grain loading jetties for large vessels to moor alongside are being constructed, mostly of reinforced concrete cylinders similar to the type used in the Ballantyne pier, and in certain locations of timber crib work sheathed on the outside with reinforced concrete so as to protect the timber from attack by marine worms. A new drydock, pier and large ship repairing yard is under construction for the Burrard Dry Dock Company and is nearly completed. A new railway and vehicular bridge across the harbour is now being constructed. This will give good railway connection to the whole of the north shore and North Vancouver. The author is engineer of these works.

The resident engineer in charge of the whole of the works since their commencement has been E. H. James, A.M.E.I.C. assisted by T. W. W. Parker, A.M.E.I.C. R. M. Wynne-Edwards, and A. L. Harvey, to all of whom the author is indebted not only for the ability with which they have carried out their work, but also for their intense loyalty and devotion to duty night and day almost continuously for several years.

Vancouver Harbour Development Since 1920

A General Review of the Improvements to the Harbour during the Past Five Years

W. G. Swan, C.E., M.E.I.C.

Consulting Engineer to Vancouver Harbour Commissioners.

Paper read before the Western Professional Meeting of the Engineering Institute of Canada, at Banff, Alta., July 13th, 1925.

Some five years ago the writer had the honour of addressing a similar convention to the one now in session, at Banff, on the subject of "Vancouver Harbour Development". At that time a number of historical and geographical facts were given, since as a matter of fact we did not have much to offer in the way of general development from a physical and commercial view point. Since that time, however, a great deal of water has passed under the bridge and Vancouver harbour has made much progress in its national importance by improving its port facilities, by broadening its policies, by entrenching itself solidly as the western gateway for the Canadian West in the export and import of commodities and by attracting to its shores steamship lines of many countries together with numerous industries, the product of Canadian, British and foreign capital. While second only to Montreal of Canadian ports, in the value of its exports and imports, Vancouver stands as the first port in the matter of tonnage of products handled and of ships entering and leaving its waters.

Important Improvements to Port Facilities

The following describes, briefly, the improvement of port facilities since 1920, both public and private, the former being carried on through the medium of the Vancouver Harbour Commissioners.

1. Deep sea berths through the construction of new piers, new wharves and jetties have been increased from 22 in 1920 to 38 in 1925.
2. Storage in pier and wharf transit sheds has been increased from 40,000 tons in 1920 to 120,000 tons in 1925.
3. Grain elevators have been increased from one to five; capacity from 1,250,000 bushels to 6,500,000 bushels; grain berths from 4 to 14; cleaning and handling capacity has been increased four fold.
4. One floating drydock, namely the Burrard Drydock Company's plant, has just been completed. Its dimensions are 98 by 556 feet and it has a deadweight capacity of 15,000 tons. Two new marine ways having a capacity each of 1,500 tons have been added.
5. Many improvements in navigation have been effected during this period, among the principal of which are, channel entrance at First Narrows dredged from 900 feet and 31 feet at low tide to 1,200 feet with 36 feet at L. W. O. S. T.; Prospect Point signal station constructed at main entrance for control of navigation; moving buoys installed in central harbour to enable ships to ride designated anchorages off shore; and many ranges and leading marks for the further control and convenience of the mariner.
6. The Second Narrows bridge connecting the north and south shores of the central harbour will be completed and in operation by October 1925. This will result in doubling the main waterfrontage of the central harbour where, by the policy of the Vancouver Harbour Commissioners, the port development of the next fifty years will be centralized.
7. A terminal or belt line railway has been begun by the Harbour Commissioners and in four years this has grown from nothing to a total of nearly 10 miles. The object of this terminal railway, as would be expected, has for its principal aim the admission of all line haul railways on an equal basis to the harbour waterfront. In the opinion of the writer, the principal is sound, the need apparent, and its value already proved beyond doubt.

Growth of Commerce

Statistics are always dry even though they be supplemented with interesting illustrations, but it is hoped that the general interest of the western members of *The Institute*, in this their principal national port, will be sufficient so that they will bear with some additional facts on the growth during the past five years of the commerce, meaning thereby ships calling and cargoes handled at Vancouver.

While not so spectacular as grain, the lumber trade occupies, and no doubt will do so for many years to come, the first place in the traffic of the port. In 1920 the total export of logs and lumber amounted to 54,000,000 f.b.m. This growth has steadily increased and for 1924 had grown to 553,000,000 f.b.m. This commodity is of course carried largely in parcel lots on regular freighters and tramps, but were it carried entirely as total cargoes it would represent approximately 140 deep sea shiploads. It may be that the sawmills or a number of those now centered in Vancouver city limits on the central harbour and False creek will move to Port Moody and the Fraser river, but the greater portion of this business will continue to load by lighter at Vancouver, and Vancouver will act as the clearing house for the trading.

The grain movement through the port of Vancouver, which began in 1920 with a total movement of 600,000 bushels, has, since that date, attracted the most widespread attention of the prairie farmer, the prairie business man, the prairie grain interests, the Vancouver business interests, the purchaser, the shipper, the railways and the steamship lines. The stream of western grain through this port has steadily grown until, of the 1923 bumper Alberta and Saskatchewan crop, there was handled through the port of Vancouver 55,000,000 bushels, and only the lack of facilities prevented a very much greater movement. The 1924 Western Canada crop provided less than half the volume of grain for export as compared to 1923; but of this crop there was exported through Vancouver 24,000,000 bushels. We want the Western grain exported through Vancouver, it means money in our pockets. Every grain ship fitting out in Vancouver for a full cargo of grain leaves with us $4,000. to $5,000. for labour, materials and ships' supplies. But we do know that this trade will move via Vancouver only when it is profitable to do so; and a fraction of a cent change in the cost laid down at Liverpool is a sufficient reason for varying the routing from east to west or vice versa, as the case may be. For this reason we look upon Alberta as being our regular, and Saskatchewan our intermittent customer. Alberta produced, in 1923, 165.-000,000 bushels of wheat. She produced, in addition, a large quantity of oats, barley and rye. With improved facilities for handling, the lowering of the export rail rate on grain and the large increase of the interests shipping through the western outlet, it is not difficult to picture 100,000,000 bushels of wheat in addition to much of the coarser grains being handled through Vancouver elevators in 1925, provided the crop now in prospect materializes.

Let us consider for a moment the general cargo increase since 1920. In that year the total of exports and imports was less than 2,000,000 tons. In 1924 this had grown to imports 2,220,000, exports 2,375,000 tons, or a total of 4,595,000 tons. The principal imports through the port of Vancouver are British, American and European manufactured products, mutton, hides, tallow, silk, hemp, fruits, copra, vegetable and mineral oils, and oriental specialties. Our principal exports are lumber, grain, flour, fish, pulp and paper, spelter and other mine products, coal, manufactured products, fruits, meats and dairy products, to Australia, New Zealand and the Orient.

Similar to the increase in cargo handled during the five years above mentioned, has been the increase in deep sea shipping. In 1920, there was cleared from the port 316 deep sea ships. In 1924 this number had increased to 1,009, while during the same period coastwise shipping doubled, reaching a total in 1924 of 17,500 vessels.

Cost of Improvements

Just a word as to the nature and the value of improvement in Vancouver harbour since 1920. Three new piers and wharves have been added at a cost of $10,500,000; new elevators have been constructed, two private and three public at a cost of $6,500,000; a new drydock has been completed at a cost of $2,500,000; a new three-berth grain jetty is almost complete, cost $1,200,000; Second Narrows bridge is nearing completion, cost $1,700,000.; dredging at a cost of $750,000. has been carried out, while private interests have carried out further improvement at a cost of $450,000. The total of these improvements exceeds $22,000,000. of which amount the Vancouver Harbour Commissioners have raised and expended approximately $12,500,000. All the facilities referred to are in active operation where completed, and are urgently required where not already finished, and are earning a good and adequate return on the monies invested.

As Vancouver is the natural outlet for Alberta, a portion of Saskatchewan and the Peace River district, it naturally follows that Vancouver is geographically and economically situated to act as the distributing centre for these territories. The proof of the pudding is in the eating; we are now distributing largely the imported products and manufactured products of the British Columbia coast and eastern Canada, (via the Panama), to the areas referred to. This trade holds great possibilities and each successive reduction of the mountain railway scale increases the tributary area.

The Scientific and Industrial Research Council of Alberta

Its early History and the extent of its Activities.

Professor Edgar Stansfield, M.Sc., M.E.I.C.
Honorary Secretary, Scientific and Industrial Research Council of Alberta.

Paper read before the Western Professional Meeting of The Engineering Institute of Canada, at Banff, Alta., July 15th, 1925.*

Alberta claims the distinction of being the first province of the Dominion to establish a research council, — a council, moreover, with laboratories and a research staff under its own control. The Dominion Research Council was formed several years earlier, but the Dominion council has so far lived up to its title of an *Advisory* Council for Scientific and Industrial Research, as the scheme for a research institute to be operated by the Council at Ottawa has not yet received the endorsation of parliament.

It would be impossible for the writer, and difficult even for an old-timer, to trace the different influences which led up to the formation of the Alberta Council. Suffice it to state that in October 1919 the first meeting was held of a committee appointed by the provincial secretary, the Hon. J. L. Côté, to advise him on matters relating to industrial research.

In January 1921 an Order-in-Council stated that most encouraging results had been obtained by this committee in their preliminary survey of the mineral resources of the country and the possibilities of their development; that it had been decided to have the work continued along the same lines; and that the work had been carried on and could best be continued in co-operation with the University of Alberta. Therefore, a council of five members, to be known as "The Scientific and Industrial Research Council of Alberta", was appointed, with necessary powers to supervise and direct research work, to engage specialists for the work, and to enter into an agreement with the university for the necessary laboratory and other facilities. The original council was: — Chairman: the provincial secretary, Hon. J. L. Côté; members: Dr. H. M. Tory, president of the university; Mr. J. T. Stirling, chief inspector of mines; Professor J. A. Allan; and Professor N. C. Pitcher.

In brief, the Research Council has virtually been in existence since October 1919, although only formally constituted and christened in January 1921. Thirty-six meetings have so far been held. The present membership is: — Chairman: Hon. H. Greenfield, premier of the province; Dr. H. M. Tory; Professor J. A. Allan; Mr. J. T. Stirling; Professor N. C. Pitcher; Dean R. W. Boyle, M.E.I.C., and Professor Edgar Stansfield, M.E.I.C., honorary secretary.

Organization and Policy

In the organization of the province the Research Council is attached to the Executive Council, where it is under the immediate control of the premier. The work is financed by a direct vote of the legislature.

The offices and laboratories of the council are situated at the university; but, as stated above, the work is carried by a direct vote, and it is thus financially entirely separate from the university. There is, however, close co-operation between the council and the university; and the facilities of the latter, particularly the library, the workshops, and, (less tangible but of even greater importance), the advice and help of members of the staff, are of incalculable value to the work of the council. The university, moreover, in its capacity as host, has given academic ranking to the senior members of the staff of the council, in order that they may take part in the many activities of the university. In short, the co-operation is so close that many overlook the fact that the council is an independent entity and not merely a department of the university.

The policy of the Research Council, from its inception, has been directed towards a slow and carefully planned growth, rather than an attempt to create a large research institute. The policy also has been to avoid conflict or overlapping with any other provincial or federal activities. In view of this, coal and materials for road construction were chosen as the two natural resources most urgently needing investigation.

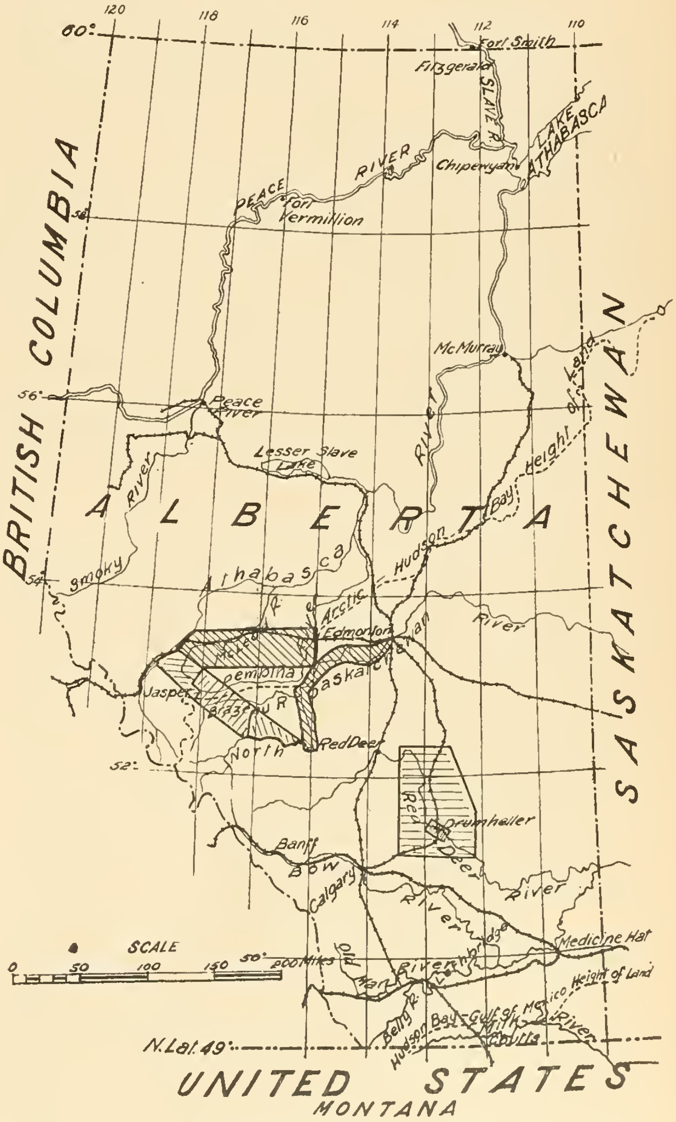


Figure No. 1.—Areas Mapped by Provincial Geologists, 1921 to 1925, inclusive.

*The original paper was illustrated by 35 lantern slides. Only 8 illustrations are reproduced here.

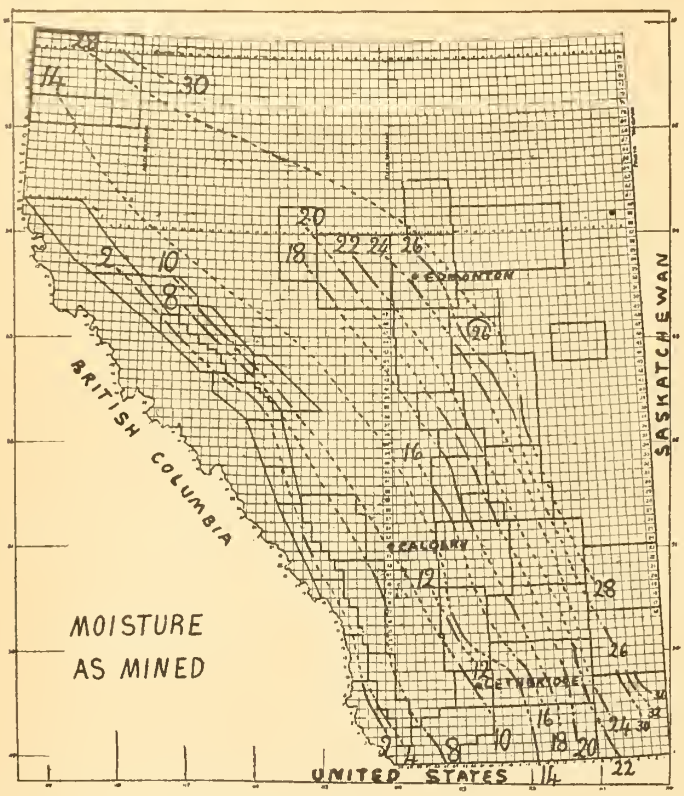


Figure No. 2.—Outline Map of Alberta, showing Lines of Equal Moisture Content of Coals.

In the time allotted it is impossible to do more than indicate the principal lines along which the work has developed, but it is hoped to stimulate greater interest in the council. Details of its work are given in the reports published from time to time. Ten of these reports have so far appeared, one is now in the press, and another is ready for publication. One of these is now out of print, but the others can be obtained free or for a nominal charge.

The two main problems under study were stated to be coal and road materials. The principal departments of the work may be said to be geology, coal, and road materials.

Consideration of Coal Problems

The geological staff, under the direction of Dr. Allan, has so far devoted itself mainly to the foothills and plains coal areas of the province, but a general study and oversight of the other mineral resources is also maintained. Figure No. 1 is a map of Alberta which shows the areas that have been geologically studied during the seasons 1921 to 1925, inclusive. The foothills survey is being continued this season eastward from Prairie creek in an endeavour to correlate the coal seams in the Coalspur area in the Saunders formation. It is hoped also that a section along the North Saskatchewan river between Rocky Mountain House and Edmonton will give additional information on the stratigraphical relation between the Saunders and Edmonton formations. Much work has already been accomplished in the determination and correlation of coal seams.

It was necessary, in a study of the coals of the province, to agree upon some logical delimitation of areas for purposes of classification and arrangement. The province had been divided into districts known as mine inspection districts; but, as these were largely based on geographical considerations rather than on the character of the coal, they did not satisfactorily meet the need. In October, 1923, the council decided to delimit and adopt coal areas for its work, and by April, 1924, the work was completed. The coal-bearing territory in the province has been divided according to the three geological formations in which the coal occurs, and then further subdivided into areas in accordance with its geological character and the chemical nature of the coal, and with some reference to commercial shipping districts.

The original map contained 36 areas; one of these has since been subdivided, and 8 new areas added in order to include all mines now operating. These 45 areas have been adopted by the provincial government in connection with the Coal Sales Act, and by the Mines Branch in the collection of mining statistics, etc. They have also been adopted by certain departments of the Dominion government.

In addition to the work outlined, a geological map of the province is in course of preparation.

The laboratory work on coal is more varied in its character, and includes many totally distinct branches of work. Two main types of samples are examined; small mine samples, taken by the provincial mine inspectors for chemical analysis, and carload samples which are thoroughly tested in many ways.

The former work may be regarded as a chemical survey of Alberta coals, and is thus in logical sequence to the geological survey already mentioned. Some 700 samples have been received since the formation of the council, but only the last 500 of these have been analyzed in the council's laboratories. These analyses, of samples taken by official samplers, made in the same laboratory by standard methods, give a mass of reliable and comparable information from which much may be deduced. A few notes will indicate the lines along which this work is proceeding.

Figure No. 2 is an outline map of the province prepared to show the variations in moisture content of the coals according to the locality in which the coal is found.

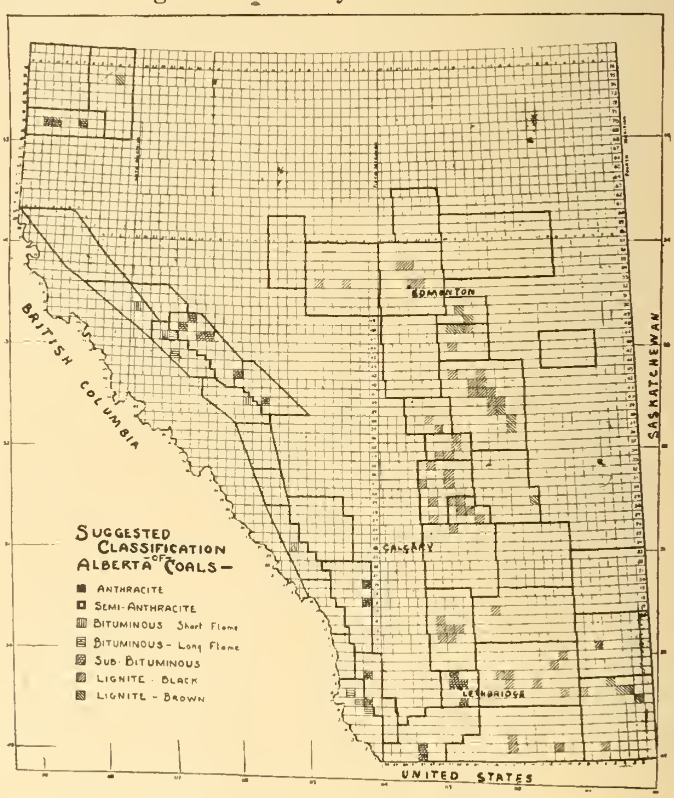


Figure No. 3.—Outline Map of Alberta, showing suggested Classification of Coals.

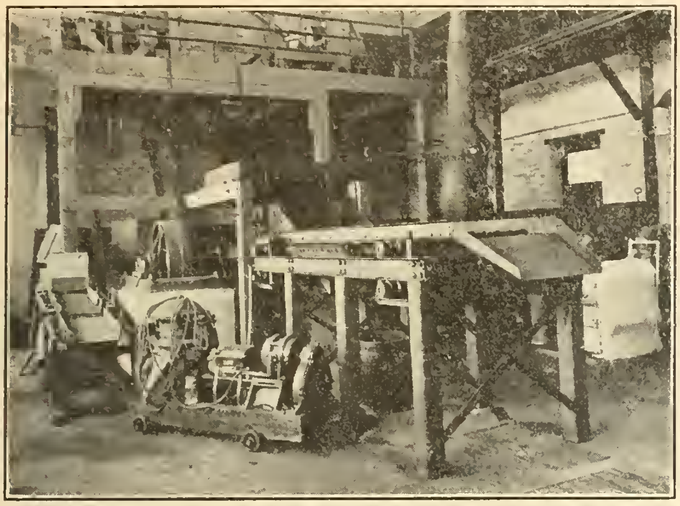


Figure No. 4—Some Coal Testing Equipment.

It will be noted that the lines of equal moisture roughly parallel the mountains on the west. Other maps have been prepared to show the calorific value of dry coal and the calorific value of the coal moist as mined. These show similar characteristics. Figure No. 2 also shows the 45 coal areas referred to above.

It is interesting to note, in connection with the maturing of coal, that instances are found where one coal is less mature than another coal which, though possibly some score thousand years younger, is yet as little as ten miles nearer to the mountain range. A striking example of this effect of mountain-building pressure in the maturing of coal has been found in the past two months. A bore hole in the Wainwright district has produced coal from a depth of over two thousand feet. This is presumed to be Kootenay coal, and therefore comparable in age with the anthracitic and bituminous coals of the Rocky mountains. Proximate analysis shows, however, that this sample is lignitic in character; almost identical with Drumheller coal. The Wainwright coal is probably several million years older than the Drumheller coal, and is found at a far greater depth. On the other hand it comes from rather more than one hundred miles further from the mountains; and so, in spite of its age and depth, it is no more mature than Drumheller coal.

This work naturally leads to an attempt to adopt a classification for Alberta coals. Unfortunately none of the many existing classification schemes appear suited to our needs. Prof. Parr's scheme seemed the most hopeful, but fails with Alberta coals.* He shows that the higher grade coals differ most notably in their content of volatile matter, whilst the lower grade coals, although varying little in volatile matter, show marked variations in calorific value. Prof. Parr's values are based on what he calls "unit coal", — that is, dry, ash-free coal. If the scheme is modified to a basis of coal moist as mined, it appears to have great possibilities for Alberta. For certain reasons it seems well to consider coals with an adjusted, average, ash content, rather than a hypothetical ash-free coal. Charts have been prepared, both by the original and the modified plan, showing all the analyses made, averaged by townships.

It should be noted that it seems certain, as more mines are opened and fresh deposits are sampled, that the gaps in the chart will be filled in, and there will be found to be a gradual change, without break, from the highest to the lowest grade. In other words, there are no logical and obvious divisions between the different classes of coal. Figure No. 3 is a map of the province showing where the different classes of coal occur.

Carload samples of coal are tested in many ways. Screening tests are made to show the relative amounts of the different sizes of coal occurring in the mine run material, and also to determine the distribution of ash in the different sizes. Storage tests are made for periods varying from one month to two years; and boiler tests have been made on many of the coals. Other tests include determinations of the possibilities of de-ashing, the clinkering temperature of the ash, and the suitability of the coal for smithy purposes. Some carbonization tests have been made, but this work has been left in abeyance for a while. Considerable progress has been made with briquetting tests. About 500 batches of briquettes have been made, and several types of coal and many different binders have been employed. Recent work has resulted in producing a very strong briquette with sub-bituminous slack from the Coal Branch with about 6 per cent of asphalt binder and 10 per cent of bituminous coal.

Another branch of the work is concerned with the use of Alberta coals in domestic heating furnaces. Great difficulty has been experienced in the development of an accurate method of test for an ordinary hot air heater, but good progress has been made. Figure No. 4 is a photograph of one end of a laboratory; it shows, from left to right, a small shaking screen, a sampler crusher, a large shaking screen, and a hot water furnace.

In addition to the above, Prof. C. A. Robb, M.E.I.C., has prepared a report for the council on "The Combustion of Coal for the Generation of Power". This has been published in multigraphed form. Prof. R. S. L. Wilson, A.M.E.I.C., is engaged in a careful study of the timber resources of the province, with special reference to the subject of coal mine timbers.

Road Materials Investigations

The road materials division, under Dr. Clark, is engaged on a totally distinct problem. Road conditions in this province are well known; a large mileage of dirt roads situated far from sources of the ordinary materials used to improve such roads and to render them passable in wet weather. It was natural, under the circumstances, to turn to the vast supplies of bituminous sand in the north, and to consider their use as a road material.

Many lines of attack were possible and are possible, but the work of the council has resulted in the development of a commercial method for separating the bitumen from the sand, so that a concentrated product may be shipped from the deposit to the point of use.

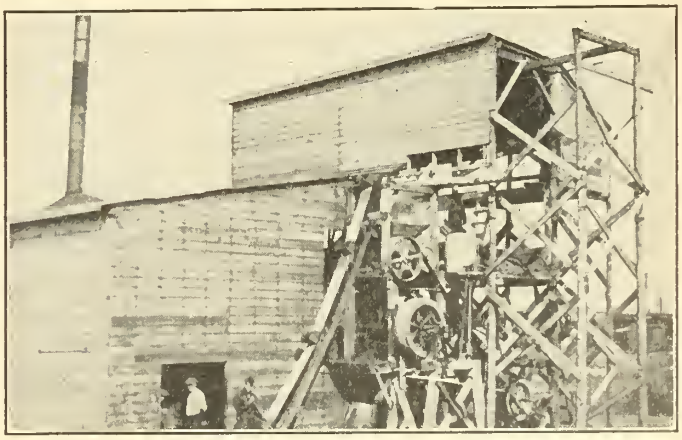


Figure No. 5.—Bituminous Sand Separation Plant.

*Journ. Ind. & Eng. Chem., Oct. 1922, p. 921.

Figure No. 6.—Incorporating Bitumen into Dirt Road Surface.

The operation briefly is as follows: — If the sand, every particle of which is coated with a film of bitumen, is treated while hot with a dilute solution of waterglass, the film is loosened from the sand, although remaining mechanically mixed with it. If, now, these film particles of bitumen are suitably aerated, they will float on the water while the sand sinks to the bottom. This sounds, and is, simple, but years of hard work intervened between the first discovery of the action of waterglass and the development of a satisfactory process. Two more years elapsed before the process was developed to the present smooth commercial operation. The first separation plant to treat small batches was operated in 1922. The second plant, which was erected in the basement of the university power house during the winter of 1922-23, could treat about half a ton of sand per hour. This plant gave good results, and produced enough bitumen for some road-treating experiments. The third plant, which was on a semi-commercial scale, was built at the Dunvegan yards at Edmonton. That is at the city terminus of the A. & G. W. Ry., over which the raw material is brought from the north. This plant was built in 1924, and operated for a short time at the end of the season, but not very successfully. The difficulties encountered were carefully investigated during the past winter in a laboratory plant, alterations were made this spring, and the plant is now operating with marked success. The average throughput is about 80 tons of sand per week, operating one shift per day only, and the total programme, which called for the treatment of 500 tons of sand, probably will be completed this week. The plant is continuous in its action; the raw sand being fed in on one side, and a steady stream of bitumen flowing out at the other. The tailings are almost clean sand. Figure No. 5 shows this plant from the feed side.

The further problem arises: — How can this bitumen be best used on the roads? A dirt road is fairly satisfactory in dry weather, where the traffic is not very heavy, but becomes almost impassable in wet weather. However, if the clayey soil in the roads is throughly mixed with sufficient bitumen, it becomes waterproofed. Some test briquettes were made with specimens of soil from local roads, mixed with 5 per cent of bitumen, but most of these briquettes fell to pieces after being subjected to a prolonged artificial rain. The same soils showed satisfactory waterproofing in most cases with 10 per cent of bitumen, and in all cases with 15 per cent. The quantity of bitumen required is found to vary with the clay content of the soil.

In 1923, a short stretch of dirt road on the university campus was waterproofed by this method as a trial experiment. Later a strip of road 14 feet wide and 500 feet long, on the Fort Saskatchewan trail, was treated. It was desired to incorporate 10 per cent of bitumen into the top six inches of surface, but the total supply

Figure No. 7.—Dirt Road after Heavy Rain — Experimental Strip in Background.

of asphalt, about 5 tons, would not permit this. Actually about 3 inches were treated, and only the upper layers received the required 10 per cent of bitumen. Figure No. 6 shows the road while the bitumen was being incorporated. Figures Nos. 7 and 8 show the adjacent road and the treated road on May 26th of the following year, after a very heavy rainfall. It is clear that even the partial treatment given this road enabled it to turn a heavy rain. Owing to the short length and narrow width of this strip, mud has been tracked on by the traffic from the sides and ends, until the treated surface has been almost obliterated.

A new feature of the problem has arisen with the development of the oil wells of the Wainwright district. This oil might also be used for road treatment, either crude or after topping. During the present season one mile of road is being treated on the St. Albert trail. The first half-mile, which is now almost completed, has been treated with crude oil from Wainwright, and the second half-mile is to be treated with McMurray bitumen from the separation plant. These experiments should give a good indication of the possibility of a large mileage of all-weather roads in the province, prepared at a reasonable expense.

The 1924 programme of work of this department also included a careful study of the deposits along the Athabaska river and its tributaries, with particular reference to the feasibility and probable cost of commercial development.

In conclusion, it should be noted that the council will always be glad to receive suggestions, advice, or friendly criticisms from the engineers of the country.

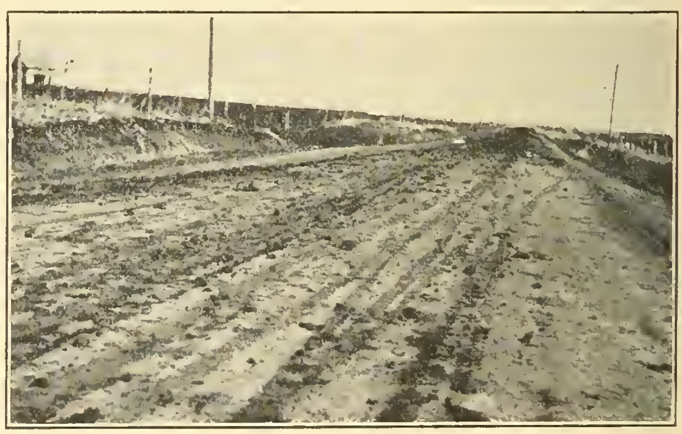


Figure No. 8.—Experimental Strip of Bituminized Dirt Road after Heavy Rain.
(The scattered lumps of dirt were tracked on by traffic from the untreated road.)

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THE

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OF CANADA

VOL. VIII OCTOBER 1925 No. 10

Maritime General Professional Meeting

Halifax, N. S., October 8th, and 9th, 1925.

Commencement of Activities

At the commencement of the fall and winter activities of the various branches, the secretary ventures to congratulate the membership of *The Institute* on the work already accomplished, and expresses his confidence that the coming year will see *The Institute's* high standard maintained, and its steady progress continued.

Council, in resuming its regular meetings after the summer recess, will direct its attention to a number of questions of *Institute* policy which call for consideration at this time. A number of these are being brought up as a result of suggestions received from the membership, while others arise from the reports of the various committees of council. In regard to many of these matters the secretary has already been able to lay before council the views of the members of the branches which he has visited, and he will continue this course as opportunity offers.

An interchange of opinions, effected in this way, is one of the best available means for promoting the progress of *The Institute* as a whole, while enabling each branch to make its opinion felt. The wide area over which our membership is spread is, of course, a matter for satisfaction, but introduces practical difficulties of administration which must be faced and overcome if *The Institute's* influence as a nation-wide body is to be maintained and developed.

Members will note that the opportunities afforded by the recent Western Professional Meeting at Banff and the forthcoming Maritime Professional Meeting at Halifax have been utilized for holding special meetings of council. Such eastern and western meetings are particularly desirable, for on such occasions councillors who are usually unable to attend in Montreal or Toronto can take a personal part in the debates, a participation which is far more effective than any written discussions can possibly be. This policy of holding frequent council meetings at points away from headquarters is one which cannot fail to commend itself to the membership at large.

The International Electrotechnical Commission

The important work of this Commission is perhaps not so well known to the engineering public as it should be. With the increasing activity in electrical engineering work it became obvious that international uniformity in legal electrical units was desirable, and in 1904, at the suggestion of the British Government, the International Electrotechnical Commission was formed to promote this very desirable object.

This Commission comprises national committees representative of all of the principal countries interested in electrical work, the members of these National Committees being nominated by the principal technical societies of the countries concerned. The Headquarters of the Commission are in London.

The development of the Commission's work led to the formation of a number of Advisory Committees to deal with its various divisions, and a meeting of these Advisory Committees was held at the Hague in April last, when most gratifying progress was achieved.

The Canadian National Committee of the I.E.C., has recently been reorganized under the auspices of *The Engineering Institute of Canada*, and its Secretary, H. A. Dupré, M.E.I.C., attended and took part in the meetings at the Hague. The various Advisory Committees sitting at this meeting were those on:—

Symbols and Nomenclature
Rating of Electrical Machinery
Prime Movers
Traction Motors
Transformer Oils
Standard Pressures
Rules and Regulations for Overhead Transmission Lines

A successful innovation at this conference was the presentation at the commencement of the session of special papers by experts, selected by the Council, each dealing with one of the particular subjects under consideration.

During the course of the meetings there was naturally at first a marked tendency for each delegate to lay stress on the correctness of his own country's proposals. One of the greatest advantages of a conference such as that recently held, is the spirit of compromise which naturally develops during the proceedings, and which is indispensable if real international agreement is to be attained.

The Committee on the Rating of Electrical Machinery made substantial progress in dealing with the form of specification for large machines.

The Committee on Prime Movers is endeavouring to agree on specifications which can be commercially used in all countries in inviting tenders.

The Committee on Transformer Oils is dealing with a mass of important information submitted regarding the tests for transformer oils, particularly with regard to their sludging properties, and has mapped out a comprehensive programme of investigation on this subject.

Under the original constitution of the Commission, long delay was frequently experienced after an advisory committee had made recommendations before these could receive endorsation at a Plenary Meeting of the Council of the Commission before publication. To obviate this delay a Committee of Action has been established which can meet more frequently, the duty of this Committee being to circulate recommendations of the Advisory Committees and obtain the consent or objections of the various national committees without waiting for a Plenary Meeting.

The final decision, in case objections are made, still remains, of course, with the Council of the Commission.

It is gratifying to note that close co-operation exists between the various National Committees of the International Electrotechnical Commission and the various national bodies charged with the work of promoting engineering standardization in general.

The Institute Library

The work of recataloging the library of *The Institute* at headquarters, which has been in progress during the past year, is nearing completion, and, while books were available to members of *The Institute* throughout the period of recataloging, with the completion of the work it will be possible to render greater service in meeting the demands for books and general information.

The system of classification adopted is that known as the Brussels Expansion of the Dewey Decimal System, and is similar to that used in the Engineering Societies Library in New York City.

The library contains approximately sixteen hundred volumes in addition to files of other societies' transactions and proceedings and technical periodicals, in most cases extending over a period of many years. During the past two years a large number of volumes have been added to the library including works on practically every branch of engineering.

It is opportune to draw the attention of the members to the service which the library is prepared to render. All books, with the exception of transactions and technical periodicals may be secured on loan by members of *The Institute*, no matter where located, a deposit of five dollars for each book being required.

In addition, photostatic copies of any articles appearing in transactions and periodicals may be secured through the library; searches for published information on any particular subject will be undertaken and articles in foreign languages will be translated. For this work the charge will be only sufficient to cover the cost of the work. Further information regarding this service and estimates of cost will be forwarded to members on request.

It is desired to render as complete service as possible through the library, and it is hoped that the members will avail themselves of this service.

American Society of Civil Engineers to Meet in Montreal

The Fall Meeting of the American Society of Civil Engineers is scheduled to take place in Montreal October 14th, to 16th, inc., with headquarters at the Mount Royal Hotel.

The programme is as follows:—

Wednesday, October 14, 1925.

Morning

10.30 "Work of the Quebec Streams Commission", O. O. Lefebvre, M.E.I.C., chief engineer, Quebec Streams Commission, Montreal, Que., Canada.

11.15 "Developments by the Hydro-Electric Power Commission of Ontario", Frederick A. Gaby, M.E.I.C., chief engineer, Hydro-Electric Power Commission of Ontario, Toronto, Ont.

12.30 Luncheon, Banquet Hall, for members, ladies, and guests. Address on "The Roads of the Province of Quebec", by the Hon. Joseph L. Perron, Minister of Roads, Montreal, Que.

Afternoon

2.15 "Some Economic Aspects of Hydro-Electric Development in Canada", Ira W. McConnell, vice-president, Dwight P. Robinson and Company, New York.

3.00 Hydro-Electric Development in Canada: Discussion led by H. G. Acres, M.E.I.C., hydraulic engineer, Hydro-Electric Power Commission of Ontario, Niagara Falls, Ont.; N. R. Gibson, M.E.I.C., hydraulic engineer, the Niagara Falls Power Company, Niagara Falls, N.Y.; William S. Lee, M.E.I.C., chief engineer, Southern Power Company, Charlotte, N.C.; D. W. Mead, professor, hydraulic and sanitary engineering, University of Wisconsin, consulting engineer, Madison, Wis.; Julian C. Smith, M.E.I.C., vice-president and general manager, Shawinigan Water and Power Company; Arthur Surveyer, M.E.I.C., consulting engineer, Montreal.

Evening

9.00 Smoker: Given by the Montreal Branch of The Engineering Institute of Canada, to members of the Society and their engineer guests.

Thursday, October 15, 1925.

Morning

Sanitary Engineering Division

9.30 "The Water Supply of Montreal, Que., Canada", F. E. Field, M.E.I.C., division engineer, Montreal Water Board, Montreal.

9.45 Symposium: "Grit Chamber Practice",

"Canadian Practice", F. A. Dallyn, M.E.I.C., director of sanitary engineering, Division Board of Health of Ontario, Toronto.

10.00 "Grit Chamber Design", George B. Gascoigne, consulting sanitary engineer, Cleveland, Ohio.

10.15 "German Practice in Grit Chamber Design", Karl Imhoff, chief engineer, Ruhr-Verband, Essen, Germany.

Discussion led by John F. Skinner, consulting engineer, deputy city engineer, Rochester, N.Y.

City Planning Division

Joint Session with the Town Planning Institute of Canada.

10.00 "The Engineer and the Town Plan", James Ewing, M.E.I.C., vice-president, Town Planning Institute of Canada, consulting engineer, Montreal, Que.

Discussion, Arranged by the Town Planning Institute of Canada.

11.00 "Aerial Photographic Maps for City Planning", Gerard H. Matthes, consulting engineer, Fairchild Aerial Surveys, Inc., New York, N.Y.

Discussion led by Frederick W. Cowie, M.E.I.C., consulting engineer, Montreal, Que.

Structural Division

9.15 "Producing a Concrete of Uniform Quality on the Job: The Factors Fundamental to Success, with Observations Based on Six Years' Experience", R. B. Young, M.E.I.C., assistant laboratory engineer, Engineering Materials Laboratory, Hydro-Electric Power Commission of Ontario, Toronto, Ont.

Discussion led by T. P. Watson, assistant engineer, Engineering Department, Pennsylvania Railroad, Pittsburgh, Pa.

10.30 "Concrete Proportioning and Testing on Exchequer Dam", L. H. Tuthill, engineer, Exchequer Dam, Exchequer, Calif.

11.30 "Water Ratio Specification for Concrete", F. R. McMillan, and Stanton Walker, associate engineers, Structural Materials Research Laboratory, Lewis Institute, Chicago, Ill.

Friday, October 16, 1925.

All day excursion to the power development on the St. Maurice river has been arranged. The party leaving from Windsor Station 8.15 a.m. by special train and returning to Montreal that night.

OBITUARY

Arthur Robert Henry, M.E.I.C.

Arthur Robert Henry, M.E.I.C., for the past seventeen years consulting engineer in Montreal, died suddenly on September 3rd, 1925, at the Royal Victoria Hospital, Montreal.

The late Mr. Henry was born in Quebec on July 7th, 1872, and received his engineering education at Cornell University from which he graduated in 1893. Following graduation he was for two years draftsman and designer with the Robb Engineering Company at Amherst, N.S. During the season of 1896-97 he took a post graduate course in electrical engineering at McGill University. The following year he was appointed assistant engineer of the Canadian Electric Light Company at Levis, Que.

In 1900, Mr. Henry was inspector and superintendent for the Canadian Electric Light Company and T. Pringle and Son on the construction of the hydro-electric development at Chaudiere Falls, Que., and for three years, 1902 to 1905, was alternately, superintendent, general superintendent and acting manager on operation and enlarging of this plant for the same company. For three years, 1905 to 1908, until entering consulting practice, he was representative for Messrs. Ross and Holgate; first on the installation of the central steam plant at the Canadian Pacific Railway Angus Shops; later in connection with work for the Hydro-Electric Power Commission of Ontario, and subsequently on the hydro-electric power development for the Huronian Company on the Spanish river, in Ontario. During his years of consulting practice he had charge of the investigation, reporting, designing and construction of many works in this country.

PERSONALS

H. J. Whiting, Jr.E.I.C., is located at Temiskaming, Que., engaged on the construction work in connection with the extension to the mill of the Riordon Pulp Corporation Limited.

C. P. Hotchkiss, A.M.E.I.C., executive secretary of the Dominion Fuel Board, left on August 8th, for a three months' inspection trip of the coal mines of western Canada, particularly those of Alberta.

C. H. N. Connell, A.M.E.I.C., formerly district engineer, Ontario lines, Canadian National Railways, at Toronto, has been appointed district engineer, Northern Ontario District, with headquarters at North Bay, Ont.

G. H. Blanchet, F.R.G.S., M.E.I.C., of the staff of the Topographical Survey, Department of the Interior, has returned to Ottawa after a season spent on the exploration of the headwaters of the Thelon and Dubawnt rivers, Northwest Territories.

Dr. Charles Camsell, B.A., M.E.I.C., deputy minister of mines has just returned from a general inspection trip throughout western Canada. He included in his itinerary a visit to the Okotoks oil field near Calgary and attended a meeting of the Lignite Utilization Board at Regina.

J. F. Pringle, A.M.E.I.C., has been appointed assistant general superintendent, transportation, with the Canadian National Railways, with headquarters at Toronto. Mr. Pringle was formerly transportation engineer with the company at Montreal.

M. S. Sutherland, A.M.E.I.C., resident engineer, Larder Lake Branch, Nipissing Central Railway, has been appointed resident engineer of the Cobalt-North Bay trunk road, with the Northern Development Branch, of the Department of Lands and Forests, Ontario.

A. G. Pedder, A.M.E.I.C., has been appointed chief engineer of the Acadia Sugar Refining Company, Limited, at Dartmouth, N.S. Mr. Pedder was formerly chief engineer of the British American Nickel Corporation Limited, Nickelton, Ont.

W. H. Munro, M.E.I.C., who has for some time been located in England with Messrs. Vickers Limited, is returning to Canada to take over the duties of Sales manager with the Canadian Vickers, Limited, Maisonneuve, Montreal.

J. Jackson Crawford, S.E.I.C., has been appointed to the position of chemist with Messrs. Price Brothers and Company, Limited, at Kenogami, Que. Mr. Crawford graduated from the University of Toronto in chemical engineering in 1922 and has had several years experience in industrial chemical work.

C. A. Leighton, A.M.E.I.C., who has been located in Vancouver, B.C., for the past four years as construction engineer with the Northern Construction Company, has been transferred by the company to Montreal and is at present resident engineer on the port construction work at Wolfe's Cove, Quebec.

Norman Farrar, S.E.I.C., has received an appointment with the engineering staff of the Riordon Pulp Corporation, Limited, at Temiskaming, Que., prior to which he was with the Canadian National Railways on survey work since graduating from McGill University in civil engineering this year.

H. C. Lott, A.M.E.I.C., has accepted a position on the staff of Messrs. Balfour, Beatty and Company, Limited, of London, England, and is located at 66 Queen Street, E.C.4, London. Mr. Lott, who was born at Ashen Essex, England, and received his education in the Old Country, was for a number of years engaged on engineering works in Canada.

J. Warren Smith, M.E.I.C., is with the contracting department of Messrs. Whitehead and Kales Company, Detroit, Mich. Mr. Smith was for a number of years with the Dominion Bridge Company, occupying position of chief draftsman and structural engineer at the Toronto branch. He was later manager of the Robb Engineering Works, Toronto, Ont.

Capt. R. D. Thexton, A.M.E.I.C., has for some time past been located on the Nigerian Eastern Railway construction work on the West Coast of Africa, and is at present on leave in England where he will remain until February of next year, his present address being: Twyford, Winchester, Hants. During the past eighteen months Capt. Thexton has been in charge of bridge, culvert, and retaining wall construction in that district.

V. R. Davies, A.M.E.I.C., who has been engaged on highway work in Manitoba, has been appointed lecturer in mathematics and surveying at Queen's University. Mr. Davies received his degrees of B.Sc., and M.Sc., from McGill University and his degree of M.C.E., from the University of Manitoba in 1923. He is a Dominion Land Surveyor and was previously on the staff of the Department of Geodesy and Surveying as demonstrator and assistant at the Meteorological Observatory at McGill University.

A. J. T. Taylor, M.E.I.C., president of the Combustion Engineering Corporation, Limited, is at present in Europe, where he is conducting a party of Canadian and American consulting engineers on a tour of inspection of plants in Sweden and Germany. The party left New York on September twelfth and will be gone about two months. Accompanying Mr. Taylor are, W. G. MacNaughton, M.E.I.C., Secretary of the Technical Section of the Pulp and Paper Association, and S. A. Andrews, on the staff of a well known consulting engineer, H. G. Acres, D.Sc., M.E.I.C., of Niagara Falls, Ont. The party will follow the same itinerary as was used by the Anglo-Japanese Commission to Sweden last year, of which Mr. Taylor was the English speaking representative.

F. H. Peters, M.E.I.C., director of surveys, Department of the Interior, who has been visiting the survey parties in the western provinces has returned to Ottawa. He accompanied Lt.-Col. H. St. J. Winterbotham, chairman of the Air Survey Committee of the British War Office, on his western trip and rendered him valuable assistance in his investigation of the methods of aerial photographic surveying now being used in connection with mapping the large areas of western Canada lying north of the present subdivided area. They visited Victoria Beach air station of the Royal Canadian Air Force and were taken on one of the flights.

Another interesting recent development of the assistance rendered to mapping by aerial survey photographs was investigated in two areas, one lying north of Edmonton and the other near Calgary where aerial photographs were supplied to the surveyors in the field and their work consisted largely in identifying the features shown in the pictures.

Institute Member elected to Legislative Assembly

A. D. Taylor, A.M.E.I.C., of Minto, N.B., was recently elected a member of the legislative assembly of New Brunswick as Conservative representative for the country of Sunbury.

Mr. Taylor was born at St. Stephen, N.B., on March 30th, 1889. He was educated at the public school of St. Stephen and later attended Washington School, Washington, Pa., receiving his engineering education at the University of New Brunswick. He has been engaged in active engineering work since 1907, the first three years of which were spent on railway location and construction, principally in connection with the National Transcontinental Railway. He later moved to the United States where he was engaged in various engineering works, connected principally with municipal and highway survey and construction. He returned to New Brunswick in 1913, and for three years was with G. G. Murdoch, M.E.I.C., St. John, N.B., engaged on sewerage, land surveys and general municipal work, but was subsequently employed by the province of New Brunswick as special supervisor in charge of rebuilding of certain provincial roads. In March 1916 he received his commission as a New Brunswick Land Surveyor.

Since 1917, Mr. Taylor has been engaged in the coal mining district at Minto, N.B., and is at present manager of the coal mining and lumbering operations of the Miramichi Lumber Company, Limited, a subsidiary of the International Paper Company, Limited, at Minto, N.B.

Dr. H. B. Dwight, A.M.E.I.C., appointed Professor

Dr. Herbert Bristol Dwight, A.M.E.I.C., who has been appointed professor of electrical engineering at the Massachusetts Institute of Technology, is a graduate of McGill University from which he received the degree of D.Sc. last year. He served his apprenticeship in the shops of the Canadian Westinghouse Company and joined their engineering staff in 1907. His genius for mathematics soon brought him to the front and he is author of numerous books and papers. His "Transmission Line Calculations" has gone through two editions and is regarded as a standard work. Besides his mathematical attainments, his genial and kindly disposition has endeared him to all his associates.

On Wednesday, September 9th, 1925, a party of about forty Canadian Westinghouse engineers, under the chairmanship of their genial chief, H. U. Hart, M.E.I.C., met for dinner at the Hamilton Club to bid farewell to Dr. Dwight. The speakers were, besides the chairman, C. H. O. Pook, manager of works, C. A. Price, A.M.E.I.C., assistant chief engineer, Brig.-Gen. C. H. Mitchell, C.B., C.M.G., M.E.I.C., H. M. Bostwick, D. P. Brown and L. B. Chubbuck. Dr. Dwight made a suitable reply and the evening closed by an adjournment to Pantages theatre.

Dr. Dwight was presented with a travelling bag by some of his engineering friends. He is leaving for Boston in a few days and will at once take up his duties there.

C. A. Magrath, M.E.I.C., New Hydro Chairman

C. A. Magrath, M.E.I.C., of Ottawa, has been appointed chairman of the Hydro-Electric Commission of Ontario according to the announcement made by Premier Ferguson. In announcing the appointment the Premier drew attention to Mr. Magrath's exceptional qualifications including his undoubted integrity and outstanding ability in administration.

Mr. Magrath's professional experience has been varied and to a marked degree of a public nature. In early days Mr. Magrath practised the profession of land surveyor in the North West Territories, holding the title of Provincial and Dominion Land Surveyor and D. T. S. He was land agent for the Alberta Railway and Coal Company, and later played an important part in the development of the sub-arid districts of Southern Alberta

C. A. Magrath, M.E.I.C.

as manager of the Canadian North West Irrigation Company. He entered politics in 1891 as member for Lethbridge, holding the post of minister without portfolio in the Haultain Ministry in Saskatchewan from 1898 to 1901. He also represented Medicine Hat in the House of Commons from 1908 to 1911.

From 1911 to the present date Mr. Magrath has occupied, with distinction, the chairmanship of the Canadian section of the International Joint Commission. This body, which has dealt with many important international questions such as, the Lake of the Woods levels and the St. Lawrence deep waterways schemes, owes much to his indefatigable energy and executive ability.

In 1913 he was chairman of a temporary Ontario Highways Commission which presented a comprehensive plan of highway expansion for the Whitney Government, on which all subsequent highway development in the province has been based.

During the war Mr. Magrath was a member of the War Trade Board of Canada and acted as fuel controller from 1917 to 1920. He has been a member of the Federal Advisory Fuel Committee since 1922. In 1920 he performed an important mission in acting as chairman of a commission appointed to investigate agricultural conditions in Southern Alberta.

Fellow members of *The Institute* cannot help but feel that this appointment to the field of business administration, bears tribute also to the engineering profession as a whole.

The Canadian Good Roads Association Annual Convention

The twelfth annual convention of the Canadian Good Roads Association, convened at the Chateau Frontenac, Quebec City, on September 22nd, 23rd and 24th, has proved one of the most successful in the history of the Association. With a registration of over three hundred delegates, and the discussion of subjects of unusual importance by outstanding men in highway engineering and administration, the Association is to be congratulated on the quality of its programme, the interesting and instructive character of the papers presented, and the enthusiasm exhibited throughout the entire meeting.

The opening session, on the morning of September 22nd, was called to order by the president, Ex-Premier P. J. Veniot, of New Brunswick, who briefly welcomed the official representatives and guests. The Lieutenant-Governor of Quebec, The Honourable Narcisse Pérodeau, then addressed the meeting extending a further welcome, following which greetings from the various provinces and from the United States, were conveyed by representatives to the meeting.

The first paper presented was entitled "The Success of Federal Aid to Date" by A. W. Campbell, M.E.I.C., chief commissioner of highways, Dominion Government, Ottawa, who reviewed in his paper the work of the federal government in connection with the highways of the country.

The second paper was presented by S. L. Squire, deputy minister of highways for Ontario, who explained that in his address on "Who Shall Pay for Highways and Our Transportation Problems?" he was giving his views as a private citizen and not in his official capacity. Mr. Squire recalled that while more than $300,000,000 had been spent on roads in Canada in ten years the road systems were still incompleted. Roads must be paid for collectively and public men are endeavoring to fix an equitable assessment of the cost. The determining factors in road expenditure are motor traffic and density of population. After going thoroughly into traffic census figures and other statistics showing the use made of the roads by various classes of the community, Mr. Squire gave the following approximate apportionment of highway costs as suitable for Ontario and capable of adaption by other provinces:

Rural portions to pay 22 per cent; towns and villages, 5 per cent; cities, 11 per cent; the road user (by gasoline tax, motor feed, etc.), 34 per cent, leaving 28 per cent to be shared by the federal Government and the province in the respective proportions of two-fifths and three-fifths.

Mr. Squire emphasized that Canada's railway problems were intermixed with highway transportation. Busses must be so taxed and regulated as to pay their proportion of road costs and prevent unfair competition with railways and electric lines. Transportation must be so co-ordinated that the railways will have the long haul at equitable rates, using the highways for short hauls.

The discussion on Mr. Squire's paper which was postponed until the morning session of Wednesday, September 23rd, brought forth some strong views in opposition to those set forth in the paper.

At the morning session, on the twenty-second, a paper on "Dust Elimination on Gravel Roads" by B. C. Tiney, maintenance engineer, Michigan Highway Department, was presented in which Mr. Tiney explained that dust control was desirable on roads carrying 300 to 500 vehicles daily, and almost a necessity when daily traffic exceeded 500 vehicles. The Michigan practice was divided between dust palliatives, calcium chloride or light asphaltic oil, giving a temporary effect, and bituminous surface treatment, giving complete elimination of dust. So far the state has been able to treat only 800 miles out of 2,300 miles, but public sentiment for dust elimination is becoming more insistent yearly. Patrol patching is an important factor in maintaining the road surface in proper condition. The cost of dust elimination, including initial treatment and renewal, worked out at an average of $850 per year over a four-year period.

Opening the discussion, Alex. Fraser, A.M.E.I.C., chief engineer of the Quebec Highways Department, reviewed his experience with calcium chloride and oil as dust layers. The cost of the former was $200 per mile for each application; and of the latter $375. So far the department had not drawn a definite conclusion as to the oil manufacturers' claim that treatment with their material lasted twice as long as the calcium chloride.

The subject of "Provincial Maintenance Systems" was discussed in a paper by H. M. Necker of La Société Générale des Ponts et Chaussées, Ltée.

The final paper of the morning session was on "The Economic Use of Refined Tars in Keeping with Traffic Conditions" and was presented by J. S. Crandall, consulting engineer of New York City, while the afternoon session was opened by a paper on "Bituminous Paving Mixtures for Resurfacing Old Macadam Roads" by D. McK. Hepburn, of Philadelphia. Both these papers were illustrated by lantern slides.

"Recent Developments in the Construction of Cement Concrete Roads" was presented by H. Eltinge Breed, consulting engineer, New York City.

R. A. C. Henry, M.E.I.C., director, Bureau of Economics, Canadian National Railways, in his paper entitled "Common Carriers" dealt with the necessity of maintaining a proper balance between motor vehicles and the older system of travel and distribution of necessities.

The final session for the presentation of technical papers was on the morning of September 24th. At this session a paper entitled "Enforcing Traffic Regulations on the Highways", was delivered by R. B. Stoeckel, commissioner of motor vehicles for Connecticut, following which Bertram E. Murray, superintendent of highways for Warren County, New York, gave an illustrated address on "Winter Roads — Cost Data and Equipment", and city Engineer Jarman, of Westmount, led the discussion and described Westmount's snow removal methods.

"What We Were Taught by the Traffic Census," was the title of an informative paper by J. L. Boulanger, deputy minister of highways for Quebec, in which he detailed the specific aims in mind in taking a traffic census on the highways of the province.

The session was concluded by a paper entitled "The Modern Brick Pavement" by W. C. Perkins, chief engineer, Eastern Paving Brick Manufacturers Association, Philadelphia.

Ample provision was made for entertainment and excursions to various points of interest in the vicinity of Quebec.

The announcement of officers for the ensuing year is as follows:— Hon. past-president, Hon. J. L. Perron, Quebec; hon. president, Hon. P. J. Veniot, New Brunswick; president, Hon. W. R. Clubb, minister of public works, Manitoba; first vice-president, Hon. George S. Henry, minister of public works, Ontario; second vice-president, Hon. John Oliver, premier of British Columbia; secretary-treasurer, George A. McNamee, Montreal. Additions to the directorate were: Theo. G. Morgan, president of the Royal Automobile Club of Canada; Hon. D. W. Stewart, minister of public works, New Brunswick; ex-Controller R. H. Cameron, Toronto; Hon. P. C. Black, minister of public works, Nova Scotia, and the president to be elected by the newly-formed Alberta Good Roads Association.

Standards of the A.S.T.M.

The American Society for Testing Materials, has issued a pamphlet of standards adopted in 1925. This volume has one hundred and twenty pages and contains thirty-six revised or newly adopted standards of the Society and forms the first supplement to the nineteen twenty-four issue of the Society's triennial book of standards. Copies of this pamphlet are available upon application to the Society's office, 1315 Spruce street, Philadelphia, Pa., at a charge of one dollar and a half.

ELECTIONS AND TRANSFERS

At the meeting of Council held on September 15th, 1925, the following elections and transfers were effected:

Member

SCHMIDLIN, Edward James Carson, (Diploma with Honours, R.M.C.), professor of engineering, Royal Military College, Kingston, Ont.

Associate Members

BOURNE, Herbert Frederick, municipal engineer, Esquimalt, B.C.
CLARKE, George Good, B.Eng. (Liverpool Univ.), Dominion Bridge Company, Montreal, Que.
JAMES, Alan Mackenzie, B.Sc. (Dal. Univ.), Lands and Rights Engr., Nova Scotia Power Commission, Halifax, N.S.
MELDRUM, William, mining engr. and surveyor, Galt Mines, C.P.R., Hardieville, Alta.
NICOLL, James McLaren, B.A., B.Sc. (Univ. of Alta.), transitman, mtce. of way dept., C.P.R., Calgary, Alta.
READ, Guy Carleton, electl. engr., Fred Thomson Co. Ltd., Montreal, Que.
RUSSELL, Cyrus James, gen. asst. to supt., The Great Lakes Power Co. Ltd., Sault Ste. Marie, Ont.

Juniors

CUNNINGHAM, Adam, B.Sc. (Edinburgh Univ.), asst. to engr. in charge, statistical and record dept., Price Bros. & Co. Ltd., Kenogami, Que.
GIRARD, Henri, C.E. (Ecole Polytech.), technical service dept., City of Montreal, Que.
TOUZIN, Thomas, B.Sc., C.E. (Ecole Polytech.), engr., Montreal Water Board, Montreal, Que.

Affiliate

HARDING, Charles Percy, 2019 Delorimier Avenue, Montreal, Que.

Transferred from the class of Associate Member to that of Member

HAYWARD, Joseph William, B.Sc. (Manchester Univ.), P.O. Box 111, Ste. Anne de Bellevue, Que.
MUDGE, Arthur Langley, B.A.Sc. (McGill Univ.), power plant engr., on staff of Canadian Section, Joint Engineering Board, St. Lawrence Deep Waterways Project, Toronto, Ont.
JETTE, Joseph Arthur, C.E., B.A.Sc. (Laval Univ.), asst. engr., Montreal Water Board, Montreal, Que.

Transferred from the class of Junior to that of Associate Member

FERRIS, Cecil Bruce, D.C.M., Croix de Guerre, B.A.Sc. (Univ. of Toronto), architect's dept., Board of Education, Toronto, Ont.
THOMSON, Alexander, hydrometric engr., Lethbridge Northern Irrigation District, Lethbridge, Alta.

Transferred from the class of Student to that of Associate Member

O'SULLIVAN, Louis Leo, B.Sc. (McGill Univ.), designer, Montreal Light, Heat & Power Cons., Montreal, Que.

Transferred from the class of Student to that of Junior

CURRIE, Victor Robert, B.Sc. (Queen's Univ.), levelman, Alabama Power Company, America, Ala.
ROBERTSON, Donald Grange, B.Sc. (Queen's Univ.), dftsman., Southern Canada Power Company, Drummondville, Que.

The following students were admitted:

CAMPBELL, Wilfred John, B.A.Sc. (Univ. of Toronto), 17 Cranford Avenue, Windsor, Ont.
CREELMAN, Edward Francis, P.O. Box 458, Truro, N.S.
FOULKES, Thomas, P.O. Box 271, Campbellton, N.B.
FOY, Albert Joseph Bernard, B.Sc. (McGill Univ.), 71 Clandeboy Avenue, Westmount, Que.
GAGNON, Elmore Girard, 629 Rivard Street, Montreal, Que.
HAYMAN, Alden Bernard, B.Sc. (Dal. Univ.), P.O. Box 1036, Truro, N.S.
JONES, John Hugh Mowbray, 17 Summit Avenue, Sault Ste. Marie, Ont.
OLIVER, John Craig, 2716–42nd Avenue West, Vancouver, B.C.
ROCHESTER, William Laurence, B.Sc. (McGill Univ.), 145 James Street, Ottawa, Ont.
STAIRS, Henry Gerald, Mabou, N.S.

EMPLOYMENT BUREAU

Situations Wanted

Electrical Engineer

Manitoba University Graduate in Electrical Engineering, with three years experience on design, checking and construction with large American electrical contracting firm desires position in engineering department of public utility or contracting company in Canada. 28 years of age, in excellent health and of good appearance. At present employed. Available on two weeks notice. Best of references. Apply box No. 193-W.

Testing Engineer

A young engineer, age 30, McGill Graduate, and past student in Metallurgy of the Royal School of Mines, London, England, desires a position with some inspection and testing company; 4½ years' experience in the testing of timber, also inspection of iron and steel. Apply box No. 194-W.

Construction Engineer

Keen progressive and thoroughly experienced contractors' engineer desires to connect up with a good firm of contractors. First class estimator with executive, designing and superintendent's experience. Box No. 195-W.

Civil Engineer

Canadian civil engineer, university graduate, M.E.I.C., at present employed on large power plant construction in Michigan, desires to return to Canada. Experience covers reinforced concrete design, plant maintenance, and concrete and general construction. Would consider any class of work, not necessarily engineering, where technical training and experience may win advancement. Personal interview sought where any such opportunity offers. Box 196-W.

Industrial Engineer

Recent graduate qualified to take charge of manufacturing plant. Experience on production, maintenance, and costs. At present superintendent of a large plant manufacturing gray iron products. Available on one month's notice. Best of references. Apply box No. 197-W.

Situations Vacant

Mechanical Engineer

Recent graduate required by a large manufacturing concern for work on factory methods and manufacturing problems. Please state in first instance, education, full qualifications, references, salary required, age, and when available. Apply box No. 144-V.

Sewer Designer

A city in Ontario requires the services of a designing engineer who has had extensive experience in sewer design in works of large capacity. Applications should give full details of qualifications and experience. Apply box No. 145-V.

Safety Engineer

Safety engineer, preferably a mechanical graduate, to take charge of all safety engineering and accident claims and reports, with a large industrial corporation in northern Quebec. Apply box No. 146-V.

Motor Salesman

An experienced Motor Salesman for a Canadian Company. One with knowledge of fractional horse power as well as integral horse power motors and their applications preferred. In replying, give experience and salary expected. Apply box No. 147-V.

Members' Exchange

World Power Conference Transactions

For sale, one complete set of the transactions of the World Power Conference, consisting of five volumes. Apply to the Secretary of *The Institute*, 176 Mansfield Street, Montreal.

Transactions of The Institute

A member of *The Institute* wishes to dispose of a set of the Transactions of the Canadian Society of Civil Engineers, including all volumes issued up to 1904. These volumes are well bound, and are in perfect condition and would be suitable to complete a set for library purposes. For further information apply to Box 11-E.

Standardization of Methods of Rating Rivers

A joint technical committee is now being organized to bring about national uniformity in the methods of rating the water power of rivers, according to an announcement by the American Engineering Standards Committee. At the present time a given water power development may be rated at 10,000, 20,000 or 40,000 h.p., by different engineers, according to the point of view from which the work is done by the engineers. For example, the first figure might mean that the power is practically available all the time without provision of any storage basin. The second might mean that this power is available a certain percentage of the time. The last figure might indicate that under certain conditions, as for example if a storage reservoir is provided, the most effective use of the river flow will be achieved when this rate is reached.

The subject was discussed at length at the World Power Conference held in London in 1924 and the conference recommended that the subject be taken up in the different countries and if possible international agreement be reached upon it.

At the instance of the United States Geological Survey, the American Engineering Standards Committee made an investigation of the situation and found that many different groups were interested in bringing about national uniformity in the rating of rivers, including light and power companies, financial groups interested in power development, consulting engineers and federal authorities, such as the Federal Power Commission, Geological Survey, and Reclamation Service. This investigation was carried out by a special investigation committee under the chairmanship of Charles A. Mead, and a questionnaire was sent to all interested technical and industrial groups.

Statistical data published as the results of various surveys made by competent bodies, giving the amount of potential power resources in different sections of the country are now not always comparable, as the basis for rating rivers varies greatly and the work now being undertaken will supply the need of uniformity in order that the data shall always mean the same thing to engineers, operating companies and investors.

The Canadian Method

In Canada the desirability of having the water power resources of the country stated on a uniform basis was recognized a number of years ago and a system was sought which would be suitable to present a fair statement of the resources of the Dominion and at the same time afford, if possible, figures which would be readily comparable with those of other countries.

After due consideration, the system that appeared to be most appropriate was one in use, at the time, by the United States Geological Survey and it was adopted largely in order that the water power resources of the North American Continent might be stated on the same basis. Under this system water powers are calculated on the basis of 24-hour power at 80 per cent efficiency for two general conditions of flow, viz., "ordinary minimum flow" and "ordinary six-month flow".

The "ordinary minimum flow" is determined by selecting from the flow records of a stream the two lowest periods of seven consecutive days in each year and obtaining the average flow for each period. The average of such figures for all the years of record is taken as the "ordinary minimum flow".

The "ordinary six-month flow" is determined by arranging the months of each year according to the day of the lowest flow in each month. The lowest of the six high months is taken as the basic month. The average flow of the lowest seven consecutive days in this month determines the "ordinary six-month flow" for that year. The average of such figures for all years in the period for which records are available is taken as the "ordinary six-month flow" of the stream.

On certain rivers where storage studies have been made it is possible to state the water power resources under dependable flow conditions with storage, but in Canada such studies have been carried out on comparatively few rivers so that it is not possible to state for the whole country what amount of power is dependable with storage.

The system as outlined has been in use for the past eight years by the Dominion Water Power and Reclamation Service of the Department of the Interior and in that time estimates on the basis of "ordinary minimum flow" and "ordinary six-month flow" have been made for all known water power sites in the Dominion. These estimates have been widely used in reports and computations and all such would be rendered practically valueless if a change were made to another basis. The same system has been used by practically all provincial organizations. It has also been reported upon favourably for adoption in other parts of the British Empire.

In view of the foregoing and due to the fact that the system is easily and quickly applied and provides a very fair estimate of water power resources, the advantages of another system would be necessarily great before a change would appeal to those dealing with such matters in Canada.

BRANCH NEWS

Montreal Branch

C. K. McLeod, A.M.E.I.C., Secretary-Treasurer.

During the summer months the Papers and Meetings Committee have been working to obtain a programme for the coming season, the results of which will be of interest to the membership at large, as seen from the following:

Programme of Meetings

October to December, 1925.

Oct. 1st.—*Address on "Evolution"*, by Dr. L. E. Pariseau; chairman, J. L. Busfield, M.E.I.C.

Oct. 8th.—*Hydraulic Regulating Gates, Design and Manufacture with regard to Erection*, by F. Newell, M.E.I.C.; chairman, J. A. McCrory, A.M.E.I.C.

Oct. 15th.—No meeting (A.S.C.E. Ball).

Oct. 22nd.—*High Voltage Phenomena*, by F. W. Peek, Jr.; chairman, R. H. Mather, A.M.E.I.C.

Oct. 29th.—*Steel Construction*, by L. H. Miller; chairman, K. G. Cameron, A.M.E.I.C.

Nov. 5th.—*Rate Making, Public Carriers*, by Dr. S. J. McLean; chairman, J. M. R. Fairbairn, D.Sc., M.E.I.C.

Nov. 12th.—*Rock Ballasting on Eastern Lines, C.P.R.*, by A. C. Mackenzie, M.E.I.C.; chairman, A. R. Ketterson, A.M.E.I.C.

Nov. 19th.—*Some Recent Stress Analysis of the Photoelastic Method*, by Professor Heyman; chairman, F. P. Shearwood, M.E.I.C.

Nov. 26th.—*Aviation and Modern Engineering Practice*, by Wing-Commander E. W. Stedman, O.B.E., M.E.I.C.; chairman, W. Walker, A.M.E.I.C.

Dec. 3rd.—Student Papers; chairman, F. E. Winter, S.E.I.C.

Dec. 10th.—*Transmission Towers*, by Major C. M. Goodrich, M.E.I.C.; chairman, G. A. Wallace, Jr.E.I.C.

Dec. 17th.—Annual Meeting of Montreal Branch; refreshments; chairman, J. L. Busfield, M.E.I.C.

The branch membership will undoubtedly be interested in learning of the outstanding speakers that are contributing papers, and a large attendance is being looked forward to at all meetings.

Smoker during A.S.C.E. Meeting

The annual meeting of the American Society of Civil Engineers is to be held in Montreal, October 12th to 16th. The Montreal Branch has invited the members of the A.S.C.E. to attend a smoker on the night of the 14th. A committee is already at work preparing an interesting programme, and those who do not attend will miss a memorable evening.

A reception and dance is being held on the night of the 15th, and Montreal Branch members are invited to attend this reception on the same basis as members of the A.S.C.E.

Victoria Branch

E. P. Girdwood, M.E.I.C., Secretary-Treasurer.

On the occasion of the visit to the city of R. J. Durley, M.E.I.C., general secretary, the Victoria Branch tendered a luncheon to him at Messrs. Spencers, Limited, on Saturday, July 25th.

This afforded an opportunity for the members to meet Mr. Durley, but I am sorry to say few turned up as so many members were out of town.

G. B. Mitchell, M.E.I.C., chairman, addressed the gathering, and said Mr. Durley was commencing his trip rather than ending it, and called upon the general secretary, who rose to address the members.

Mr. Durley talked on the subject of policy of the E.I.C., answering questions of the members in such an able manner that they could not but think he had held the position for years. He spoke on the Canadian Standards Committee and the work which was performed by this branch, and said he hoped that the usual government grant for such purpose would be forthcoming this year.

E. P. Girdwood, M.E.I.C., the branch secretary, was called upon, and gave a tabulation of the work done by the branch since November last, after welcoming the general secretary.

Mr. Cleveland then spoke, welcoming Mr. Durley, and said he admired the way he took off his coat and rolled up his sleeves and waded into the new work. Mr. Durley met several of his former students who reminded him that they had often struggled with his examination papers in the old days.

Mr. Durley visited the Dominion drydock and Saanich observatory, and points of interest in the district.

Cape Breton Branch

D. W. T. Brown, Jr.E.I.C., Secretary-Treasurer.

Branch visits Glace Bay

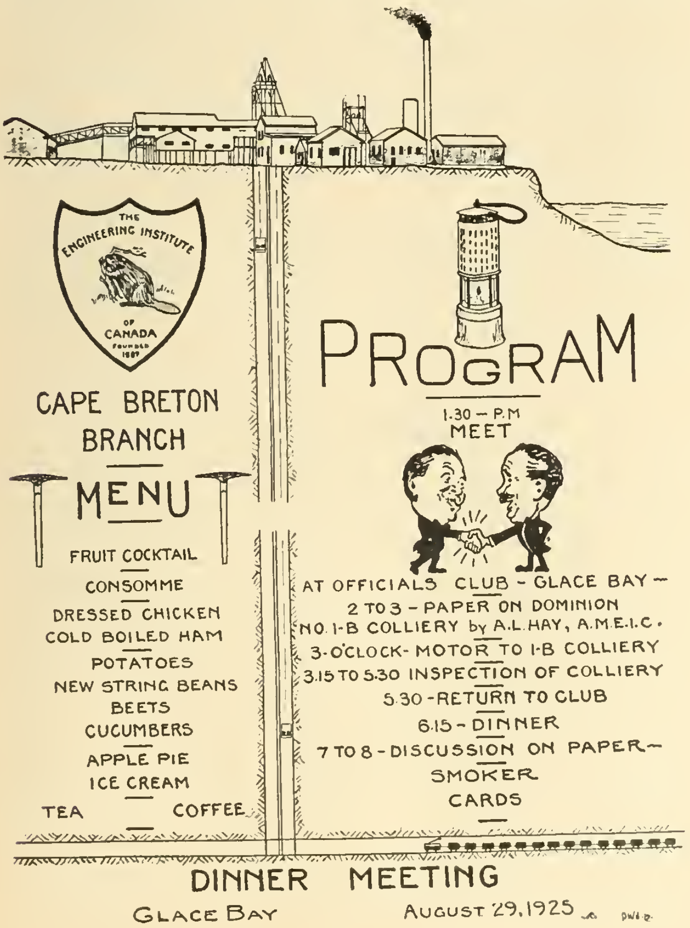
The activities of the Cape Breton Branch were auspiciously opened for the coming season by a dinner meeting held in Glace Bay on the afternoon and evening of Saturday, August twenty-ninth. Approximately fifty members and friends attended the meeting, forty remaining to the dinner. The Officials Club of the Dominion Coal Company, Ltd., was placed at the disposal of the branch through the kindness of Mr. H. J. McCann, general manager of coal mines for the British Empire Steel Corporation. The paper read at the meeting being devoted to No. 1-B Colliery of the Dominion Coal Company, Ltd., Mr. McCann also arranged for permission for all those attending the meeting to visit the colliery.

The meeting opened in the club rooms at two o'clock, at which time A. L. Hay, A.M.E.I.C., assistant mining engineer of the Dominion Coal Company, presented a paper on the above mentioned Dominion No. 1-B colliery. The speaker was thoroughly familiar with his subject, having been directly connected with the development of this important work, and being largely responsible for the success which is now being experienced in the operation of this colliery. The paper was illustrated by maps showing the location of the colliery being discussed and its relation to other collieries in the field and also its position in relation to the unworked portion of the famous Phalen seam in which it is located. These plans also showed how the merger of the Nova Scotia Steel and Coal Company, and the Dominion Coal Company, interests made this new colliery possible.

Mr. Hay told of the difficulties encountered in the operation of No. 1-A colliery due to the excessive length of underground rope haulage, and of the advantages gained by reaching this field through the new opening and with improved equipment at No. 1-B, which is now the most important of the mines operated by the company, and the largest producer in Nova Scotia. The average output per eight hour day is approximately twenty-five hundred tons.

After the completion of the paper the party motored to the colliery where they arrived about three thirty. Here they were supplied with mine lamps and overalls and accompanied by several mine officials entered the mine and visited all the places of interest in the underground workings, being taken to the face in a trip of mine cars hauled by an electric, trolley type, locomotive. Later the surface equipment was visited. Some of the things which impressed the visitors particularly were, the trolley locomotive haulage, which is the first in use in Nova Scotia; the decided effort made towards making everything as nearly as possible safe for the workers, and the enormous amount of labour and expense necessary to insure reliability and permanence. This expenditure is easily explained when it is considered that the probable life of this colliery is over one hundred years. One of the safety features, unique in coal mining practice in this province, is the system of spreading pulverized stone dust over the main haulage way, on floor, roof and walls, to prevent the finely powdered coal dust from forming an explosive mixture.

After the inspection the party returned to the club rooms where a delightful dinner was served by the Ladies' Auxiliary of the Glace Bay General Hospital. A discussion of the paper followed the dinner, after which came a smoker, sing-song and cards.



Calgary Branch

G. P. F. Boese, A.M.E.I.C., Secretary-Treasurer.
W. St.J. Miller, A.M.E.I.C., Branch News Editor.

At a recent meeting the question was discussed as to the possibility of including in our local branch news matter that would be of interest to members outside the branch as well as to branch members. The following article has been written up from notes supplied to the branch editor by J. Hanna, A.M.E.I.C., and is along the lines suggested.

Many members of the Calgary Branch have visited the Turner Valley oil field in the course of the last few months and have shown a keen interest in its development, as also in the development of other oil prospects throughout the province of Alberta. A few remarks, therefore, concerning this particular field may prove of interest to those who have visited it as well as to those who have not been so fortunate.

Turner Valley Oil Fields

Turner valley lies to the southwest of Calgary some 45 miles distant, and it was here that the notorious oil boom of 1914 started, eventually spreading its tentacles in all directions with Calgary as the centre of wild-catting, the like of which was never seen in the West before. It has taken ten years to live down the unenviable reputation then gained. This boom was organized by promoters from outside of Canada, but we have no one to blame except ourselves for permitting such a disaster to occur. Alberta can now be proud of the producing wells located in this valley and the first wells of real commercial value in western Canada.

A short history of the oil business here may prove of interest. A small amount of oil was taken out of several of the wells during the war, but it is only in the last year that the field has proved its extraordinary value. In 1921, the Dingman interests were taken over by the Imperial Oil Company, Ltd., an absorption plant was installed and a pipe line laid to Okotoks to connect with the natural gas supply pipe from Bow Island to Calgary. A deep test hole was started in September, 1922, which blew in on October 16th, 1924, at a depth of 3,740 feet. This has since been known as the famous Royalite No. 4 well. The gas pressure in this phenomenal well exceeded 1,200 pounds per square inch by an indeterminate amount, and the gas proved to be extremely wet with gasoline content. On an attempt being made to close off the supply the well was wrecked by the tremendous pressure, and it has only been possible to partially control the gas, the remaining gas being piped some distance and ignited for safety. This tremendous flare is visible over fifty miles away and is always left burning. It is strange to see the pipe line covered with white frost, even in the summer time, right up to the end of the pipe from which the huge flame is roaring.

Steps were immediately taken to recover the gasoline from the flowing gas, and the production of this has increased steadily until the official figures for July of this year were 536,135 imperial gallons, or 15,308 barrels, averaging about 500 barrels a day. This flow is crude gasoline of about 72 degrees Beaume gravity and has a strong sulphurous odor. It requires chemical treatment and blending to make a satisfactory motor gasoline. A scrubbing plant for the gas is nearing completion which will remove the sulphur compounds and the gas will then be suitable for use in Calgary mains. A 10-inch pipe line is being laid to carry 17,000,000 cubic feet of gas per day and also a 4-inch pipe line to carry the gasoline to the Imperial Oil refinery at Calgary.

Besides the Imperial Oil Company's rotary drilling outfits there are quite a number of independent concerns busy prospecting for oil in the vicinity, and during the next year the important question should be settled once and for all as to whether any heavier oil is lying in this structure. Although the present production is extremely valuable it is freakish, and the discovery of a good quality ordinary crude oil in this or any other Alberta field would be hailed with delight and would greatly stabilize the industry. It is true that a heavy crude oil has been found at Wainwright, Alberta, but this has proved of such low gasoline content and inferior quality that the outlook does not appear promising for the present. It is, however, a favourable indication of the presence of such a grade of oil in Alberta.

Geological investigations, followed by the drilling of test holes, are being quietly but efficiently carried on from the International boundary to the Arctic circle, and whereas this work is both tedious and expensive and requires a large amount of faith in the future, it is being persistently undertaken. The Imperial Oil Company are undoubtedly the leaders in this valuable work and have already spent some five million dollars in prospecting for oil in the province. The need of an oil supply north of the boundary and east of the Rockies is great and the search for it should be willingly supported by the people of the West, and the discoverer should reap a big reward commensurate with his faith in the venture.

Two Complete Trips around the World

Dr. Norman H. Savage gave a very illuminating address in the Board of Trade rooms on September 4th before a large number of members and guests, his subject coming under the heading of "Conditions, experience and impressions of great nations resulting from two complete trips around the world".

The speaker was introduced by the acting chairman, R. S. Stockton, M.E.I.C., who claimed a twenty years acquaintance, having worked under him as engineer for some years on some of the larger irrigation projects in the United States. He eulogized Dr. Savage in well chosen words, stating that he was undoubtedly one of the outstanding engineers on this continent, having been supervising engineer for the United States Reclamation Service for a number of years during a period when a very extensive programme of development work on big irrigation projects was taking place. He remembered how at times his wonderful foresight had seemed almost uncanny and how he was always determined that the work in hand should be carried out with accuracy to the smallest detail.

In return Dr. Savage spoke of Mr. Stockton as a prominent engineer especially in connection with maintenance work on irrigation projects.

Commencing his address, he stated that his travels had greatly opened his eyes to the wonderfully effective manner in which Great Britain had administered and was administering her civil service departments in India and Africa, especially in respect to engineering problems. The immensity of the irrigation projects in these two countries alone, he said, was extraordinary even to one who had been so closely connected with similar development work on this continent. In India, 40,000,000 acres were under irrigation and being cultivated, and still some 300,000,000 native population were more or less in a semi-starving condition. In Egypt there were 3,000,000 acres of arable land awaiting development adjacent to the confluence of the White and Blue Nile rivers. He said that politically Egypt is in a bad way to-day, her problems being extremely complex, and although for certain projects the money is actually available the work cannot be undertaken at present for this reason. In Africa he found a British administration that showed admirable efficiency. The Uganda railways and steamers on the lakes were modern in every respect. In commenting on the Victoria Nyanza lake, which is the source of the Nile river, he surprised his hearers with the statement that a dam only three feet high would be sufficient to regulate the waters of the Upper Nile, but of course the lake was some 150 miles long by the same in width. Referring to the Assouan dam, he stated the possibility of again raising the height of the structure and practically doubling the capacity of the storage reservoir. He was reticent to state this as a fact, but nevertheless it was a possibility. During his visit to the Sennar dam on the Blue Nile, he found here a typical example of the splendid engineering work that the British government is doing throughout the empire. By means of this dam 300,000 acres of cotton lands will be irrigated by rotation by areas of 100,000 acres each year.

Throughout his address, Dr. Savage impressed his hearers with his forceful and at the same time pleasant manner of delivery, and with the help of a map of the world projected on the screen, the accounts of his travels and observations from an engineer's viewpoint were much appreciated by all present. His two trips round the world, covering about 100,000 miles, were made first by way of England through Europe to the near east, thence to Egypt and to the far east including India, Ceylon, Hong Kong, Japan, and the Phillipines and home, then retracing his steps westward and on to the South Sea Islands, New Zealand, Australia, India to Basra, the Holy Land, Mesopotamia, and Egypt again.

It was in New Zealand that he found an advancement in engineering matters that surprised him as much as anything during his travels. Here, he said, they had wonderful dams and works largely after the plans of those in the United States, but in actual machinery they, like Sweden, were ahead of the United States and elsewhere. He had travelled there primarily to find out why this far off country was so exceptionally prosperous, and it was not long before he discovered the reason in its wonderful climate, abundant resources, and natural stored up potentialities. This applied to a large extent to Australia as well.

During the discussion Dr. Savage gave his impressions on American colonization in the Phillipines, claiming that there was a country with extraordinary potentialities but whose authorities were politically hand tied, whose native population imported 3,500,000 pounds of rice last year, when the land was essentially fitted for growing rice, and whilst claiming his loyal citizenship, he felt that his government were making great mistakes in this important matter of colonization. He pointed out that these islands were ideal for the production of tropical fruits of all kinds for consumption in the States, but that practically nothing was being grown for export. Coal cost $15. a ton to mine, and he stated that a single island in the group was capable of producing all the rubber the States required.

During the discussion Dr. Savage gave some very interesting comments on causes and effects of earthquakes in the Pacific coast area of the United States, as well as in Japan. He related how a certain scientist had practically foretold the disaster in Santa Barbara from a close study of the slips and faults in the earth's surface in this vicinity. Damage by the earthquake itself at San Francisco was nothing compared with the havoc wrought by the fire that followed. He remarked on the wonderful efficiency that the Japanese showed in the rebuilding of Yokahama and Tokio after the earthquake and gave an interesting account of their advanced scientific theories in respect to the forecasting of earthquakes.

In moving a vote of thanks S. G. Porter, M.E.I.C., said he had known the speaker many years in connection with irrigation matters in the States, and thanked him on behalf of all engineers present for his most interesting and instructive address. This was seconded by J. Haddin, M.E.I.C., and enthusiastically agreed to by everyone present.

A. S. Dawson, M.E.I.C., returns from Inspection Tour

A. S. Dawson, M.E.I.C., has returned from a tour of inspection through the western states, visiting some of the large irrigation projects. May we extend the hope that Mr. Dawson will feel disposed to pass on, in part at least, the valuable information he has gathered, to members and the public generally through the columns of *The Journal.*

Transportation Arrangements at Banff Meeting

The local editor assumes the entire responsibility for omitting a word of commendation in connection with the transportation arrangements at the Banff meeting. R. S. Trowsdale, A.M.E.I.C., was in charge of this, and the least that can be said is that the arrangements could not have been carried out more efficiently.

London Branch

E. A. Gray, A.M.E.I.C., Secretary-Treasurer.

On August 15th about twenty members of the London Branch motored to Windsor, this being the third annual trip of this nature.

The party were met at the Prince Edward hotel by Chairman J. Clark Keith, A.M.E.I.C., Secretary F. J. Bridges, A.M.E.I.C., and the executive of the Border Cities Branch.

After lunch the party was conducted on a tour of inspection of the Ford Motor plant at Walkerville and the Border Cities filtration plant, the members being much interested in the various phases of engineering encountered.

In the evening the members of the Border Cities Branch entertained the party at dinner at the Prince Edward hotel.

The London Branch sincerely appreciate the efforts of the Border Cities Branch in arranging such an interesting programme and trust that they may have the pleasure of returning the courtesy in the near future.

Sault Ste. Marie Branch

A. H. Russell, Jr. E.I.C., Secretary-Treasurer.

Joint Meeting with Lake Superior Mining Institute

On August 14th some one hundred and twenty delegates to the Lake Superior Mining Institute visited Sault Ste. Marie, Ont., under the joint auspices of the local branch of *The Engineering Institute of Canada* and of the Board of Trade. The convention, which comprised delegates from all states in the Lake Superior region besides many further afield, held its opening sessions in Ishpeming and Marquette, Mich., adjourned to Sault Ste. Marie, Mich., and finished on the Canadian side. The party arrived in the Canadian Soo after a trip through the locks by launch and were conducted to the paper mill, where an inspection was made of one of the large paper machines, and to the steel plant and other interesting points in the city.

In the evening a dinner was served at the Riverside Pavilion to which about one hundred and sixty sat down. The chairman was Mr. John Hussey, president of the Board of Trade, and an address of welcome was delivered by His Worship Mayor Dawson. Mr. Myron J. Sherwood, representing the Mining Institute, in his reply made humourous reference to the love, amity and high spirits that pervaded the meeting.

An interesting announcement was made by Mr. James E. Jopling, president of the Mining Institute, to the effect that it was the intention of the institute to visit the mining regions of Porcupine, Sudbury and Cobalt in the near future. J. D. Jones, M.E.I.C., vice-president and general manager of the Algoma Steel Company, on behalf of the local branch of *The Engineering Institute* addressed a few well chosen remarks to the visitors dealing largely with mining opportunities, both American and Canadian, round lake Superior. R. J. Durley, M.E.I.C., general secretary of *The Institute*, who was on his way home from the west, referred to the enthusiasm and optimism of the mining fraternity both here and out west and pointed out the great debt that civilization owed them as pioneers.

Visit of New General Secretary

On August 14th, 1925, the members of the branch had the pleasure of meeting General Secretary R. J. Durley, M.E.I.C. He arrived at 10.30 a.m., on the steamer Manitoba from Fort William and was met by several members of the branch and about thirty members gathered at the Y.W.C.A., at luncheon.

Wm. Seymour, M.E.I.C., chairman, presided, and introduced Mr. Durley, and extended the good wishes of the Soo Branch to our new general secretary. He expressed the pleasure it was to have him with us and felt sure that the visit from Mr. Durley would result in the executive and members of the branch getting some valuable pointers. Mr. Durley expressed his pleasure in being able to be present and to meet the executive and members of the branch. He outlined briefly his trip west where he had attended the Western Professional Meeting at Banff, held under the auspices of the Calgary Branch, and he felt that the Calgary Branch should be congratulated on the capable manner in which they had carried it through. As this was his first trip as general secretary he called it his "Voyage of Discovery" and he had discovered "That the engineers are a body of picked men, wherever you meet them".

A round table conference was held and *The Journal*, membership grading, dues, by-laws, etc., were thoroughoy discussed and many points were brought up that might well be looked into later by their respective committees.

Mr. Durley was entertained during the afternoon by Mr. Seymour and other members of the branch.

The Scaling of Mt. Logan

Members of the local branch have noted with interest the recent brilliant achievement of the Alpine Club of Canada in scaling Mt. Logan. Prominent in the party was H. F. Lambert, B.Sc., D.L.S., A.M.E.I.C., of the Geodetic Survey of Canada, Ottawa.

Mr. Lambert with the permission of the Department of the Interior was appointed to the important post of vice-leader on account of his extensive mountain climbing experience, attained largely during his work on the Alaska-Yukon boundary surveys. He had already climbed such peaks as Mt. Natazhat 13,500 feet and Mt. Robson, highest summit of the Rocky mountains and was therefore particularly fitted to assist the leader, Mr. MacCarthy in equiping and conducting the expedition.

It will be recalled that Mt. Logan is in the Yukon, 21 miles east of the International Boundary and is named after Sir William Logan the founder, and for many years the director of the Geological Survey of Canada. Mt. Logan, with its elevation of 19,850 feet, is the highest peak in Canada and second highest in North America, ranking next to Mt. McKinley, in Alaska, which rises to a height of 20,310 feet. It is one of the greatest, (if not the greatest), of mountain masses in the world. Moreover Mt. Logan is the centre of the greatest known glacial expanse outside of Greenland and the Antarctic continent.

Preparations for the climb went on steadily during the latter part of 1924. A complete plan of campaign was drafted, based on the maps of Mt. Logan prepared by the photographic method developed and perfected by the late Dr. E. G. Deville, director general of surveys of Canada. Previous to 1925 no man had ever set foot on Mt. Logan but photographs of it had been taken from Mt. St. Elias, and other points about 20 miles distant, and from these photographs maps had been made which enabled Mr. MacCarthy and Mr. Lambert to map out their route from the base to the summit.

The party went by steamer to Cordova, Alaska, then inland 191 miles on the Copper River and Northwestern Railway to McCarthy. The remaining 156 miles to the summit of Mt. Logan had to be traversed on foot.

The climbing in all occupied 23 days, and at 4.30 p.m., on 23rd June they reached what they had supposed was the summit, only to find that 2½ miles to the eastward was another peak some hundreds of feet higher. After taking a number of photographs they proceeded across the intervening ravine, which necessitated a descent of about 1,000 feet, followed by the still more trying ascent and succeeded in reaching the actual summit at 8 p.m. Their trip back to railhead at McCarthy occupied 20 days part of it on rafts floating down the Chitina river.

Experienced alpinists all over the world have expressed their appreciation of the magnitude of the feat, and laymen may gain some idea of it from the recollection that the ascent of Mt. St. Elias, much more accessible and nearly two thousand feet lower, was not accomplished until after six separate attempts had been made in a period covering twenty years.

This expedition has added greatly to our store of geographical and meteorological knowledge; it has proved the accuracy of Canada's system of photographic mapping; and it has shown the tremendous virgin field for mountain climbing in Canada, which is attracting each succeeding year more alpinists from every part of the world.

The Annual General

and

General Professional Meeting

will be held in

Toronto

January 27th, 28th and 29th, 1926

The business session of the Annual Meeting will be held in Montreal on January 26th, and adjourned to Toronto.

Further details will be published later.

The Topographical Survey of Canada, Department of the Interior, have issued development plans on a scale of sixty chains to an inch, showing the detailed classification of lands for each township in the area covered by the recently issued map of the district north and east of Preeceville, Saskatchewan.

A further map issued by the Survey is that covering The Pas Mineral Area, which is on a scale of six miles to the inch.

The General Merchandising Department of the Canadian General Electric Company, Ltd., have announced that an arrangement has been concluded whereby the traffic signal equipment of the Canadian General Electric Company will be distributed throughout the Dominion by the Traffic Engineering Division of the Gas Accumulator Company of Canada, with head office at Toronto. This places a complete service equipped to meet every traffic requirement at the disposal of municipal officials.

The Dominion Wire Rope Company, Montreal, has been designated as Canadian distributor of products of the American Cable Company of New York. A new product which this company will handle is Tru-lay wire rope, a rope made up of wires and strands "preformed" to the shape they must hold in the finished rope.

According to the announcement of an interview with Mr. Arthur V. Davis of the Aluminum Company of America and also of the Aluminum Company of Canada, Limited, which is building the new aluminum plant at Arvica and the hydro-electric plant at Chute à Caron, Que., W. S. Lee, M.E.I.C., who has been the chief engineer of the large power development at Isle Maligne, and who is in charge of the Aluminum Company's plant and hydro-electric development, the contracts have been closed with the Canada Cement Company for the entire requirements of cement for this work.

Trade Publications

Oxweld Acetylene Company, have issued a small pamphlet entitled "Precautions and Safe Practices" in the storage, care and handling of acetylene, copies of which may be secured through any office of the company.

The Hydraulic Society of New York, have issued a booklet entitled standards of The Hydraulic Society (3rd edition) 1925, which contains considerable information in the form of recommendations by the Society, which should be of interest to purchasers and users of pumps, as well as manufacturers of this type of equipment. The headquarters of the Society are at 90 West Street, New York City. Its membership includes some thirty-five manufacturers of pump equipment.

Preliminary Notice

of Applications for Admission and for Transfer

September 19th, 1925

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in October 1925.

R. J. Durley, Secretary.

*The professional requirements are as follows:—

A Member shall be at least thirty-five years of age, and shall have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office, or a term of instruction in a school of engineering recognized by the council. The term of twelve years may, at the discretion of the council, be reduced to ten years in the case of a candidate for election who has graduated from a school of engineering recognized by the council. In every case the candidate shall have held a position in which he had responsible charge for at least five years as an engineer qualified to design, direct or report on engineering projects. The occupancy of a chair as a professor in a faculty of applied science or engineering, after the candidate has attained the age of thirty years, shall be considered as responsible charge.

An Associate Member shall be at least twenty-seven years of age, and shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years. The occupancy of a chair as an assistant professor or associate professor in a faculty of applied science of engineering, after the candidate has attained the age of twenty-seven years, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council, shall be required to pass an examination before a board of examiners appointed by the council. The candidate shall be examined on the theory and practice of engineering with special reference to the branch of engineering in which he has been engaged. This examination may be waived at the discretion of the council if the candidate has held a position of professional responsibility for five or more years.

A Junior shall be at least twenty-one years of age, and shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the council, if the candidate for election has graduated from a school of engineering recognized by the council. He shall not remain in the class of Junior after he has attained the age of thirty-three years.

Every candidate who has not graduated from a school of engineering recognized by the council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects: geography, history, (that of Canada in particular), arithmetic, geometry, euclid (books I, IV and VI), trigonometry, algebra up to and including quadratic equations.

A Student shall be at least seventeen years of age, and shall present a certificate of having passed successfully an examination equivalent to the final examination of a high school or the matriculation of an arts or science course. He shall either be pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall not remain in the class of student for more than two years after graduation; or he shall be receiving a practical training in the profession, in which case he shall pass an examination equal to that prescribed for admission to the grade of Junior in the foregoing section and he shall not remain in the class of Student after he has attained the age of twenty-seven years.

An Affiliate shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience, qualify him to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as reference does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

ARTHUR—HAROLD FRANKLYN, of Catherine Street, Glace Bay, N.S. Born at Halifax, N.S., May 13th, 1896; Educ., B.Sc. (E.E.), N.S. Tech. Coll. 1923; 1915-16, asst. to Major David Barry, of Bate, McMahon & Co., Ottawa, on constrn. of military camps in Canada; Winters 1923-24 and 1924-25, instructor, elect'l. engrg., evening classes, Coal Mining School, Glace Bay; 1923-25, elect'l. dept., Dominion Coal Co., Glace Bay, from June 1924 in charge of electr'l. operation, 1-B Colliery; August 1925 to date, asst. to E. L. Martheleur, chief elect'l. engr., British Empire Steel Corpn., Glace Bay, N.S.

References: F. R. Faulkner, E. L. Martheleur, W. F. McKnight, H. W. L. Doane, J. F. Lumsden.

McDONALD—ALEXANDER, of 218 Union Street, Sydney, N.S. Born at Pictou, N.S., June 27th, 1879; Educ., I.C.S. course in boiler making and design. Private study; 1894-98, ap'tice mechanic, Pictou Iron Foundry; 1898-1900, boiler making, J. B. Snowball, Chatham, N.B.; 1900-03, blast furnace erection, 1903-07, millwright, open hearth dept., 1907-18, boiler shop, Dominion Iron and Steel Co., Sydney, N.S.; 1918 to date, chief inspr., steam locomotives, with supervision over design and specifications, Dominion Steel Corporation, Sydney, N.S.

References: D. H. McDougall, G. D. Macdougall, H. C. Chipman, J. R. Morrison, G. Beaton, S. C. Mifflen, J. H. Fraser.

MILLIKEN—HUMPHREYS, of 59 McGill College Avenue, Montreal, Que. Born at Somerville, Tenn., U.S.A., Oct. 27th, 1881; Educ., B.S. Mass. Inst. Tech., 1902. 2 years at Institution Internationale, Paris, France; 1902-04, Gen. Elec. Co., Schenectady; 1904-05, Case Sch. of App. Science; 1905-07, New York Edison Co.; 1907-09, res. engr. on Pacific Coast for S. W. Barstow & Co. of New York City, i/c design and constrn., Oregon Electric Rly.; 1909-19, chief elect'l. engr. of W. S. Barstow & Co. operating a large number of public utilities; 1919-22, vice-pres. and chief engr., By-Products Recoveries Inc.; 1922-24, with H. S. Cooper Co. of New York City on Muscle Shoals hydro-electric development. At present, chief elect'l. engr., Montreal Light, Heat & Power Co., Montreal, Que.

References: S. H. Cunha, J. Morse, L. H. Marrotte, P. S. Gregory, C. K. McLeod.

NENNIGER—EMILE, of 7374 St. Denis Street, Montreal, Que. Born at Berne, Switzerland, July 4th, 1901; Educ., Structural engr., Grad. of Tech. School of Burgdorf (Switzerland), 1921; 2½ years, supt. of office of G. Rieser, gen. contractor and architect; 1921-23, office of W. Schreck, S.I.A., F.I.D.I.C., reinforced concrete specialist at Berne; design and preparation of reinforced concrete plans; July 1923 to date, design and preparation of plans in office of Dr. Arthur Surveyer, Consltg. Engr., Montreal, Que.

References: A. Surveyer, F. T. Kaelin, C. E. Gelinas, J. Labelle, H. S. Deubelbeiss.

ROSS—CHARLES CATHMER, of 1710-10th Street West, Calgary, Alta. Born at Ottawa, Ont., June 14th, 1884; Educ., B.Sc. (Civil), McGill Univ. 1909; 1904-05 (summers), Montreal, Ottawa and Georgian Bay ship canal survey, asst. to F. W. Anderson, under direction of Alex. McDougal; 1906-08 (summers), astronomical computer, Dominion Observatory; 1909-10, International Boundary Survey, triangulation, plane table, observing, asst. to George White-Fraser, D.T.S.; 1910-11, hydrographic survey, sextant triangulation, sounding, plotting, asst. to P. C. Musgrave, R.N.; 1911-13, private practice contracting; 1916-18, asst. inspecting engr. to O. S. Finnie, Dept. of the Interior; 1918 to date, i/c of Western staff administering Departmental regulations, Dept. of the Interior, Calgary, Alta.

References: B. L. Thorne, L. Stockett, C. C. Richards, A. L. Ford, P. J. Jennings, F. M. Steel, S. J. Davies, O. S. Finnie, T. H. G. Clunn, W. H. Powell, G. M. Pitts.

WHITE—HANS GROVE, of 2365 McNeill Avenue, Oak Bay, Victoria, B.C. Born at Mallow, Co. Cork, Ireland, Sept. 8th, 1890; Educ., Grad. Camborne School of Mines, England, 1910; 1910-11, elect'l. ap'tice, Atchison, Topeka Santa Fe Rld.; 1912-14, prospecting, Northern Saskatchewan; 1916-17, overseas; 1918-20, assayer, Consolidated Mining & Smelting Co.; and in charge lubrication dept., 1921-23; 1924, assayer and surveyor, Danwell Mines; At present, mining engr., Glacier Creek Mining Co., Stewart, B.C.

References: R. H. W. Lockyer, B. R. Warden, A. B. Ritchie, E. P. Girdwood

FOR TRANSFER FROM CLASS OF ASSOCIATE MEMBER TO MEMBER

BOOTH—MARK WESTAWAY, of 160 Whitney Avenue, Sydney, N.S. Born at Bradford, Yorks., England, March 10th, 1887; Educ., 1903-09 (incl.), indentured ap'tice mech. engrg., with shops and dfting office training, Sheephridge Coal & Iron Co. Ltd., England. 1903-09 (incl.), mech. engrg., Chesterfield Tech. School; 1911-21, with Dominion Iron & Steel Co., Sydney, as follows: 1911-16, chief dftsman., mech'l. dept.; 1917-18, gen. inspr. of constrn.; 1919, supt. of shops; 1920-21, steam engr.; 1921 to date, steam engineer, British Empire Steel Corpn., with extension of work to cover combustion engrg. with coal sales dept. of this corpn.

References: A. P. Theuerkauf, W. E. Clarke, G. D. Macdougall, S. C. Mifflen, W. S. Wilson.

HAY—ALEXANDER LOUDON, of Glace Bay, N.S. Born at Hamilton, Scotland, March 23rd, 1882; Educ., Prov. Tech. School. I.C.S. mining engrg.; 1903 to date, with Dominion Coal Company as follows: 1903-04, compassman; 1904-11, transitman; 1911-20, charge of mine surveys; 1920-21, in charge of ventilation, design and constrn. of sixteen collieries; 1921 to date, supervision of all underground engrg., including design and direction of mining and transportation of coal, ventilation, drainage, development and construction.

References: D. H. McDougall, E. L. Martheleur, S. C. Mifflen, W. C. Risley, K. G. Cameron.

ICKE—HENRY ARTHUR, of 2100 Brighton Avenue, Oak Bay, Victoria, B.C. Born at Church Stretton, Shropshire, England, June 14th, 1862; Educ., National Schools and Private study; 1883-85, instr'man. dftsman. and examiner of field work, Ordnance Survey; 1886-88, (recovering from illness), private study of maths. and civil engrg.; 1888-91, dftsman., Natal Govt. Rlys.; 1892-94, asst. engr., Natal-Johannesburg Rly.; 1895-96, designing steel bridge superstructure for replacing bridges on Natal Govt. Rlys. main line; 1897-98, asst. engr., Orange Free State Govt. Rlys.; 1900-01, reconstrn. Natal Govt. Rly. works; 1902-04, surveys, design and constrn. of new system water supply, City of Pietermaritzburg, Natal; 1905, consltg., municipal works, Natal; 1906, asst. engr. to G. H. Hill & Sons, consltg. engrs., Manchester; 1907, divn'l. engr., Nat. Resources Dept., C.P.R., Gleichen to Calgary. Charge of Gleichen Divn., irrigation works; 1908-09, engr. in charge waterworks improvements, City of Victoria; 1911-12, surveys and constrn. small municipal works, B.C.; 1913-17, surveys, design and part constrn. of rly. terminals, harbour works and bridge, Victoria, for B.C. Govt.; 1918-19, holiday and examining harbour works, Pacific Coast, U.S.; 1920-21, engr. in charge of design of twin highway and rly. bridges across Victoria harbour, and other works; 1922-24, consltg. hydraulic and structural; At present engaged on surveys to ascertain hydro-electric power possibilities of certain lakes and rivers in northern portion of Vancouver Island.

References: P. B. Motley, F. C. Gamble, F. M. Preston, D. O. Lewis. A. E. Foreman, F. W. Knewstubb.

McDOUGALL—JOHN J., of Sydney Mines, N.S. Born at Glace Bay, N.S., Nov. 1st, 1886; Educ., St. Francis Xavier's College; 1902-03, engrg. staff, Dominion Steel Co.; 1903-05, survey staff, Dominion Coal Co.; 1905-09, i/c of constrn. and survey at Dom. Steel Co.'s Wabana mine; 1910-14, engrg. staff, Dominion Steel Corpn. at Sydney, Glace Bay and Wabana; 1914-19, mgr., Wabana mine, Dominion Steel Co.; 1919-21, mining engr., Acadia Coal Co.; 1921-23, asst. gen. mgr. Mainland District of Besco; Dec. 1923 to date, district supt., Nova Scotia Steel & Coal Co., Sydney Mines, N.S.

References: D. H. McDougall, G. D. Macdougall, J. S. Whyte, J. Purves, T. J. Brown, R. E. Chambers.

ROUSSEAU—THEODORE E., of 48 Second Avenue, Quebec, Que. Born at New Haven, Conn., Feb. 25th, 1887; Educ., C.E. and B.A.Sc., Laval Univ. 1908. P.Q. Land Surveyor; 1904-08, with Quebec Bridge Co. and Trancontinental Rly., during vacations; 1908-10, instr'man., and asst. bridge engr., and 1910-14, res. engr., dist. "C"., Transcontinental Rly.; 1914-17, dist. engr., highway dept., Quebec Govt.; 1917-19, chief engr. for contractors highway constrn.; 1919-21, partner, Joncas, Malouin & Rousseau, consltg. engrs. and surveyors; 1920 to date, chief engr., and gen. mgr., T. E. Rousseau Ltd., Engrs. and Contractors.

References: A. R. Décary, J. O. Montreuil, A. B. Normandin, W. R. Russell, H. S. Van Scoyoc.

SEAMAN—LEE NORTON, of Dehra Dun, United Provinces, India. Born at Charlottetown, P.E.I., August 20th, 1882; Educ., B.Sc. 1910, M.A. 1912, Acadia Univ.; Course at N.S. Tech. College, 2 years subsequent to graduation at Acadia; 1914-19, overseas, Major, R.G.A.; Organized timber testing divn., Forest Products Lab., Montreal (with R. W. Stearns); chief of divn., 1919-20; Organized similar lab. for Govt. of India at Dehra Dun, 1921, and still in executive control of that lab.; At present, Officer i/c Timber Testing Forest Research Institute, Dehra Dun, U.P., India.

References: H. M. MacKay, E. G. M. Cape, J. S. Bates, R. P. Freeman, M. W. Maxwell, R. R. Murray.

TERREAULT—JOSEPH HENRI AUGUSTE, of 414 Harvard Street, Montreal, Que. Born at Montreal, Feb. 18th, 1877; Educ., C.E. Ecole Polytechnique, Montreal, 1899; Engrg. work with J. Emile Vanier, civil engr. of Montreal; 1899-1900, municipal engrg.; Gen. Elec. Co., Schenectady; Cambria Steel Co., Johnstown, Pa.; 1902-15, chief engr. and mgr. of works, Govt. Ship Yards, Sorel; With the Naval Service during war as chief inspr. for constrn. of ships in Canada; 1920-22, chief engr., Montreal Water Works; 1922 to date, chief engr. and director of public works, City of Montreal

References: J. E. Vanier, C. J. Desbaillets, F. W. Cowie, H. G. Hunter, W. S. Lea. T. W. Harvie, J. H. Hunter, O. O. Lefebvre.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

DUCLOS—LEWIS MURRAY, of Ottawa, Ont. Born at Ottawa, June 22nd, 1890; Educ., Engrg. Cert., Acadia Univ. 1914. Complete course in Rld. Engrg., I.C.S.; 1911-13 (summers), with C.P.R., last year as rodman, also inspected concrete on bridge and culvert constrn.; 1915, rodman, 1917, transitman, C.P.R.; 1918-19, overseas; 1919, i/c of wooden block pavement on concrete base and office work, C.P.R.; 1920-21, senior instr'man., G.T.R.; 1922 to date, transitman, C.P.R.

References: A. C. Mackenzie, J. E. Beatty, W. W. Benny, W. Walker, S. E. Farley.

GRADY—JOHN EMILE, of 39 Balmoral Avenue So., Hamilton, Ont. Born at Macleod, Alta., Nov. 6th, 1885; Educ., 2 years civil engrg . S.P.S. Univ. of Toronto; 1905-06, C.N.R. location in Alta. and Sask.; 1908-11, on constrn. C.N.R.; 1911-15, with N.T.C. Rly. as follows: 1911-12, div. dftsman.; 1912-14, instr'man. on constrn.; 1914-15, res. engr. on constrn.; 1915-16, instr'man., Bloor St., Viaduct, Toronto; 1916-17, instr'man., Ont. Prov. Highways, Toronto; 1917-18, i/c of party on coke oven constrn. at Steel Co. of Canada, Hamilton Works for Wilputte Coke Oven Co. of New York City; 1918-20, battery foreman, 1920-25, general foreman and from March 1925 to date, asst. supt., By-Product Coke Plant of Steel Company of Canada, at Hamilton Works, Hamilton, Ont.

References: F. W. Paulin, W. E. Janney, G. P. MacLaren, H. W. Tate, G. Hogarth, J. A. Brown, T. Taylor.

PAYZANT—SAMUEL KEMPTON, of Talara, Peru, S.A. Born at Windsor Forks, N.S., Oct. 27th, 1891; Educ., B.S. in C.E., N.S. Tech. Coll. 1917. B.Sc. Acadia College, 1914; 1913 (summer), student asst., Public Works Dept., Shelburne, N.S.; 1914-15, junior asst., dfting. and instr'man., Public Works Dept., Halifax, N.S.; 1916 (summer), student asst., Geol. Survey, Rocky Mts., Alta.; 1917 (summer), traffic records and equipment, Bell Telephone Co., Montreal; 1918-19, Can. Engrs., employed at Halifax, N.S. as military dftsman.; 1919-20, dftsman. for mech. supt., Imperial Oil Ltd., Halifax Refinery; 1920-22, dfting room design and process development work, Imperial Oil Ltd., Sarnia Refinery; 1922 to date, engr. and dftsman., International Petroleum Co., Talara Refinery, Peru.

References: T. Montgomery, F. W. Townsend, C. B. Leaver, F. C. Mechin. F. R. Faulkner, K. L. Dawson, W. P. Morrison.

TEMPEST—FRANK, of 125-7th Avenue N.W., Calgary, Alta. Born at Keighley, Yorks., England, August 6th, 1891; Educ., Third year work, Univ. of Alberta, did not graduate. Private study; Five years in various positions as levelman, transitman, hydrographer, topographer, plane table operator. asst. to engr. on rly. and bridge constrn.; 1919, field engr. with Reclamation Service; 1920, field engr. with Parsons Engrg. Co., Regina; 1921, engr. with contractor on rly. constrn.; 1922, field engr. on Lethbridge Northern Irrigation Project; 1923, mech'l. dftsman. and asst. to engr., Imperial Oil Refineries, Calgary, and 1924 to date, i/c of a shift on process work in distillation of crude oil, Imperial Oil Refineries, Calgary.

References: R. L. Dunsmore, J. J. Hanna, W. T. McFarlane, H. R. Carscallen, F. S. Dyke, A. L. Ford, P. J. Jennings.

WALLACE—GEORGE ARTHUR, of Montreal, Que. Born at Milton East, Que., May 18th, 1892; Educ., B.Sc., 1919, M.Sc. 1921, McGill Univ.; 1917 (summer), engrg. ap'tice., Canadian Westinghouse; 1918, 2nd Lieut. R.M. on scientific staff of anti-submarine divn. of Admiralty, England; 1919-23, lecturer in elect'l. engrg., and from 1923 to date, asst. professor of elect'l. engrg., McGill University, Montreal, Que. (Also consltg. engrg. work under Herdt & Burr, Consltg. Engrs., Montreal.)

References: C. V. Christie, E. G. Burr ,E. Brown, A. R. Roberts, R. DeL. French.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

ANDERSON—DAN, of 64 Durocher Street, Montreal, Que. Born at Kensington, P.E.I., May 14th, 1896; Educ., B.Sc. (E.E.), McGill Univ. 1923; Summers: 1920, electrician, Walker Vehicle Co., Chicago. Ill.; 1921, res. engr., highway constrn. for Prov. of P.E.I.; 1922, electrician and dftsman., Belgo Paper Co., Shawinigan Falls, Que.; 1923 (June-July), engr., plant dept., Bell Telephone Co. of Canada; 1923-24, engrg. dftsman., Newfoundland Power & Paper Co. Ltd.; July 1924 to date, electr'l. engr., with H. S. Taylor, Consltg. Engr., Montreal, Que.

References: J. Stadler, H. C. Brown, H. S. Taylor, H. H. Shaw, G. Claxton.

BALTZER—EDWIN, of 13 St. Francis Street, Ottawa, Ont. Born at Preston, Ont., May 12th, 1897; Educ., B.Sc. (Honors), Queen's Univ. 1920; 1912-19, vacation periods, in shop and office of various industrial firms, etc., the last three years as dftsman; 1919, i/c small dfting room, Roelofson Machine Tool Co., Galt. Ont.; 1920, office and jr. hydraulic engr., Spanish River Pulp & Paper Mills, Sault Ste Marie, Ont.; 1921-22, demonstrator, mech'l. engrg. Labs., Queen's Univ., also i/c fuel lab.; 1922, meter engr., Abitibi Power & Pulp Co., Iroquois Falls, Ont. Inspr., Dept. Public Highways, Ontario, on road and bridge contracts, under res. engr. at Napance and Waterdown, Ont.; 1923, designing dftsman., Wheeling Steel Corpn., Wheeling, W.Va.; 1923 to date, asst. engr., i/c domestic furnace lab., fuel testing station, Mines Branch, Ottawa, Ont.

References: J. McLeish, B. F. Haanel, E. S. Malloch, R. A. Strong, S. C. Ells, A. A Swinnerton, G. H. Kohl, L. T. Rutledge, W. P. Wilgar. D. M. Jemmett.

BARRETT—ANDREW GRANT, of Asbestos, Que. Born at Summerstown, Ont., Oct. 26th, 1896; Educ., B.Sc., Queen's Univ. 1921; Summers: 1917, junior asst., Geol. Survey of Canada; 1919, rodman with municipal engr. on drainage schemes; 1920, instr'man., topog'l. dept., G.S.C., on plane table work, City of Vancouver and district; 1921, same as 1920, on control traverse work also lake surveys; 1922 (May-Dec.), instr'man. with municipal engr. on drainage and road work; 1922-23, instr'man., Ontario Dept. of Highways; 1924 (Jan.-May), instr'man., Quebec Development Co.; Nov. 1924 to date, field engr. for Canadian Johns Manville Co., Asbestos, Que.

References: H. G. Cochrane, A. A. Smith, H. A. Smail, W. P. Wilgar, W. L. Malcolm.

CHISHOLM—JOSEPH DONALD, of Cornerbrook, Nfld. Born at Antigonish, N.S., March 17th, 1897; Educ., B.Sc. (E.E.), McGill Univ. 1923; June 1923 to Apr. 1924, test course, Canadian Westinghouse; April 1924 to date, elect'l. design office, Newfoundland Power & Paper Co. Ltd., Cornerbrook, Nfld.

References: L. A. Herdt, C. V. Christie, H. C. Brown, C. M. Bang, R. L. Weldon.

CLARK—GEORGE SILAS, of Corner Brook, Nfld. Born at Lachute, Que., Mar. 5th, 1898; Educ., B.Sc. McGill Univ., 1922; 1922-23, sales and service engr., Baily Meter Co. Ltd.; 1923 to July 1924, engr. dftsman., and at present, steam control engr., Newfoundland Power & Paper Co. Ltd., Corner Brook, Nfld.

References: C. M. McKergow, R. L. Weldon, A. R. Roberts, J. B. Gough, J. Stadler, J. J. York.

CORNEIL—FREDERICK MAURICE, of St. Narcisse, Que. Born at Omemee, Ont., June 16th, 1895; Educ., B.Sc. (Civil), Queen's Univ. 1923; Summers: 1920, on constrn. C.N.R.; 1921, with Geol. Survey of Canada; 1922, with Northern Canada Power Co., Timmins, Ont.; 1923-24, instr'man. on constrn. of dam and power house at La Gabelle, Que. for Shawinigan Engineering Co.; 1924 (May-Nov.), supt. in charge of depot constrn. for woods dept. of the Newfoundland Power & Paper Co. Ltd.; Feb. 1925 to date, field engr. i/c of dam and power house constrn., at St. Narcisse for Shawinigan Engineering Co. Ltd.

References: C. S. Saunders, C. Luscombe, W. P. Wilgar, H. K. Wyman, L. T. Rutledge, A. Macphail, F. S. Keith.

FINLAYSON—HAROLD MUSGRAVE, of Cornwall, Ont. Born at Toronto, Ont., August 8th, 1897; Educ., B.Sc. McGill Univ. 1923; 1913-17 (summers), rodman and instr'man. on sub-division work and various small private surveys; 1917-19, engine tester, R.F.C.; 1919 (Jan.-Oct.), and summers 1920 and 1921, wood machinist, Angus Shops, C.P.R.; 1922 (summer), asst. on road constrn., City of Montreal; May 1923 to date, junior engr., Dept. of Railways and Canals.

References: D. W. McLachlan, R. Yuill, A. Murray, P. Chevalier, H M. MacKay, A. L. S. Nash, E. D. McIntosh, G. A. Lindsay.

GUSCOTT—ALFRED GEORGE, of 267 Merton Street, Toronto, Ont. Born at Toronto, Sept. 5th, 1896; Educ., B.A.Sc. Univ. of Toronto, 1922; 1919, rodman, C.N.R.; 1920, rodman and asst. instr'man., C.N.R.; 1921, rodman for H.E.P.C. at Chippawa, Sept. 1921, employed by Toronto Street Rly. Arbitration; After grad. in 1922, employed by Messrs. James, Proctor & Redfern, as dftsman. for 3 mos., then asst. to the res. engr. at Cobourg, Ont.; Oct. 1922, employed by same firm as res. engr. on install'n. of waterworks, reservoir, pump house and water mains, at Trenton, Ont.; 1923-24, asst. engr. to N. McNicol on plans and constrn. of water mains, etc.; 1924, inspr. and res. engr., on constrn. of reinforced concrete bridge in Vaughan Twnps. for Frank Barber and Associates Ltd.; At present employed by the Town of Leaside on design and constrn. of water mains, sewers and sidewalks.

References: H. K. Wicksteed, E. M. Proctor, E. A. James, F. Barber, R. A. Baldwin, H. W. McAll.

HANNA—HAROLD BENJAMIN, of Riverbend, Que. Born at Prescott, Ont., Sept. 29th, 1897; Educ., B.Sc. (Honors), Queen's Univ. 1924; Summers: 1921, foreman, highway constrn. dept., Public Highways, Ontario; 1922-23, foreman, reinforced concrete culvert and concrete paving, for W. L. Malcolm, contractor; 1924 (May-Dec.), asst. field engr., Price Bros. & Co. Ltd., Kenogami paper mill extension; Dec. 1924 to date, office engr. for W. I. Bishop Ltd. on constrn. of Price Bros. & Co. Ltd. Riverbend paper mill.

References: W. L. Malcolm, W. P. Wilgar, A. Macphail, C. R. McCort, A. B. McEwen, G. F. Layne, D. J. Emery.

KELSEY—ERNEST STARKEY, of Montreal, Que. Born at Bristol, England, March 26th, 1898; Educ., B.Sc. (E.E.), Univ. of Man. 1921; 1920 (summer), install'n. of central office equipment in Garry Office, Winnipeg, and main office, Calgary, for Automatic Electric Company of Chicago; 1921-22, gas and elec. meter inspection, Dom. Govt. Elect'l. Standards Lab., Winnipeg; 1922-23, dftsman., Manitoba Power Company; 1923-25, equipment engr., Northern Electric Company; and from March 1925 to date, circuit studies, method of operation, relay adjustments, etc., engrg. dept., Northern Electric Company, Montreal, Que.

References: W. C. Adams, W. S. Vipond, J. D. Peart, E. P. Fetherstonhaugh, N. M. Hall, O. Higman, F. H. Martin.

McLEISH—ROBERT GRAHAM HAMILTON, of St. Catharines, Ont. Born at Glasgow, Scotland, August 8th, 1898; Educ., 2 years, Kahki College, overseas. 6 mos. D.S.C.R. course in mech. engrg., Queen's Univ.; 1915-16, junior mech. engr., Can. Gen. Elec. Co.; 1916-19, overseas; 1919-20, Can. Gen. Elec. Co.; 1920-24, with H.E.P.C. of Ontario as follows: Sept. 1920 to Sept. 1921, struct'l. dftsman.; 1921 (Sept.-Dec.), preparing cost studies; Jan. 1922-Sept. 1923, asst. rt. of way engr. on Niagara power development; Oct. 1923-June 1924, asst. engr. on topog'l. surveys for future developments; 1924 (June-Aug.), plant and production engr., and from August 1924 to date, plant supt., Imperial Radiator Co. Ltd., St. Catharines, Ont.

References: H. G. Acres, J. R. Montague, A. C. D. Blanchard, S. W. Johnston, L. L. Gisborne, J. B. Goodwin.

McLENNAN—GORDON RODERICK, of 1299 Lansdowne Avenue, Toronto, Ont. Born at Ottawa, Ont., March 25th, 1898; Educ., B.Sc. McGill Univ. (Mech.) 1922, (Elec.) 1923; One summer in dfting office of Darling Bros., Montreal; 15 mos. in test dept., Can. Gen. Elec. Co., Peterborough Ont.; At present, asst. transformer engr., Can. Gen. Elec. Co., Davenport Works, Toronto, Ont.

References: J. B. Bladon, C. M. McKergow, C. V. Christie, L. DeW. Magie, C. E. Sisson.

McNICOLL—ARTHUR EDWARD, of 731-a De L'Epee Ave., Outremont, Que. Born at Poole, Dorset., England, August 12th, 1892; Educ., Royal Masonic School, Bushey, Herts., England; Montreal Tech. School (night classes); 1916-17 and 1919-20, detailing, and from 1921 to date, designing and gen. engrg., at local contracting office, Dominion Bridge Company, Montreal, Que.

References: F. P. Shearwood, D. C. Tennant, L. R. Wilson, J. Robertson, C. S. Kane, L. A. St. Pierre, H. H. Hawkes.

NATTRESS—DAVID IRVING, of 238 John Street, Niagara Falls, Ont. Born at Woodbridge, Ont., April 11th, 1897; Educ., B.A.Sc. Univ. of Toronto, 1923; 1913 (summer), rly. constrn., Algoma Central Rly.; 1920 (summer), operation and mtce work on ore dock, 1921 (summer), same work on coal dock, for Algoma Steel Corpn.; 1923 (summer), elect'l. engr., Algoma Steel Corpn.; 1923-24, engaged with G. L. Ramsey, O.L.S. (deceased), on surveying work; 1924 (Jan.-Apr.), i/c of transit and level party for Lang & Ross; May 1924 to date, with the H.E.P.C. of Ontario, to Oct. 1924 elect'l. asst. at Toronto Power Generating Station, Niagara Falls, and from Oct. 1924 to date, asst. in meter dept., Ontario Power Generating Station.

References: J. L. Lang, K. G. Ross, J. H. Jenkinson, L. R. Brown, J. R. Bond, G. H. Wood, C. G. Cline.

NORWICH—HARRY BEN, of 36 Humber Trail, Toronto, Ont. Born at Toronto, Feb. 12th, 1893; Educ., B.A.Sc. Univ. of Toronto, 1919; 1913 (summer), with survey party, C.N.R. at Nipigon, Ont.; 1915-18, overseas; 1919-20, plan examiners, City Architect's Dept., Toronto; 1920 (May-Oct.), engr. for Wm. F. Sparling Co., Contracting Engrs., Toronto; 1921 to date, with the City Architect's Dept., City of Toronto; at present designing and checking engr. Responsible for the structural design of all public bldgs. erected by the City.

References: P. Gillespie, C. R. Young, P. M. Thompson, C. A. Scott, E. T. Bridges, R. A. Crysler, J. E. Tremayne, T. Taylor.

PATTERSON—THOMAS BILTON, of 1327 Avenue B, Saskatoon, Sask. Born at London, Ont., June 10th, 1898; Educ., Three years Applied Science, McGill Univ.; Summer work: 1920, asst. inspection engr., Dept. Rlys. and Canals; 1922, lightkeeper and signaller, Geodetic Survey Dept.; 1923, on constrn. work, C.P.R.; Fall 1923 and Winter 1924, res. engr. with Foundation Company of Canada on Diamond drill explorations; 1924-25, res. engr., on prelim. survey and constrn., with Dept. of Highways, Saskatchewan.

References: H. S. Carpenter, H. R. Mackenzie.

RIEHL—WILLIAM HENRY, of Brampton, Ont. Born at Sebringville, Ont., April 30th, 1897; Educ., B.A.Sc. Univ. of Toronto, 1920; 1917 (Apr.-Oct.), rodman, C.P.R. Toronto terminals, and West Toronto yard extension; Oct. 1917 to May 1918, and summers 1919 and 1920, transitman, G.T.R.; 1920-25, asst. engr., City of Stratford, Ont.; April 1925 to date, engr. Town of Brampton, Ont.

References: A. B. Manson, P. Gillespie, W. L. Malcolm.

ROBITAILLE—JEAN M., of 633 Durocher Avenue, Outremont, Que. Born at Quebec, Que., Feb. 22nd, 1896; Educ., One year Arts, Univ. of Toronto, 1916-17. I.C.S. and private study; 1908-16 (summers), rodding, dfting, etc., for Roberval-Saguenay Rly.; 1917-19, steel testing, Imperial Munitions Board; 1919-23, general office work — dfting., estimating, surveying, with deGaspé Beaubien, Consltg. Engr., Montreal; 1923 to date, general engrg. work with Messrs. Beaubien, Busfield & Co., Consltg. Engrs., Montreal.

References: deG. Beaubien, J. L. Busfield, W. H. Abbott, G. E. Templeman, A. Surveyer, H. E. Pawson.

ROSS—MALCOLM VAUGHAN, of La Tuque, Que. Born at Quebec, Que., April 6th, 1897; Educ., B.Sc. (E.E.), McGill Univ. 1923; Summer work in mach. shops and power houses; July 1923 to date, asst. elect'l. engr. for the Brown Corporation sulphate pulp mill at La Tuque, Que.

References: F. M. Gaudet, C. V. Christie.

SCOTT—WILLIAM ORVILLE CRAIG, of 719-8th Ave. West, Vancouver, B.C. Born at Kenora, Ont., August 13th, 1897; Educ., B.A.Sc. 1922, M.A.Sc. 1923, Univ. of B.C.; 1921-22 (summers), asst. in constrn. work at Granite Falls under Coast Quarries Ltd.; 1923, mech'l. and sales end of Diesel engines, mach'y., etc., under J. W. Thompson & Co.; 1924, asst. in water works survey, City of Vancouver, under W. H. Powell; March 1925 to date, smoke inspr., City of Vancouver.

References: W. H. Powell, E. G. Matheson, A. Lighthall, C. C. Ryan, W. B. Young, H. P. Archibald.

SIMMERS—JOSEPH ADOLPH, of Sturgeon Falls, Ont. Born at Toronto, Ont., August 1st, 1895; Educ., B.A.Sc. Univ. of Toronto, 1921; 1914 (summer), rodman, dept. of works, City of Toronto; 1914-19, overseas, P.P.C.L.I., Can. Engrs., R.N.A.S.; 1921 (Apr.-Dec.), assembly, calibration, and research on steam-flow meters with Baily Meter Co., Cleveland, Ohio; June 1923 to Apr. 1924, junior traffic engr. on machine switching office cut-overs in Manhattan, New York Telephone Co., New York City; Sept. 1924 to date, dfting. designing and surveying, as asst. to res. engr., Spanish River Pulp & Paper Mills, Ltd., Sturgeon Falls, Ont.

References: C. H. Mitchell, P. Gillespie, C. R. Young, T. R. Loudon, H. A. Morey.

Interesting Features in a Box Car Unloader

The box car unloaders which the Philadelphia Grain Company recently ordered from the Link-Belt Company of Chicago for their new Port Richmond elevator will contain many interesting features of design.

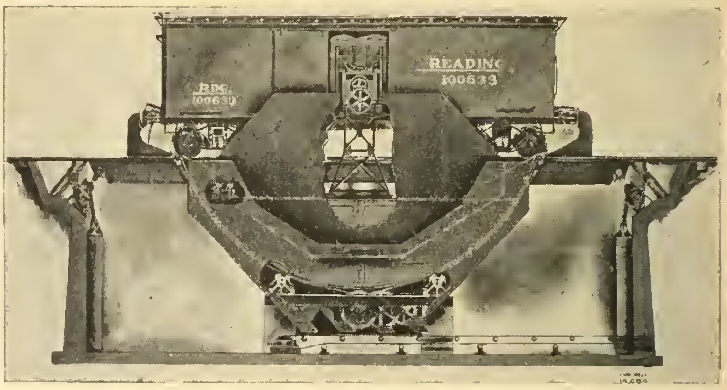
A brief description of these machines is as follows:—

Each unloader consists of a car supporting platform consisting of two heavy rolled girder beams connected by diaphragms and bracing, pivotally connected with a heavy structural steel cradle. The axes of these pivots are parallel to the longitudinal axis of the car and permit the tipping of the car sidewise to an angle of 15 degrees. The side tipping operation is accomplished by means of two cast steel gear rack sections mounted in structural steel brackets and driven by cut steel spur gears from a 20-h.p., motor equipped with a solenoid brake. The cradle, which is made up of two semi-circular structural steel girders connected by diaphragm and heavy bracing is mounted on four rollers in such a manner as to permit endwise tipping of the car to an angle of 40 degrees in either direction. Steel cables, driven from two 30-inch diameter drums and secured to the cradle by spring ends to prevent shocks, are used for tipping the car endwise. The operating drums are driven through oil enclosed cut steel spur gearing by a 40-h.p., motor equipped with solenoid brake. The combined effect on the car of the sidewise tipping to an angle of 15 degrees and the endwise tipping to an angle of 40 degrees causes the grain to be discharged through the door opening into the receiving hopper at the side of the machine, from which it is carried by belt conveyors to the elevator.

The door opener which is supported from the main cradle by pivoted structural steel levers will push in the boards forming the grain door by means of a steel screw and threaded sleeve driven through cut steel spur gears from a 15-h.p., motor. The grain door will remain attached to the door opener frame which will be raised above the main flow of grain during the dumping operation. During the entire unloading operation the grain door will not be touched by hand. When the car is righted the door opener mechanism is removed from the car and the grain door deposited on the car floor. The door opener is adjustable to cars of widths varying from 8 feet 6 inches to 10 feet 6 inches and with floor heights varying from 3 feet 5 inches to 4 feet 3 inches above top of rail.

The machinery for clamping the car on the platform against longitudinal movement consists of two cast steel carriages which travel on guides in the upper table, and hold the car by contact with the couplers. The clamp carriages are moved and held by steel screws, driven by threaded sleeves turning in fixed bronze-bushed bearings. The sleeves are driven by cut steel spur gearing from a 15-h.p. motor. The clamp carriages are to disappear into pits at the ends of the machine when at their extreme outer position, to permit passage of cars on and off the machine.

Four pivoted end posts, one at each corner of the car supporting platform are provided for taking the weight of a loaded car or locomotive when passing on or off the dumper. These posts always bring the rails on the dumper into correct alignment with those outside the dumper. The posts are operated by the end clamp carriages and are entirely automatic. When the end clamp carriages disappear into their pits at the ends of the machine they operate the end posts through a system of levers. This feature makes it absolutely impossible to run a car over the machine without the end posts being under the car supporting platform.



Sectional View of Box Car Unloader

Briefly the operation of the unloader is as follows:—

The loaded grain car, with its outer door open on the dumping side, is spotted on the platform of the unloader approximately central by a car haulage system, small locomotive, or otherwise. The disappearing end clamp carriages are simultaneously brought into position in contact with the car couplers, thus positively centering the car on the main cradle. This operation also automatically removes the end posts from beneath the car supporting platform. The grain door is then removed by the door opener, and the car tipped sidewise 15 degrees. With this operation a large percentage of the grain in the centre of the car is discharged into the receiving hopper. The main cradle is next tipped to a maximum of 40 degrees to the horizontal in one direction to discharge the grain from one end of the car. With the upper end of the car empty a baffle plate is inserted through the door opening and the cradle tipped to an angle of 40 degrees to the horizontal in the opposite direction, discharging the grain from the other end of the car.

After the car has been emptied of its load the side tipping and longitudinal tipping platforms are again brought to normal horizontal position. The door opener is withdrawn and the end clamp carriages are run into their pits. This operation of the end clamp carriages automatically places the end posts under the corners of the car supporting platform. The empty car is then moved off the platform by means of the car haulage system. The time required for the complete cycle of operation of the unloader is claimed to be 3½ minutes. With the car spotting system which is being planned by the Philadelphia Grain Company in connection with these unloaders and a conveying system large enough for taking the grain away from the receiving hoppers it is considered that there should be no difficulty in maintaining an average unloading capacity of 16 cars per hour with two machines.

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A

AERIAL PHOTOGRAPHY

Topographic Mapping. Airplane Speeds Up Power Surveys J. B. Beadle. Elec. World, vol. 86, no. 7, Aug. 15, 1925, pp. 311-314, 6 figs. Contour maps made from aerial photographs overcome many limitations of prevailing methods and shorten time of preparation; typical examples of Conowingo project and Green River Basin.

AIR COMPRESSORS

Efficiency. Maintenance of Air Compressor Efficiency, F. H. Ryan. Power House, vol. 18, no. 13, July 5, 1925, pp. 27-28, 4 figs. Value of two-stage compression; proper lubrication, essential; suction screen to eliminate dust; condition of governors important.

Motor, Pressure Regulators for. Automatic Pressure Regulator for Motor-Compressors, F. Eckinger. Brown Boveri Rev., vol. 12, no. 6, June 1925, pp. 126-130, 11 figs. Describes regulator constructed in manner suggested by Aichele, working on following principle: a diaphram under influence of pressure actuates certain valves controlling pneumatic servo-motor, which in turn operates motor-switch; pressure range for this apparatus is from 2-12 kg. per sq. cm., and smallest adjustable pressure difference between automatic switching in or out of motor is 7 kg. per sq. cm.

AIR PREHEATERS

Ljungström. Air Preheaters of the Ljungström Type (Der Luftvorwärmer Bauart Ljungström), W. Gumz. Feuerungstechnik, vol. 13, nos. 18 and 20, June 15 and July 15, 1925, pp. 217-220 and 248-249, 5 figs. Discusses increased importance of preheaters; Ljungström type of rotary regenerator, design, construction, dimensions, efficiency and results of tests; technical and economic advantages and drawbacks.

AIR PUMPS

Manufacture. Operations in Manufacturing Air-Brake Pumps. Am. Mach., vol. 63, no. 5, July 30, 1925, pp. 191-193, 10 figs. Some of the tools and methods used in milling, boring, and drilling air-pump cylinders; old and new equipment for similar work.

Size. Selecting the Right Size of Air Pump, H. E. Carleton. Power Plant Eng., vol. 29, no. 15, Aug. 1, 1925, pp. 791-792, 3 figs. It may be assumed that weight of air to be removed is proportional to weight of steam.

AIRPLANE ENGINES

Ignition System. Eliminating Disturbing Effect of Electric Ignition System of Explosion Engines on Radio Receivers in Airships (Ueber die Beseinigung der störenden Wirkung des elektrischen Zündsystems der Explosionsmotoren auf den Radioempfang bei Flugzeugen), V. S. Kulebakin. Elektrotechnische Zeit., vol. 46, no. 29, July 16, 1925, pp. 1061-1067, 10 figs. Describes new method in which in place of usual connecting cables in ignition system special chain-like conductors are used; results of tests in laboratory and during flight.

AIRSHIPS

Design. Inertia Factors of Ellipsoids for Use in Airship Design, L. B. Tuckerman. Nat. Advisory Committee for Aeronautics—Report, no. 210, 1925, 7 pp. Report based on study made by writer as member of Special Committee on Design of Army Semi-rigid Airship RS-1.

Landing Systems. The "Nobile" Mechanical Landing System, U. Nobile. Aviation, vol. 19, no. 3 July 20, 1925, pp. 63-65, 5 figs. Describes system, which comprises a device on ground and a device on board airship; device on airship, aside from usual landing cable, consists of special automatic anchor attached to free end of landing cable, and small windlass to drum of which other end of cable is fixed, located inside nacelle; device on ground consists of three braking ropes arranged 120 deg. to each other, converging to one and same point.

ALARM SIGNALING

Safe-Protection, Electrical. Improved Electrical Protection for Safes, Etc. (Die Elektresor-Kassensicherung "E/111"), W. Blut. Elektrotechnische Zeit., vol. 46, no. 5, Jan. 29, 1925, pp. 150-157, 9 figs. Apparatus, connections and principle of operation of improved Elektresor equipment for protection of safes, strong rooms, etc.; distinctive feature of equipment is that alarm bell itself is permanently under automatic supervision.

ALCOHOL

Production from Coke Ovens. Alcohol from Coke Ovens. Iron Age, vol. 116, no. 7, Aug. 13, 1925, pp. 419. How the French are recovering it commercially from gases by a noted process. Abridged translation from Chemie et Industrie, May 1925.

ALLOY STEELS

Automobile Construction, for. Some Alloys Steels for Automobile Construction, C. H. S. Tupholme. Metallurgist (Supp. to Engineer, vol. 140, no. 3631), July 31, 1925, pp. 98-101. Deals with chrome, nickel, chrome-nickel, chrome-vanadium, and chrome-molybdenum steels and their use for automobile construction.

ALLOYS

Aluminum. *See Aluminum Alloys.*

Aluminum-Molybdenum-Nickel. The Aluminum-Molybdenum-Nickel System (Das System Aluminum-Molybdän-Nickel), H. Pfautsch. Zeit. für Metallkunge, vol. 17, no. 4, April 1925, pp. 125-127, 8 figs. Results of investigations at Metallurgical Institute of Technical High School, Charlottenburg, Germany.

Copper. *See Copper Alloys.*

Molybdenum-Nickel-Tin. The Molybdenum-Nickel-Tin System (Das System Molybdän-Nickel-Zinn), H. Pfautsch. Zeit. für Metallkunde, vol. 17, no. 4, April 1925, pp. 122-124, 4 figs. Results of investigations at Metallurgical Institute of Technical High School, Charlottenburg, Germany.

ALUMINUM ALLOYS

Aging of. The Effect of Artificial Ageing upon Age-Hardened Aluminum Alloys, M. L V. Gayler. Metal Industry (Lond.), vol. 27, no. 2, July 10, 1925, pp. 30-32, 7 figs. Discussion of article by K. L. Meissner, published in June 26 issue of same journal. Main points of criticism are that, contrary to Meissner's statements, not only can aluminum-copper alloys be age-hardened at room temperatures, but only few of them can be age-hardened at elevated temperatures; that there is no ground for Meissner's classification of age-hardening alloys into those that can be age-hardened at elevated temperatures; Meissner's assumption that $MgZn_2$ is age-hardening agent is unproved.

AMMUNITION

Small-Arms. Modern Small Arms and Their Manufacturing Requirements, G. P. Wilhelm. Army Ordnance, vol. 5, nos. 29 and 30, March-April and May-June 1925, pp. 713-718 and 807-812, 7 figs. March-April: Comparison of war-time status of small arms and post-war development; infantry and small-caliber weapons for anti-aircraft uses; infantry weapons and normal tactical use; improved types of ammunition. May-June: War-time manufacturing problems of small-arms ammunition; importance of interchangeability; small arms and gages

APPRENTICES, TRAINING OF

National Program. A National Apprenticeship Program. Mech. Eng., vol. 47, no. 8, August 1925, pp. 624-626. Abridgment of paper by F. W. Thomas and paper by R. L. Cooley, read at Apprenticeship Session, held under auspices of Committee on Education and Training for Industries, at A.S.M.E. spring meeting, and discussion, dealing with apprenticeship system of Santa Fe Ry., place of vocational schools in district apprenticeship plan, and Milwaukee co-operative plan.

Welding Operators. The Training of Welding Operators, W. J. Meadowcroft. Am. Mach., vol. 63, no. 7, August 13, 1925, pp. 275-277, 2 figs. Description of methods used by E. G. Budd Mfg. Co.

AUTOGENOUS WELDING

Tanks. Autogenous Welding of Tanks. Ry. Jl., vol. 31, no. 7, July 1925, pp. 26-28, 8 figs. Discusses selection and inspection of material, design and layout of welded joints, preparation of plates for welding, welding technique, and test of completed tank.

AUTOMOBILE ENGINES

Air Cleaners. Air Clarifiers, K. B. Harmon. Army Ordnance, vol. 5, no. 29, March-April 1925, pp. 737-739, 4 figs. Discusses different types of air cleaners which are classified under liquid, inertia, and filter cleaners.

Mercedes Oiling System. Mercedes Oiling System a Departure from Conventional Practice. Automotive Industries, vol. 53, no. 7, August 13, 1925, pp. 256-261, 12 figs. Small supply of fresh lubricant constantly fed into pressure pump during engine operation; oil delivered to one bearing at a time with special distributor.

AUTOMOBILE FUELS

Index Number. Judging Automobile Fuels by Means of an Index Number (Die Bewertung von Motorbrennstoffen mit Helfe der "Kennziffer"), Ostwald. Petroleum, vol. 21, no. 21, July 20, 1925, pp. 1323-1328, 5 figs. Proposes to use behavior in boiling of fuel as a criterion of its quality and develops boiling point curves for the purpose.

Producer Gas. *See Charcoal, Producer-Gas Automobiles, for.*

AUTOMOBILES

Axles. Inspecting and Testing Automobile Axles, R. L. Rolf. Forging—Stamping—Heat Treating, vol. 11, no. 7, July 1925, pp. 226-231 and 240, 20 figs. Tremendous demands of axle service require that every possible test be used that will help make finished product one of absolute dependability. Discusses chemical, mechanical, deep-etch, and cold tests, and microscopic study.

Brakes. B-K Booster Brake Utilizes Vacuum of Inlet Manifold. Automotive Industries, vol. 53, no. 3, July 16, 1925, pp. 100-101, 1 fig. Describes brake manufactured by Bragg-Kliesrath Corp. of Long Island City, N.Y.; supplies all of force needed in most applications and is assisted by pedal pressure in emergencies; controlled by means of molded rubber valves actuated through pedal.

Electric. The Case for the Electric, A. W. Blake. Motor Transport (Lond.), vol. 41, no. 1062, July 6, 1925, pp. 19-20. Reasons for more extended use of battery-driven vehicles; their advantages from point of view of health and economy.

Gear Shifts. Automatic Shift is Applicable to any Three-Speed Gearbox. Automotive Industries, vol. 53, no. 3, July 16, 1925, pp. 98-99, 2 figs. Describes gear shift developed by Hasbrouck Gear Shift Corp., New York City; gear preselected by means of convenient lever on steering post under wheel and actual shifting is effected automatically through operation of clutch pedal; housing containing mechanism bolts to top of gear box.

New Automatic Shift Partly Eliminates Selecting Operation. Automotive Industries, vol. 53, no. 4, July 25, 1925, pp. 140-141, 2 figs. Describes comparatively simple device for shifting gears automatically brought out by U. S. Automatic Shift Co. of Madison, Wis.; works on mechanical principle and effects shifting during return stroke of pedal; no selecting required for going from intermediate into high and vice versa.

Rear Axles, Worm-Drive. Worm Drive Rear Axles as Applied to Modern Automobiles, D. McCall White. Mich. Technic, vol. 38, no. 4, May 1925 pp. 17-19 and 23-24, 5 figs. Analysis of worm drive; weight on spring seatings caused by car load; tractive effort in one direction; reflex brake load, torsional load, bending moments due to reflex load; axle weight; inertia of axle.

Research. Bearing of Research Department Work on Car Developments, H. L. Horning. Soc. Automotive Engrs.—Jl., vol. 17, no. 2, August 1925, pp. 189-191. Discusses methods of keeping oil clean, and lubricating engines with mud; vibrations of 0.001 in. are tiresome; etc.

Steering Gear. Making a Steering Gear for Low-Pressure-Tired Wheels, J. Younger. Am. Mach., vol. 63, no. 7, Aug. 13, 1925, pp. 264-266, 10 figs. Some of the manufacturing refinements employed by Packard Motor Co. to insure safety and easy steering with low-pressure tires.

Steering Gear, J. L. Synge. Automobile Engr., vol. 15, no. 204, July 1925, pp. 204-205, 4 figs. Some fundamental considerations in design.

Stopping Distance of. Factors Determining the Minimum Stopping Distance of an Automobile, H. H. Allen. Soc. Automotive Engrs.—Jl., vol. 17, no. 2, August 1925, pp. 192-194, 5 figs. Summarizes and explains derivation of some of the relations that are essential to a correct determination of possible deceleration; all variables that are of significance or of sufficient magnitude to affect appreciably performance of a car under a given set of conditions of vehicle or of environment have been included.

Transmissions, Materials for. Novotext, an Important Material in Automobile Construction (Novotext, ein neuer wichtiger Konstruktionswerkstoff für den Automobilbau), G. Flatow. Motorwagen, vol. 28, no. 18, June 30, 1925, pp. 379-382, 10 figs. Novotext, known as textolite in United States, is a GEC and AEG product used for production of noiseless transmission gear; it consists of a very strong fiber material pressed under high pressure with bakelite as binder; properties etc.

B

BALANCING

Internal-Combustion Engines. *See Internal Combustion Engines, Balancing.*

BALANCING MACHINES

Dynamic-Static. New Dynamic-Static Balancing Machines (Ueber neuere dynamisch-statische Wucht-maschinen), H. Hort. Elektrotechnische Zeit., vol. 46, no. 29, July 16, 1925, pp. 1073-1078, 10 figs. Discusses Krupp views on balancing problems and describes Krupp machines developed on these views; detailed description of design and operation of BT type; proves accuracy of method used and shows its advantages.

BEAMS

Channel-Iron. Bending and Torsional Stresses in Channel-Iron Beams (Beanspruchung Eines [-Trägers auf Biegung und Verdrehen], L. Föppl. Bauingenieur, vol. 6, no. 12, June 25, 1925, pp. 455-463, 8 figs. Discusses deviations from straight-line law; center loading of beam supported at both ends, loading with two loads 100 cm. distant from center resistance to bending.

Elastic Equation for. The Elastic Equation for Beams, W. D. Womersley. Concrete & Constructional Eng., vol. 20, no. 7, July 1925, pp. 366-371, 5 figs. Discusses application of powerful single-equation method for determination of bending moments, reactions, etc., in beams due to any kind of loading, fixing, and sinkage conditions which has been in use in engineering schools of Cambridge University for past 20 years.

Stresses. Graphic Determination of Stresses in Straight Beams by a Uniform Method for Homogeneous Profiles, for Profiles without Tensile Strength, and for Reinforced-Concrete Profiles (Graphische Bestimmung der Normalspannungen in geraden Stäben nach einen einheitlichen Verfahren für homogene Querschnitte, für Querschnitte ohne Zugfestigkeit und für Eisenbetonquerschnitte), H. Spangenberg. Bauingenieur, vol. 6, no. 10, May 25, 1925, pp. 366-373, 8 figs. Discusses methods applicable to symmetric and to asymmetric loading of profiles.

BEARINGS

Split, Machining of. Machining Split Bearings. Mech. Wld., vol. 78, no. 7009, July 3, 1925, p. 5, 7 figs. Description of a method of machining whereby many disadvantages are eliminated, with very considerable saving in machining times.

BEARINGS, BALL

Operation and Application. Operation and Application of the Ball Bearing, T. C. Delaval-Crow. Am. Mach., vol. 63, no. 8, Aug. 20, 1925, pp. 295-299, 9 figs. Its qualifications in comparison with those of plain bearing; describes action between balls and races; material factor; examples of successful application.

BEARINGS, ROLLER

Noise-Measuring Device. The Measurement of Noises, D. L. Rich. Mich. Technic, vol. 38, no. 4, May 1925, pp. 14-16 and 26-28, 1 fig. Describes noise- and vibration-measuring device developed to meet needs of a particular type of inspection of roller bearings.

Railway Cars. New Design of Roller Bearings for Street and Railway Operation. (Eine neue Rollen-lagerkonstruktion für elektrischen Strassenbahn und Eisenbahnbetriebe), H. Angström. Verkehrstechnik, no. 25a, June 21, 1925, pp. 423-434, 35 figs. Discusses experience with Malmö street-car lines, disadvantages of ball bearings, advantages of roller bearings determined from tests; describes new design and recommends standard cylindric roller bearing for railway operation. (From Swedish).

BEARINGS, THRUST

Michell. The Michell Thrust Bearing, R. O. Boswall. Engineering, vol. 120, no. 3110, Aug. 7, 1925, pp. 153-155, 3 figs. Author indicates how existing theory must be altered in order that certain modifications may be taken into account.

BELTING

Conveyor. Belting and Conveyor Equipment in Non-Metallic Industry. Belting, vol. 27, no. 1, July 1925, pp. 20, 22, 24, and 26, 2 figs. Installations of labor-saving equipment in several large plants on Pacific Coast represent importance to this industry.

Belting and Transmission in U. S. Air Mail Plant, W. H. Mack. Belting, vol. 27, no. 1, July 1925, pp. 28, 30, 4 figs. Discusses use of conveyor belting at U. S. Air Mail Service plant at Maywood, Ill. Describes coal conveyor.

Leather. The Application of Leather Belting, R. F. Jones. Universal Engr., vol. 42, no. 2, August 1925, pp. 28-35, 12 figs. Effect of center distance on transmitting capacity; effect of pulley size on transmitting capacity; study of belts operating at various pulley ratios; tests on gravity idler; effect of high speed on capacity of leather belts; rating charts for leather belting based on experimental data; precautions.

BLAST-FURNACE GAS

Power from. Power from Blast Furnace Gas, C. H. S. Tupholme. World Power, vol. 4, no. 20, August 1925, pp. 90-93, 2 figs. Includes table giving typical data relating to use of gas from 600-ton blast furnaces; describes installation at River Rouge plant as example.

BLAST FURNACES

Cyanid Accumulation in. Economic Significance of Cyanid Accumulation in the Blast Furnace, R. Franchot. Am. Inst. Min. & Met. Engrs.—Trans., no. 1470-C, July 1925, 14 pp. From efficiency viewpoint, greatest loss of energy to blast furnace is in its failure to convert more than about a third of coke carbon from CO to CO_2; this has usually been ascribed to necessity of a 2:1 excess of CO in order to reduce iron; it has, however, been proved that iron is completely reduced by equal volumes of CO and CO_2; hence there is room for hypothesis that vaporization, as cyanid, of accumulated alkalis is serious primary factor limiting ratio of ore to coke; observed cyanid-vapor concentrations and those measured by variations of nitrogen-oxygen ratio in hearth gases form basis for quantitative explanation of furnace action.

Great Britain. Blast Furnaces of the United Kingdom Built and in Blast. Foundry Trade Jl.—Supp., vol. 32, no. 467, July 30, 1925. Table compiled from returns received direct from furnaces.

BOILER FEEDWATER

Composition. Behavior of Iron, Red Brass, and Brass in Salty Water at Ordinary Temperature and at Temperatures and Pressures in Boilers (Das Verhalten von Eisen, Rotguss und Messing in salzhaltigen Wässern bei gewöhnlicher Temperatur und bei den im Dampfkessel herrschenden Temperaturen und Drücken), Bauer. Stahl und Eisen, vol. 45, no. 28, July 9, 1925, pp. 1101-1109, 14 figs. Results of tests show that magnesium salts are dangerous for boilers, danger increases with gradually enriching feedwater with them.

Deaeration. Deaerating Boiler Feedwater (Le dégazage de l'eau d'alimentation des chaudières), Dantin. Génie Civil, vol. 86, no. 24, June 13, 1925, pp. 573-576, 8 figs. Describes Aulnoye central-station plant equipped with Scam-Contraflo apparatus for treating 130 tons per hour; analysis of water before and after treatment.

Heating. Advantages of Feed-Water Heating by Stage Bleeding, R. W. Booze. Power, vol. 62, no. 6, Aug. 11, 1925, pp. 211-212, 3 figs. Essential principles involved in bleeder heating and advantages.

Treatment. Preventing Formation of Boiler Scale (Die Verhütung von Kesselsteinbildungen in Dampfkesseln), Hellmers. Zeit. für angewandte Chemie, vol. 38, no. 28, July 8, 1925, pp. 609-610. Describes Menz method, German Patent 386,676, in which chemical and physical action are combined; makes use of tannin and its action on calcium carbonate and gypsum.

Pulverized Coal. *See Pulverized Coal, Boiler Firing.*

BOILER FURNACES

Air Supply. Air and Combustion. Power Engr., vol. 20, no. 233, August 1925, pp. 291-292, 1 fig. Notes showing how vital a matter is supply of oxygen to boiler furnace.

Flue-Gas Analysis. Gas Analysis as an Aid to Correct Furnace Design, J. R. Darnell. Combustion, vol. 13, no. 2, August 1925, pp. 96-98. Discussion of use of mercury Orsat for more exact flue-gas analysis and its value in furnace design.

Pulverized-Coke-Burning. Burning Pulverized Petroleum Coke. Power Plant Eng., vol. 29, no. 16, Aug. 15, 1925, pp. 834-836, 5 figs. Changing over from pulverized coal to pulverized coke in Oklahoma City plant of Morris & Co. required only minor changes to equipment.

Pulverized Coal, for. Boiler Furnaces for Pulverized Coal. Blast Furnace & Steel Plant, vol. 13, no. 8, August 1925, pp. 330-333, 4 figs. Discussion by H. W. Brooks of paper by A. G. Christie presented at spring meeting of A.S.M.E., 1925.

Refractories. *See Refractories, Boiler Furnaces.*

BOILER PLANTS

Coke-Plant. New Boiler Plant of By-Products Coke Corporation. Power, vol. 62, no. 6, Aug. 11, 1925, pp. 196-199, 6 figs. Has four boiler units equipped with forced-draft chain grates and special furnaces for burning of coke braize, with front and rear arches and side-wall cooling.

BOILERS

Downdraft. Downdraft Boilers, R. W. Robb. Combustion, vol. 13, no. 2, August 1925, pp. 100-101, 2 figs. Particular use of these boilers for heating-plant application.

Heads. Danger of Explosion in Slightly Dished Boiler Heads with Sharply Bent Flanges (Explosionsgefahr. bei schwachgewölbten Kesselböden mit scharfer Krempenbiegung), W. Quack. Wärme, vol. 48, no. 20, May 15, 1925, pp. 259-262, 13 figs. Describes a boiler explosion; probable cause of sharply bent flange, indications of an explosion in process of forming, necessity for overbauling such boiler heads.

High-Pressure, Drums for. Calculating Strength of High-Pressure Boiler Drums (Zur Festigkeitsberechnung von Hochdruck-Kesseltrommeln), E. Meissner, Schweizerische Bauzeitung, vol. 86, no. 1, July 4, 1925, pp. 1-5, 7 figs. Discusses calculation of Krupp boiler shells of ingot iron and nickel steel for interior pressures of up to 120 kg. per sq. cm. and temperatures of 400 deg. cent. and over, hemispherical ends, assuming constant wall thickness, constant temperature and hemispheres free from rivet holes.

Oil Fuel for. Oil as a Boiler Fuel. Power Engr., vol. 20, no. 233, August 1925, pp. 303-305. Notes on its advantages and on principles underlying its efficient combustion.

Waste Heat. *See Waste Heat, Utilization.*

BOILERS, WATER-TUBE

Heat Radiation. Heat Radiation in Water-tube Boilers (Ein Beitrag zur Untersuchung des Wasserrohrkessels in bezug auf Wärmestrahlung), Koessler. Zeit. Bayerischen Revision-Vereines, vol. 29, nos. 10, 11, and 12, May 31, June 15 and 30, 1925, pp. 115-118, 126-130, 136-140, 19 figs. Investigates heat transmitted by radiation per unit of surface and unit of time from a surface of abs. temp. T_1 to a surface of abs. temp. T_2; ratio of absorption and delivery of radiation of a tube and a strip of surface of equal length; etc. Develops formulas and gives numerical examples.

BOILER TUBES

CHANGING. New Methods for Changing Tubes in Locomotive and Stationary Boilers by the Priborsky System (Neue Arbeitsmethoden zur wirtschaftliche-Durchführung des Rohrwechsels bei Lokomotivkesseln und ortsfesten Dampfkesseln nach System Priborsky), B. Schapira. Feuerungstechnik, vol. 13, no. 20, July 15, 1925, pp. 241-245, 14 figs. Discusses cleaning and changing tubes by present methods, and by new method; welds and tests, bend connectors, bests of screw threads of tube connections.

BOLTS

EYE-BOLTS. Eye-Bolt Stresses as Determined by Photoelastic Test, T. H. Frost and W.E. Richards. Soc. Automotive Engrs.—Jl., vol. 17, no. 2, August 1925, pp. 213-217, 8 figs. Describes tests made at Mass. Inst. Technology, and results obtained; shows that maximum stress of 862.44 lb. per sq. in. occurs at a section on either side of eye at inner boundary 0.115 in. below line from center of eye to outer boundary of bolt perpendicular to axis of shank.

BONUS SYSTEMS

WEEKLY RESULTS, BY. Bonus Payment by Weekly Results, A. Whitehead. Machy. (Lond.), vol. 26, no. 665, June 25, 1925, pp. 399-400. Describes pliable system; relative advantages of large and small batches; example of working of system.

BORING MACHINES

CYLINDER. A New Electrically-Driven Portable Cylinder Boring Machine. Ry. Gaz., vol. 43, no. 5, July 31, 1925, p. 180, 1 fig. Notes on new machine designed and built by Beyer, Peacock & Co., Ltd., for boring locomotive cylinders while in position.

BRASS

ALPHA-BETA, CORROSION OF. Corrosion of Alpha-Beta Brass as Affected by Grain Size, R. J. Anderson and S. H. Brooks. Mech. Eng., vol. 47, no. 8, August 1925, pp. 643-645, 4 figs. Results of a series of tests made on accelerated electrolytic corrosion of brass 66:33:1 copper-zinc-tin; examination was made of effect of grain size in range 0.01 mm. diameter to 0.10 mm. on corrosion loss in 6 different corroding media.

HARDNESS. *See Copper Alloys, Hardness.*

HEAT TREATMENT. Thermal Treatment of Certain Brasses Containing Nickel (Sur les traitements thermiques de certains laitons), L. Guillet. Académie des Sciences—Comptes Rendus, vol. 180, no. 18, May 4, 1925, pp. 1340-1342. Heat treatment profoundly influences microstructure; casting in sand causes formation of solid solutions; on reheating to 850 deg., followed by very slow cooling, all three alloys tested show eutectoid structure; cooling in air results in distinctly higher hardness tests than does water quenching; reheating increases hardness, especially when solid solutions are formed.

IMPACT TEST. *See Copper Alloys, Impact Test.*

BRIDGE ERECTION

REINFORCED-CONCRETE, DEVELOPMENT OF. The Development of Reinforced Concrete Bridge Construction, W. Mueser. Cornell Civil Engr., vol. 33, no. 8, May 1925, pp. 160-165, 178, 180 and 182-183, 10 figs. Beginning of modern reinforcement; 36-ft. Melan reinforced-concrete arch bridge near Rock Rapids, Ia., first bridge; problem at Jacksonville, Fla.; notes on other notable undertakings; novel method of beautification.

BRIDGES, CONCRETE

ARCH. Construction Features of Concrete Bridge at Binghamton, N. Y. Eng. News-Rec., vol. 95, no. 7, Aug. 13, 1925, pp. 264-265, 1 fig. Arches concreted in three 20-ft. sections; 3-hinged steel truss arch used for centering; flood destroys trestling.

BRIDGES, HIGHWAY

CONCRETE. California Road Bridge Concrete All Tested in Field, H. D. Miller. Eng. News-Rec., vol. 95, no. 5, July 30, 1925, p. 182, 1 fig. Both 10-day and 28-day tests now standard practice followed by state highway department.

LOADING. Loads on Highway Bridges. Engineering, vol. 120, no. 3110, Aug. 7, 1925, p. 172, 1 fig. Review of report on typical loadings for three classes of bridges.

BRIDGES, STEEL

MATERIAL STRENGTH OF. Material for Iron Bridges and Use of High Grade Structural Steel (Zur Gesschichte des Werksstoffes für eifserne Brucken und zu den neueren Besstrebungen nach Verwendung eines hochwertigen Bausstahls), Osw. Etlinghagen. Kruppsche Monatshefte, vol. 6, May 1925, pp. 85-98, 19 figs. Reviews developments from cast iron to wrought iron, and Siemens-Martin steel, crucible steel, nickel steel, etc., giving examples of bridges; specifications as to strength of material in various countries.

BRONZES

HARDNESS. *See Copper Alloys, Hardness.*

IMPACT TEST. *See Copper Alloys. Impact Test.*

ACID-RESISTING CASTINGS. Acid-Resisting Bronze. Foundry Trade Jl., vol. 32, no. 468, Aug. 6, 1925, p. 117. Article is written as reply to query in relation to bronze castings for mine work, trouble being that of making them in non-corrosive, of acid-resisting material; manganese bronze is only one that will successfully resist acids; methods of introducing manganese; preparation of copper manganese.

BUILDING CONSTRUCTION

DAY LABOR SYSTEM. Day Labor Operations in Public Construction. Eng. & Contracting (Gen. Contracting), vol. 63, and vol. 64, nos. 6 and 1, June 17 and July 15, 1925, pp. 1312-1320 and 149-157. Inefficiencies and ineconomies of handling public works without contracts. Report of Executive Board of Asso. Gen. Contractors of America.

EARTHQUAKE-RESISTANT. Earthquake-Resistant Construction: Suggestions from Tokyo, R. F. Moss. Eng. News-Rec., vol. 95, no. 5, July 30, 1925, pp. 183-184. Principal conclusions drawn from experiences in Japanese earthquake; light floors, strong walls and thorough interconnection are vital; remarks on foundations and materials.

BUILDINGS

LIVE LOADS. Live-Loads for Building Designs: Recommended Standards. Eng. News-Rec., vol. 95, no. 6, Aug. 6, 1925, p. 214. Committee of Department of Commerce reports its conclusions from floor-loading data and opinions of experts.

STRESSES IN FRAMEWORK. Working Stresses in Framework of Buildings: Tentative Proposals. Eng. News-Rec., vol. 95, no. 6, Aug. 6, 1925, pp. 215-216. Suggested building code provisions drafted by Committee of Department of Commerce for criticism.

BUSES

TROLLEY. Trackless Trolley 'Bus Working. Motor Transport (Lond.), vol. 41, no. 1062, July 6, 1925, pp. 9-11, 2 figs. Reviews use of trackless trolley buses and describes successful systems.

C

CABLES, ELECTRIC

DIELECTRIC LOSSES. Dielectric Losses in Cables, F. A. Brownell. Elec. Wld., vol. 86, no. 5, Aug. 1, 1925, pp. 218-220, 4 figs. Discusses decreased efficiency of high-tension transmission cables due to dielectric loss and describes experiments and tests employed.

CALORIMETERS

GAS. A Simple Gas Calorimeter, Harald Nielsen. Gas Jl., vol. 171, no. 3243, July 8, 1925, pp. 107-109, 4 figs. Construction details of small calorimeter suitable for small gas-works or laboratory and easily made up.

CARBON MONOXIDE

MIXTURES, COMBUSTION OF. *See Combustion, Carbon-Monoxide Mixtures.*

CARBURETORS

INTAKE LOCATION. Best Location for Carbureter Intake, A. H. Hoffman. Soc. Automotive Engrs.—Jl., vol. 17, no. 2, August 1925, pp. 172-174. Discussion of paper published in May 1925 issue of same journal.

CAR WHEELS

A. R. A. COMMITTEE REPORT. Report of A. R. A. Committee on Wheels. Ry. & Locomotive Eng., vol. 38, no. 7, July 1925, pp. 204-207, 1 fig. Deals with developments in cast-iron-wheel design, grinding of cast-iron and steel wheels, grinding cost data, gage for remounting wheels, pressure gages for wheel presses, steel-wheel wear, brakes and brake equipment, etc.

CENTERS, MACHINING OF. Turning, Facing, and Boring Machine for Railway-Wheel Centers. Mech. Wld., vol. 77, no. 2009, July 3, 1925, pp. 4-5, 2 figs. Describes machine for machining of railway-wheel centers on a mass-production basis; will deal with wheel centers of either forged or disk type ,and is designed to perform whole of operations on center at one setting; is of vertical duplex type.

CARS, FREIGHT

BOX. Committee on Car Construction Submits Report. Ry. Rev., vol. 77, no. 3, July 18, 1925, pp. 96-99, 3 figs. Particulars of new design of 40- and 50-ton capacity double-sheathed box car with wooden sheathing and lining presented for adoption by committee of Am. Ry. Assn.

CARS, FREIGHT

REINFORCED-CONCRETE. The Development of the Reinforced Concrete Car, A. B. Reeve. Ry. Age, vol. 79, no. 1, July 4, 1925, pp. 41-44, 7 figs. Experience of past 6 years points way towards successful use of new materials in car construction: progress and aspects of development.

CASE HARDENING

ROLLING STOCK. Case Hardening and Its Application for Rolling Stock (Das Einsatzhärten und seine Anwendung in der Eisenbahnfahrzeugindustrie), Kühnel. Glasers Annalen, vol. 97, no. 12, and vol. 97, no. 1, June 15 and July 1, 1925, pp. 259-265 and 1-7, 21 figs. Discusses contradictory statements in the literature as to temperature, time, action, and depth of penetration; theoretical requirements for successful case hardening; apparatus for hardening process.

CASTING

CENTRIFUGAL. *See Pipe, Cast-Iron, Centrifugally cast.*

INGOTS. Feeding Ingots. Foundry Trade Jl., vol. 32, no. 464, July 9, 1925, p. 39. Casting of steel and of non-ferrous ingots.

LUBRICATOR TUBES, CASTING-IN. The Casting-in of Lubricator and Similar Tubes. Metal Industry (Lond.), vol. 27, no. 5, July 31, 1925, pp. 99-100, 2 figs. It is claimed that by method described of casting-in small iron or steel tubes, not only are difficulties of ordinary method avoided, but passages of curved contour can be provided, while expensive machining operations can often be avoided.

CASTINGS

ALUMINUM, X-RAY, INSPECTION OF. Inspecting Aluminum Castings with X-ray, R. J. Anderson. Iron Trade Rev., vol. 77, no. 7, Aug. 13, 1925, pp. 374-376, 12 figs. Advantages of X-ray examination in production and use of castings; discusses radiography and apparatus used.

CHILL. Chill Casting (Ueber Hartguss), P. Goerens and H. Jungbluth. Stahl und Eisen, vol. 45, no. 28, July 9, 1925, pp. 1110-1117, 13 figs. Reviews research work since 1906; experiments to establish effect of carbon and silicon and also casting temperature and thickness of molds on hardness and depth of penetration, using experimental rolls.

MECHANICAL PROPERTIES. Determining Mechanical Properties of Castings (La Détermination des Propriétés Mécaniques des Pièces moulées), H. Thyssen. Fonderie Moderne, vol. 19, June 1925, pp. 121-127, 5 figs. Discusses tests provided in specifications, aud gives details of Frémont tests, including bending, shearing, and hardness tests, and their application.

WASTERS. What Constitutes a Waster Casting, J. H. List. Metal Industry (Lond.), vol. 27, no. 4, July 24, 1925, pp. 81-82. Author holds that there is no hard and fast line between waster and good casting, and deprecates methods based on such attitude as strongly as where attempts are made to patch up castings that can never be made good.

X-RAY EXAMINATION OF. Castings and Forgings. Mech. Eng., vol. 47, no. 8, August 1925, pp. 657-663, 2 figs. Summary of the more important points brought out in discussion of three papers presented at Materials and Machine-Shop Practice Session of A.S.M.E. spring meeting, by I. E. Moultrop and E. W. Norris, R. L. Streeter and P. V. Faragher, and J. F. Harper, dealing with methods of examining steel castings by X-rays for defects, castings and forgings from aluminum and its light alloys, and avoidance of defects in large steel forgings.

CAST IRON

ELEMENTS, EFFECT OF. The Influence of Various Elements on Cast-Iron, M. Hamasumi. Foundry Trade Jl., vol. 32, no. 466, July 23, 1925, pp. 71-76, 9 figs. Effect of silicon on strength; effect of phosphorus, sulphur, manganese, copper, chromium, and tin. (Abstract.) From Science Reports of Tohoku Imperial University, Japan.

GRAY, GROWTH OF. The Growth of Gray Iron (Das Waehsen von Graueisen), P. Oberhoffer and E. Piwowarsky. Stahl u. Eisen, vol. 45, no. 28, July 9, 1925, pp. 1173-1178, 9 figs. partly on supp. plate. Review of literature bearing on subject; with aid of original curves the mechanism of growth of iron is critically discussed and views are expressed in regard to existing theory.

HEAT TREATMENT AND COLUME CHANGES. The Heat Treatment and Volume Changes of Grey Cast-Iron, J. E. Hurst. Foundry Trade Jl., vol. 32, no. 465, July 16, 1925, pp. 49-52, 6 figs. Constitutional changes on heating cast iron; decomposition of carbides by heat treatment; microstructure of heat-treated cast iron; influence of heat treatment on strength properties; low-temperature heat treatment; volume changes and growth; influence of thermal expansion.

PROPERTIES. The Mechanical and Physical Properties of Cast Iron, J. H. Hurst. Foundry Trade Jl., vols. 31 and 32, nos. 462, 464, 467 and 468, June 25, July 9, 30 and Aug. 6, 1925, pp. 545-548, 31-32, 101-105 and 118-120, 12 figs. June 25: Ultimate breaking strength; compression; transverse bending; influence of casting conditions and composition on ultimate strength; indirect influence of other elements; casting and cooling conditions; casting temperature. July 9: Piston-ring drum tests; elasticity test; torsional strength; hardness tests; relation between hardness and ultimate strength properties. July 30: Impact tests; Fremont test; specific gravity of cast iron; relation between specific gravity and chemical composition; magnetic properties; electrical conductivity. Aug. 6: Thermal properties; latent heat; thermal conductivity; resistance to corrosion and wear.

TESTING. The Testing of Cast Iron, C. Dickinson. Foundry Trade Jl., vol. 32, no. 464, July 9, 1925, p. 40. Relation of test pieces to casting; shape of test pieces; machines used; compression and hardness testing. (Abstract.) Lecture before Sheffield Foundry Trades Tech. Soc.

THYSSEN-EMMEL PROCESS. The Thyssen-Emmel Process, H. Hermanns. Foundry Trade Jl., vol. 32, no. 468, Aug. 6, 1925, pp. 113-114, 3 figs. Process is said to be most important exhibit at spring Technical Fair for Foundry Work in Leipzig; for first time cast iron was publicly shown which possesses strength properties hitherto regarded as unheard-of and impossible, and designed to effect complete revolution in ideas regarding gray cast iron, its properties and possibilities of its utilization; advantages of new material. Translated from Giesserei-Zeitung.

CENTRAL STATIONS

CHICAGO. Crawford Avenue Station, W. L. Abbott. Elec. World, vol. 86, no. 3, July 18, 1925, pp. 113-119, 8 figs. New Chicago station designed to operate as part of superpower pool; expected to effect great fuel economy; interesting because of boilers, turbines, and steam pressure employed, accessibility and simplicity, and for method of utilizing steam to secure economy planned.

CONSTRUCTION COSTS. Analyzing Utility Construction Costs, P. O'Moore. Elec. Wld., vol. 86, no. 4, July 25, 1925, pp. 168-170, 1 fig. Description of method employed by Duquesne Light Co., Pittsburgh, Pa., in establishing detailed cost system covering substations, metering, overhead lines, underground cable installation and street lighting.

DESIGN. Discussion on Power Plant Design. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 8, Aug. 1925, pp. 886-895. Includes discussion on paper by C. F. Hirshfeld entitled Trenton Channel Station, published in July 1925 issue of Journal.

DESIGN AND OPERATION OF. Latest Design and Practice in Power Plants. Power, vol. 62, no. 4, July 28, 1925, pp. 126-128, 4 figs. Shows that heat units per kilowatt-hour have been reduced from about 22,500 in 1913 to less than 14,000 in 1925; although cost of coal per unit of power is decreasing, there is a decided increase in fixed charges.

DETROIT, MICH. Bid Schedules on Mechanical Auxiliaries in Detroit Municipal Plant. Power, vol. 62, no. 3, July 21, 1925, pp. 97-100. Tabulated bid data on boiler-feed pumps, mechanical-draft equipment, bridge cranes, condenser tubes and ferrule stock, of Morrell Street plant that is being erected by Public Lighting Commission of City of Detroit.

DIESEL ENGINES. Large Diesel Engines as Spares and Peak Load Engines for Large-Scale Power Plants (Grossdieselmotoren als Reserve- und Spitzenmaschinen von Grosskraftwerken), M. Gercke. Elektrotechnische Zeit., vol. 46, no. 24, June 11, 1925, pp. 880-886, 7 figs. Critical examination of suitability of Diesels; comparison with steam-turbine plants of similar capacity is in favor of Diesel.

OPERATION. Economic System Operation, E. G. M. Stahl. Elec. Wld., vol. 86, no. 4, July 25, 1925, pp. 165-167, 3 figs. How Brooklyn (N.Y.) Edison Co. operates three stations to make yearly cost a minimum; outlines scheduling of units, checks of operation and handling of reserves. Abstract of paper read before New York Sec., A.S.M.E.

PRIME MOVERS. Central Stations Eliminating Steam Engine. Elec. World, vol. 86, no. 7, Aug. 15, 1925, pp. 314-315. Turbines now 7 times greater in rating than steam engines; total rating of internal-combustion engine decreased; gives table of rating of prime movers in central stations and various circuit data, compiled from 1925 issue of McGraw Central Station Directory.

UNIFLOW ENGINE IN. Instal Uniflow Engine in a Municipal Plant, J. B. Hamilton. Power House, vol. 18, no. 12, June 20, 1925, p. 20, 1 fig. Describes unit, direct connected to 375 kva. generator operated at less than quarter load for nine months, which generates 409,200 kw.

CHARCOAL

PRODUCER-GAS AUTOMOBILES, FOR. Production of Charcoal for Producer-Gas Automobiles (La production du charbon de bois pour les automobiles à gazogène), P. Razous. Génie Civil, vol. 86, nos. 25 and 26, June 20 and 27, 1925, pp. 607-611 and 628-632, 16 figs. June 20: Discusses production of charcoal from French forests, and other methods of production. June 27: Carbonization in transportable furnaces; details of types of furnaces used.

CHIMNEYS

DRAFT AND CAPACITY. Draft and Capacity of Chimneys, J. G. Mingle. Combustion, vol. 12, no. 6, and vol. 13, no. 1, June and July 1925, pp. 434-439 and 40-46, 3 figs. Relation between height and diameter and typical example.

COAL

CARBONIZATION, HEAT OF. Heat of Carbonization of Coal, J. D. Davis, P. B. Place, and P. Edeburn. Fuel, vol. 4, no. 7, July 1925, pp. 286-299, 6 figs. Factors affecting heat of carbonization reaction, and its quantitative measurement; carbonization reaction heat from coke-oven heat balances; experimental method and apparatus used; heating coil circuit; coal samples tested; primary reaction heat and its variation with maximum temperature of carbonization; time required to complete carbonization reactions; effect on carbonization reaction heat of preheating coal in oxygen and hydrogen; carbonization of coal in atmospheres other than nitrogen; etc.

CARBONIZATION. The Mechanism of the Carbonization of Coal in the By-Product Coke Oven, N. A. Ross. Gas World, vol. 82, no. 2137, July 4, 1925, pp. 12-14 (Coking and By-Products Section). Discusses Illingworth, Beilby, and Foxwell theories; cause and degrees of plasticity; rate of heating; theory of carbonization process; structure of the coke; final temperatures and coke combustibility.

CHEMICAL CONSTITUTION. Pressure and the Elucidation of the Chemical Constitution of Coal, R. Quarendon. Chem. & Industry, vol. 44, no. 27, July 3, 1925, pp. 676-679. Review of investigations upon chemistry of coal in which pressure has been employed with special reference to works of Fischer and Schrader.

LOW-TEMPERATURE CARBONIZATION. Low-Temperature Coal Carbonization (Ueber Kohleschwelung), F. Schütz and W. Buschmann. Stahl und Eisen, vol. 45, no. 29, July 16, 1925, pp. 1232-1242. Discusses nature and object of low-temperature carbonization, fields of application and products; half coke, primary tar, tar benzine, gasol (hydrocarbons boiling below 30 deg.), residuary gas; operation of Allkog rotary furnace process and gas compression.

PURCHASING. Coal Buying of the Future, D. Henderson. Combustion, vol. 13, nos. 1 and 2, July and August 1925, pp. 37-39 and 91-94. July: A method of buying coal after due consideration of both quality and price in their relation to each other. It is an accomplished fact and author urges its adoption as a standard method. August: Relation of characteristics of particular plant to range of coals suitable for it and to specifications under which coal is purchased.

SCREENING. Coal Screening, S. R. Berrisford and W. H. Berrisford. Instn. Min. Engrs.—Trans., vol. 69, Pt. 3, June 1925, pp. 282-307, 17 figs. Discusses tub route, descending creeper, tripping full tubs, screening, picketing, pulsating picking conveyors, bar and wire belts, picking and sorting, and loading.

COAL HANDLING

CONVEYORS. Belt Rides on Wheels in New-Type Sectional Coal Face Conveyor, A. F. Brosky. Coal Age, vol. 28, no. 4, July 23, 1925, pp. 112-113, 5 figs. Describes all-metal continuous sectional belt conveyor for transporting coal from working face to an entery where cars of a trip may be loaded one after another without appreciable delay; belt is of rubber fabric; drive section may be inserted in line at any point; only two men needed to operate machine at face.

COAL MINING

CUTTING. Coal-Cutting in Practice, H. H. Ridsdale. Instn. Min. Engrs.—Trans., vol. 69, Pt. 4, July 1925, pp. 358-361 and (discussion) 361-366. Practical details on machine-mining of coal. Paper read before South Staffordshire and Warwickshire Inst. Min. Engrs. See also Colliery Guardian, vol. 130, no. 3366, July 3, 1925, pp. 21-22, and Iron Trade Rev., vol. 111, no. 2992, July 3, 1925, pp. 1-2.

EXPLOSIVES FOR. Use of Explosives in Coal Mining, A. MacEachern. Can. Inst. Min. & Met.—Bul., no. 158, June 1925, pp. 585-597. Discusses loose powder, permitted explosives, ammonium nitrates, storage, shotfirer, charge limit, stemming, and detonation.

LONGWALL SYSTEM. Longwall Operations, Sydney Mines, N.S., J. J. McDougall. Can. Inst. Min. & Met.—Bul., no. 158, June 1925, pp. 635-648, 3 figs. on supp. plates. Points out reason for adoption of longwall methods of work in mines, and gives account of results that attended efforts of those concerned.

COAL MINES

DEWATERING. Air-Lift Pumping System Quickly Raises Water From Flooded Anthracite Mine Areas, E. J. Gealy. Coal Age, vol. 26, no. 5, July 30, 1925, pp. 143-146, 8 figs. Methods being employed to reopen Neilson mine of Shamokin Coal Co. in Shamokin, Pa.; ordinary dewatering methods could not easily be used at first; now air lifts water part way up shaft and centrifugal units pump to surface.

COAL WASHING

WASHING CHARACTERISTICS OF COAL. The Scientific Control of Coal-Washing by the Combined Application of Ash-Characteristic Curves and X-Ray Examination, W. McLaren and J. L. Thomson. Instn. Min. Engrs.—Trans., vol. 69, Pt. 4, July 1925, pp. 315-338, 19 figs. Description of "washability" and "ash-characteristic" curves and method of plotting them. See also Colliery Guardian, vol. 130, nos. 3366 and 3367, July 3 and 10, 1925, pp. 25 and 85-88, 7 figs.

COKE MANUFACTURE

ASH CONSTITUENTS, INFLUENCE OF. The Influence of Ash Constituents on the Coking Process, R. Lessing. Chemistry & Industry, vol. 44, no. 29, July 17, 1925, pp. 345T-350T. Discusses influence of amount of ash and influence of ash composition. References.

COKE OVENS

HEATING OF. The Heating of Coke Ovens, R. A. Mott and R. Wigginton. Chemistry & Industry, vol. 44, no. 29, July 17, 1925, pp. 350T-354T. Deals with transmission of heat to oven walls; most important factors governing uniformity of heat distribution in vertical-flued ovens along length of an oven wall and in height of oven.

TYPES. New Coke-Oven Types, O. Peischer. Blast Furnace & Steel Plant, vol. 13, nos. 7 and 8, July and August 1925, pp. 290-292 and 314-317, 5 figs. Carbonizing capacity, temperature distribution and heat consumption. See also succeeding article entitled, The American Version, by F. W. Sperr, pp. 317-318, containing criticism of this foreign viewpoint.

COMBUSTION

CARBON-MONOXIDE MIXTURES. The Combustion of Carbon-Monoxide Mixtures, J. H. Crowe and A. H. Newey. Lond., Edinburgh, and Dublin Philosophical Mag. and Jl. Sci., vol. 49, no. 294, June 1925, pp. 1112-1131, 5 figs. Describes investigation, which is part of series undertaken at Birmingham University, to determine something of manner in which combustion proceeds when a mixture is exploded in a closed vessel, more particularly to measure velocity of propagation of flame front.

CONTROL. Combustion Control by Means of Triangular Diagrams (Le contrôle de la combustion au moyen de diagrammes triangulaires), Sunnen. Chaleur et Industrie, vol. 6, no. 62, June 1925, pp. 266-269, 1 fig. Discusses graphic chart of composition of flue gases for permanent control of combustion and for determining whether proportion of air requires changing.

PROBLEMS. Combustion Problems, E. Kieft. Combustion, vol. 13, no. 1, July 1925, p. 36. Effects of moisture in air and moisture in gas.

CONCRETE

REQUIREMENTS. Some Important Requirements for Good Concrete, A. M. Bouillon. Ry. Eng. & Maintenance, vol. 21, no. 8, Aug. 1925, pp. 315-318, 4 figs. How time of mixing, proper speed of mixer, and manner of curing affect quality of product.

SAND FOR. Effect of Grading on Sand Strength Ratios, C. E. Proudley. Pub. Roads, vol. 6, no. 4, June 1925, pp. 90-91, 1 fig. Particulars of study made by U. S. Bur. Pub. Roads for purpose of finding factors influencing relationship between strength ratio test and compression test. Relation between quality and grading as it exists for a large variety of sands which have been used or proposed for use in concrete.

CONCRETE BLOCKS

TESTS OF. Cement Manufacturers Supervise Concrete Block Tests. Cement, Mill & Quarry, vol. 26, no. 12, June 20, 1925, pp. 17-23, 9 figs. Tests of 108 variables of different kinds and gradings of aggregates, and proportions of cement to aggregate: 5 different periods of mixing and 20 curing conditions. Gives details and results of investigation.

CONCRETE CONSTRUCTION

FOUNDATIONS. Foundations Repaired with Precast Units, C. P. Dunn. Concrete, vol. 27, no. 1, July 1925, pp. 3-5, 10 figs. Structure to replace wood piles beneath concrete mat in power generating station completed without interruption of service of power plant equipment.

CONDENSERS, STEAM

SURFACE. Modern Condensing Practice in Great Britain, C. H. S. Tupholme. Power Plant Eng., vol. 29, no. 16, Aug. 15, 1925, pp. 841-842, 4 figs. Surface condensers, particularly when used with turbines, are most widely favored; types of surface condensers.

CONDUITS

PRESSURE. Determination of Maximum Economic Dimensions of a Metal Pressure Conduit (La solution générale du problème de la détermination des dimensions économiques maximum d'une conduite forcée en métal et son application aux calculs pratiques), P. P.-Santo Rini. Houille Blanche, vol. 24, nos. 97-98 and 101-102, Jan.-Feb. and May-June 1925, pp. 5-9 and 65-73, 9 figs. Discusses calculation of economic diameters and lengths of sections of curvilinear conduits. May-June: Application of formulas developed and numerical examples.

CONNECTING RODS

STRESSES IN. Stresses in Connecting-Rods, B. B. Low. Engineering, vol. 120, no. 3111, Aug. 14, 1925, pp. 185-186, 13 figs. Stress caused by inertia bending is analyzed mathematically and example is worked out to show practical application of results obtained; examination of tensile stress; consideration of forces which act on connecting rod; expressions for acceleration of piston and angular acceleration of rod.

CONVEYORS

BELT. Belt Conveyors, H. Eckersley. Machy. (Lond.), vol. 26, no. 665, June 25, 1925, pp. 401-404, 8 figs. Illustrates on broad lines design and operation of belt conveyors.

CONTINUOUS. Has the Continuous Conveyor a Place in Metal Mines, A. B. Parsons. Eng. & Min. Jl.-Press, vol. 120, no. 2, July 11, 1925, pp. 45-50, 6 figs. Outlines some of the work now being done in coal mines; enumerates disadvantages, and suggests conditions under which there seems to exist best chance for advantageously using conveyors in metal mines.

POWER PLANTS. Fuel Conveyors for Power Plants, C. H. S. Tupholme. World Power, vol. 4, no. 19, July 1925, pp. 30-33, 6 figs. Reviews some of the chief types of conveyor suitable for both small and large plants and indicates their respective fields of utility.

CONDUITS

QUEENSTON STATION, CANADA. The Conduit System of Queenston Station, J. C. Martin. Contract Record and Eng. Rev., vol. 39, no. 25, June 24, 1925, pp. 626-628, 6 figs. Unit scheme for conduit designation found reliable method of nomenclature; control cables carried in special pans; total of 400,000 ft. of conduit used.

CONTRACTING

ETHICAL PRACTICE FOR CONTRACTORS. Rules of Ethical Practice for Contractors. Eng. News-Rec., vol. 95, no. 4, July 23, 1925, p. 142. Working principles by which members of Associated General Contractors are to be governed in their relations with client owners and public, with other agencies of construction, and with members of their own profession.

CONVERTERS

ROTARY. Voltage Regulation of Rotary Convertors, F. Johnstone-Taylor. Power House, vol. 18, no. 13, July 5, 1925, pp. 45-46, 3 figs. Explains several methods available, and those most common in use.

COPPER ALLOYS

HARDNESS. On the Dynamic Hardness of Bronze, Aluminium-Bronze and Brass at High Temperatures, T. Matsuda. Tôhoku Imperial Univ.—Sci. Reports, vol. 13, no. 4, March 1925, pp. 401-409, 3 figs. partly on supp. plates. Hardness of bronze, aluminum bronze and brass were determined dynamically at various temperatures ranging from ordinary to 900 deg. and results are given.

IMPACT TEST. Repeated Impact Test on Brass, Aluminium-Bronze and Bronze, T. Matsuda. Tôhoku Imperial Univ.—Sci. Reports, vol. 13, no. 4, March 1925, pp. 419-426, 1 fig. on supp. plate. Results of tests carried out with Stanton repeated impact testing machine; results obtained.

COPPER METALLURGY

COPPER AND IRON SULPHIDES, SEPARATION OF. Differential Flotation of Copper and Iron Sulphides, H. E. Keyes. Eng. & Min. Jl.-Press, vol. 120, no. 4, July 25, 1925, pp. 135-136. Microscopic examination to determine degree of association necessary first; tests show importance of cyanide as a reagent for dripping pyrite. Pub. by permission U. S. Bur. Mines.

CORROSION

RUST-PREVENTING MATERIALS. Tests of Some Rust-Preventing Materials Suitable for the Protection of Stored Machinery, C. Jakeman. Engineering, vol. 120, no. 3109, July 31, 1925, pp. 123-125, 5 figs. Investigation of behavior of chosen representative preservatives under varying conditions of exposure and comparison of results given by different methods of exposure. Tests carried out at Nat. Physical Laboratory, Teddington, Eng.

COST ACCOUNTING

EXPENSE DISTRIBUTION. Methods of 42 Manufacturers in Distributing Expenses to Product, Chas. Reitell. Mgmt. & Admin., vol. 10, no. 2, August 1925, pp. 87-92. Results of survey of leading industries of Pittsburgh for purpose of finding actual practice followed in distribution of selling and administrative expenses to units or divisions of product; these expenses are handled in four ways which are discussed individually.

INDUSTRIAL POLICY, RELATION TO. Cost Accounting in Relation to Industrial Policy, S. L. Gill. Indus. Mgmt. (Lond.), vol. 12, nos. 6 and 7, June and July 1925, pp. 333-335 and 369-371. Relation between industry and labor; relation of management to industry; trend towards price control. Paper read at Costing Conference, Lond.

CRANES

BEARINGS. Application of Ball and Roller Bearings in Hoisting Machinery (Die Anwendung der Wälzlager im Hebemaschinenbau), R. Hänchen. Maschinenbau, vol. 4, no. 12, June 18, 1925, pp. 578-583, 23 figs. Examples of ball- and roller-bearing applications to various types of cranes.

STARTING AND REGULATING RESISTANCES FOR. Brown Boveri Starting and Regulating Resistances for Cranes, W. Schaffner. Brown Boveri Rev., vol. 12, no. 7, July 1925, pp. 146-150, 5 figs. Mechanical and electrical details of two special types of resistances developed by Brown Boveri & Co. to meet demands of crane operation and other intermittent work, known as resistances Type N and Type B; their installation and service conditions.

CUPOLAS

DESIGN. Notes on Cupola Design. Engineer, vol. 140, no. 3632, Aug. 7, 1925, pp. 144-146, 1 fig. Vital factors to be considered in construction of cupola; notes on shell, height of cupola, linings, tuyeres, blowers, etc.

ECONOMICAL PRACTICE. Cupola Practice a Big Factor in Production, R. Micks. Can. Foundryman, vol. 16, no. 6, June 1925, pp. 10 and 28. Location of cupola; economical linings; taper in lining beneficial; fuel and metal should be weighed carefully; charging of iron must be done evenly and close to sides of furnace.

IRON LOSSES IN. Losses Incurred in Melting Iron. Foundry Trade Jl., vol. 32, no. 465, July 16, 1925, p. 58. Causes determining losses; oxidization in cupola; silicon and manganese losses; total loss in cupola; loss from charge to finished casting.

CUTTING TOOLS

KANGO HAMMER. A New Mechanical Hammer. Automobile Engr., vol. 15, no. 204, July 1925, p. 229, 3 figs. Description of Kango hammer, which is primarily a cutting tool, though it may be used in numerous applications that are of a hammering character; used for panel beating, chiselling or forming operations, mortising and grooving, etc.; outside automobile industry it is being employed for heavy wood carving, sculpture, and drilling and backing brickwork and masonry.

D

DAMS

CONSTRUCTION WITH BELT CONVEYORS. Belt Conveyors Build Wanaque Dam Embankment and Core Wall. Eng. News-Rec., vol. 95, no. 7, Aug. 13, 1925, pp. 252-258, 13 figs. Over 1,000,000 cu. yd. of earth fill and 77,000 cu. yd. of concrete core wall are being placed by 2½ mi. of belt conveyor in Wanaque reservoir dams for North Jersey cities.

DIELECTRICS

LOSSES, MEASUREMENT OF. Measurement of Dielectric Losses at High Voltages, B. Hague. World Power, vol. 4, no. 20, Aug. 1925, pp. 81-83, 3 figs. Describes new type of a.c. bridge.

DIESEL ENGINES

AIRLESS-INJECTION. Airless Injection Adopted by Oldest Diesel Builders. Motorship, vol. 10, no. 7, July 1925, pp. 526-527, 4 figs. After 32 years of experience with Diesel engine, famous Augsburg (Germany) firm dispenses with compressor. Notes on airless injection 4-cycle Diesel engine of M.A.N. company.

BOLTS AND FRAMES, STRESSES IN. The Stresses in Diesel-Engine Main Bolts and Frames, C. C. Pounder. Mech. Wld., vol. 78, no. 2010, July 10, 1925, p. 29, 1 fig. Discusses initial tightening, effect of piston load, and total stresses.

HIGH-POWER. Developments in High Power Diesels, Johnstone-Taylor. Gas & Oil Power, vol. 20, no. 237, June 4, 1925, pp. 183-184, 2 figs. Progress with double-acting engines, supercharging, and airless injection.

HIGH-SPEED. Submarine Engines and High Speed Heavy-Oil Engine Electric Generating Sets, P. A. Holliday. Diesel Engine Users Assn., Paper read Feb. 13, 1925, 36 pp. (includes discussion), 20 figs. Considers state of progress made by Germany in development of high-speed Diesel engine; most prominent developments arose from demands of submarine service; information regarding application of these engines to electric generating stations; deals chiefly with 4-stroke cycle engine as designed by M.A.N. Company.

HYDRO-ELECTRIC PLANTS. *See Hydro-electric Plants, Diesel Engines.*

MINING FIELD, IN. The Diesel Engine in the Mining Field, F. E. Wormser. Eng. & Min. Jl.—Press, vol. 120, no. 4, July 25, 1925, pp. 124-134, 18 figs. Principles upon which Diesel engine works, variations in design of numerous American types and examples of Diesel-engine plants in mining field with work that they have done and are doing.

PEAK-LOAD SERVICE. *See Central Stations, Diesel Engines.*

DISKS

CALCULATION. Change in Form of Very Thin Circular Disks and Cylindric Basins under Constant Internal Pressure (Ueber die Formänderung sehr dünner kreisförmiger Platten und zylindrischer Schalen unter konstantem Innendruck), Theodor Pöschl. Zeit. für angewandte Mathematik und Mechanik, vol. 5, no. 3, June 1925, pp. 185-193, 2 figs. Discusses simplification of methods of calculation of change in form of very thin disks (diaphragms) and dishes; develops equations and gives examples of solutions.

DREDGES

DIESEL-ELECTRIC. The Diesel-Electric Pipe-Line Dredge "Clackamas", J. H. Polhemus. Mech. Eng., vol. 47, no. 8, August 1925, pp. 605-612, 14 figs. Details of Port of Portland's 30-in. hydraulic dredge, largest yet constructed, and first of type to use Diesel-electric power.

DRILLING MACHINES

RADIAL. Direct-Drive Radial Drilling Machine. Machy. (Lond.), vol. 26, no. 667, July 9, 1925, pp. 471-472, 3 figs. Describes machine in which motor for driving drill spindle is mounted on top of saddle; in this way drive is extremely direct and short and all changes of direction involving bevels and long splined transmitting shafts are avoided; built by F. Braun, of Zerbst, Germany, having agents in England.

SENSITIVE-SPINDLE. Sensitive Spindle Drilling Machine. Machy. (Lond.), vol. 26, no. 669, July 23, 1925, pp. 536-537, 2 figs. Describes 3-spindle machine built by E. H. Druce & Co., Ltd., Coventry, England, in which an improved power feed motion is embodied; a feature of latter is that it can be supplied as a separate attachment or unit complete with all necessary fittings and ready for application to any existing Druce drilling machine previously purchased with only a plain hand feed.

E

EDUCATION, ENGINEERING

RELATION TO INDUSTRY. Relation of Engineering Education to Industry, F. C. Pratt. Gen. Elec. Rev., vol. 28, no. 7, July 1925, pp. 468-471. What is being done by one large manufacturer to develop engineers of to-morrow to their maximum state of usefulness.

ELECTRIC CIRCUITS

SEMI-CONDENSERS, CONTAINING. Electrical Properties of Circuits containing Semi-Conductors, O. R. Randall. World Power, vol. 4, no. 19, July 1925, pp. 20-26, 9 figs. Describes experiments dealing with two problems, one being conditions at contact of a semi-conductor, and other being certain electrical properties of material of semi-conductor.

ELECTRIC DISTRIBUTION

CONTROL SYSTEMS. Supervisory Systems, C. E. Stewart. Gen. Elec. Rev., vol. 28, no. 5, June 1925, pp. 448-453, 8 figs. Necessity of unified system of control; telephone; superiority of automatic supervisory equipments; distributor system; cable system; selector system; carrier-current selector system.

ELECTRIC DISTRIBUTION SYSTEMS

ECONOMICS. Economics of the Distribution System, H. P. Seelye. Elec. World, vol. 86, no. 3, July 18, 1925, pp. 107-110, 5 figs. Relative importance of distribution to central-station investment and operating expense; losses in distribution; fundamentals of analyzing costs and planning for economy, efficiency and future growth.

NETWORKS, THREE-PHASE. Calculation of Short-circuit Ground Currents on Three-phase Power Networks, Using the Method of Symmetrical Co-ordinates, S. Bekku. Gen. Elec. Rev., vol. 28, no. 7, July 1925, pp. 472-478, 14 figs. Describes method of reducing unbalanced currents to three sets of components readily solvable on calculating table.

TWO-PHASE FIVE-WIRE. Two-Phase, Five-Wire Distribution, P. H. Chase. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 8, Aug. 1925, pp. 833-841, 5 figs. Its engineering and economic elements; advantages of system; comparison with 3-phase 4-wire star system; relation of primary distribution.

ELECTRIC FURNACES

ANNEALING IRON AND STEEL IN. Annealing Iron and Steel in the Electric Furnace, H. Fulwider. Fuels & Furnaces, vol. 3, no. 7, July 1925, pp. 731-732. Presents table giving approximate annealing temperatures for iron, carbon steel, and some of more common alloy steels; aging or relieving of strains, normalizing, or refinement of grain structure in steel castings; advantages of electric furnace. (Abstract.) Paper read before Nat. Elec. Light Assn.

ARC. Balance of an Electric Arc Furnace (Bilanz eines Elektro-Lichtbogenofens), Keil and Hess. Stahl und Eisen, vol. 45, no. 28, July 9, 1925, pp. 1134-1146, 4 figs. Works out balance for material, electric current, and heat; by detailed determination of all losses especially those of radiation, convection, and lines, the usual "charging losses" were avoided; electric efficiency equals 81 per cent, total thermal efficiency 39.9 and 49.7, respectively; discusses reasons for this low efficiency.

METALS REFINING. Refining Metals Electrically, L. J. Barton. Foundry, vol. 53, nos. 13, 14, 15 and 16, July 1, 15, Aug. 1 and 15, 1925, pp. 519-521, 560-563, 612-614 and 657-660, 1 fig. July 1: Making white irons and alloy mixtures; acid practice. July 15: Basic practice; duplixing proves to be unsatisfactory. Aug. 1: Controlling white-iron structure; alloying gray cast iron. Aug. 15: Different classes of ladles contrasted pouring practice.

STEEL. Electric Annealing of Steel, H. Fulwider. Iron Age, vol. 116, no. 6, Aug. 6, 1925, pp. 342-344, 4 figs. Advantages of electric heat; four types of furnaces now in operation for aging, normalizing and annealing castings. From report prepared for and included in Power Committee report of Nat. Elec. Light Assn.

TEMPERATURE CONTROL. Temperature Control of Electric Furnaces by the Help of Electron Technology (Temperaturregelung elektrischer Ofen mit den Hilfsmitteln der technischen Elektronik), Taeger. Elektrotechnik und Maschinenbau, vol. 43, no. 24, June 14, 1924, pp. 466-470, 2 figs. Shows how cathode tubes may be used for maintaining constant temperature of electric furnaces, and gives example with calculations.

NON-FERROUS. Electric Furnaces used for Non-Ferrous Metals (Considérations sur les fours électriques employés pour la fusion des métaux non-ferreux). Fonderie Moderne, vol. 19, no. 7, July 1925, pp. 137-139. Details of induction, resistance and arc furnaces, giving principal types, advantages and drawbacks.

ELECTRIC GENERATORS, A. C.

PARALLEL OPERATION. The Parallel Operation of Alexanderson High-Frequency Alternators, J. L. Finch. Gen. Elec. Rev., vol. 28, no. 5, May 1925, pp. 315-318, 4 figs. Discusses parallel operation of 15,000 to 30,000-cycle machines sharing load rapidly fluctuating between zero and full value; causes and remedy of hunting.

SELF-PARALLELING. The Hunt Self-Paralleling Alternator. Power Plant Eng., vol. 29, no. 16, Aug. 15, 1925, pp. 854-856, 4 figs. A. C. generator does not require to be synchronized before connecting in parallel with other machines.

SHORT CIRCUITS. Short-Circuit Currents of Synchronous Machines, R. F. Franklin. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 8, Aug. 1925, pp. 863-872, 16 figs., and (discussion) pp. 880-886, 16 figs. First step in investigation is calculation of short-circuit currents; method of solution used is that of assumption of zero resistance and constant flux linkages which has proved so useful in solution of many short-circuit problems; formulas are calculated for both initial and permanent short-circuit currents of all circuits involved in short circuit; discussion of these formulas, together with plot of them for assumed all generator constants.

Short-Circuit Investigation on Generators (Experimentelle Untersuchung über den plötzlichen Kurzschluss von Wechselstromgeneratoren), H. Rikli. Schweizerischer Elektrotechnischer Verein—Bul., vol. 16, no. 5, May 1925, pp. 217-229, 24 figs. Results of tests on 3,000-r.p.m., 2,500-kva., 2-polar turbo-generator to investigate mechanical breaking action of short circuit upon revolving masses of generators and driving machines; maximum breaking energy was obtained for single-phase short circuit, reaching momentarily 25,000 kw., or 10 times rating of machine; reproduced oscillographs show various phases of single and polyphase short circuits as recorded during tests.

ELECTRIC LOCOMOTIVES

ARTICULATED. Heavy Articulated Electric Locomotives, Virginian Railway. Ry. Gaz., vol. 43, no. 4, July 24, 1925, pp. 150-151, 2 figs. Notes on locomotive built for Virginian Ry. by Westinghouse Elec. & Mfg. Co., of East Pittsburgh, for working heavy coal traffic; maximum tractive effort at 30 per cent adhesion 277,500 lb. See also Railroad Herald, vol. 29, no. 7, July 1925, pp. 20-24, 3 figs. and Ry. Jl., vol. 31, no. 7, July 1925, pp. 23-25, 4 figs.

ELECTRIC MOTORS

CONTACTORS. Contactors for Industrial Motor Control, W. Wilson. World Power, vols. 3 and 4, nos. 18 and 20, June and Aug. 1925, pp. 313-318 and 58-62, 8 figs. June: Types of contactor; requirements in design; characteristics; d.c. contactors. Aug.: A. C., line and accelerating, counter-e. m. f., series and shunt lock-out, double-pole and double-throw, and high-tension contactors.

ELECTRIC MOTORS, A. C.

COMMUTATOR. Polyphase Commutator Motor Progress, A. Heyland. Electrician, vol. 94, no. 2459, July 3, 1925, pp. 4-5, 8 figs. Use of a commutating field; its advantages in improving power factor; its application as a generator.

INDUCTION. The Development of Low Starting Current Induction Motors, P. L. Alger. Gen. Elec. Rev., vol. 28, no. 7, July 1925, pp. 499-508, 13 figs. Traces progress of alternating-current motor toward goal of low starting current and high torque, and describes some of the latest developments in double-squirrel-cage machines.

SYNCHRONOUS. Operation of Synchronous Motors for Power Factor Correction, S. H. Mortensen. Power, vol. 62, no. 6, Aug. 11, 1925, Mechanical design of a synchronous motor to be operated as a phase modifier for voltage regulation and power-factor correction; starting, etc.

ELECTRIC POWER

COST. Cost of Electric Power, P. T. Davies. Eng. Jl., vol. 8, no. 8, August 1925, pp. 337-344, 12 figs. Analysis and discussion of complementary items entering into organization, management, operation and distribution costs of power.

ELECTRIC SWITCHES

EQUIPMENT DEVICES. Automatic Switching Equipment Devices, R. M. Brockway. Gen. Elec. Rev., vol. 28, no. 6, June 1925, pp. 440-447, 9 figs. Classification; motor mechanisms for oil circuit breakers; relays: grounding protective, hesitating drop-out, sensitive voltage and current, alternating-current differential direct-current directional, thermal and temperature; timers.

ELECTRIC TRANSMISSION LINES

VOLTAGE REGULATION. The Voltage Regulation of Three-phase Transmission on Lines, H. Cotton. World Power, vol. 4, no. 19, July 1925, pp. 3-10, 6 figs. Discusses voltage drop due to omic resistance, line reactances, line capacity and leakage, magnitude of current and power factor influencing drop, and develops equations for calculation.

ELECTRIC WELDING, RESISTANCE

JOINTS. The Mechanical Properties of Resistance-welded Joints, P. L. Roberts. Machy. (Lond.), vol. 26, no. 664, June 18, 1925, pp. 366-369, 6 figs., 6 tables. Deals with resistance butt and resistance spot welding; spot welding of copper and aluminum.

ELECTRICITY SUPPLY

HIGH-TENSION. International Conference on High-Tension Electric Supply. Engineer, vol. 140, no. 3630, July 24, 1925, pp. 92-93. Abstracts of reports presented at third International Conference on high-tension electric supply networks which took place in Paris, June 16-25, 1925, covering production of energy, boilers and fuels, alternators, interconnection of central stations, transformer oils, test pressures, out-of-doors stations, construction of transmission lines, supports for transmission lines, insulators, underground cables, operation of transmission networks, excess pressures, accidents and breakdowns, etc.

ENGINEERING

DEVELOPMENTS. British Engineering Developments, M. Meridith. Nat. Engr., vol. 29, no. 8, Aug. 1925, pp. 371-374. Comment and discussion on recent developments in British and European engineering practice, including turbo-condensing system of railway traction, novel locomotive for gasoline storage, waterworks operated by producer gas, etc.

EXECUTIVES

EFFICIENCY. The Efficient Executive, Wm. Davenport. Am. Mach., vol. 63, no. 8, Aug. 20, 1925, pp. 309-310. How shop executive has become new element in industry; qualities necessary to success; and how these traits may be developed.

F

FANS

CENTRIFUGAL. Theoretical Rating Compared with Operating Performance of Centrifugal Mine Ventilating Fans, A. S. Richardson. Am. Inst. Min. & Met. Engrs.—Trans., vol. 1466-A, August 1925, 6 pp. For variation in mine conditions that may easily occur, mechanical efficiency of fan may vary from 35 to 70 per cent, or power bill may be double what it should be; to avoid such losses, more information is necessary; writer believes there should be formulated comprehensive code for testing mine fans, which will permit presentation of information on influence of these factors on fan performance.

FEEDWATER HEATERS

POWER-PLANT. Selection and Installation of Modern Feed-Water Heaters, C. L. Hubbard. Nat. Engr., vol. 29, no. 8, August 1925, pp. 361-363, 7 figs. Suggestions on most desirable types for different classes of service.

FLOW OF STEAM

DETERMINATION. Steam-Flow Determination with a Thin-Plate Orifice, E. S. Bristol. Power, vol. 62, no. 7, Aug. 18, 1925, pp. 244-245, 1 fig. Opportunity to secure orifice-calibration for steam arose in connection with water-rate tests made upon 30,000-kw. steam turbine; steam flow was determined in tests by weighing condensate from turbine condenser.

FLOW OF WATER

TURBULENT. Origin of Turbulent Flow (Beiträge zur Entstehung der Turbulenz), O. Tietjens. Zeit. für angewandte Mathematik und Mechanik, vol. 5, no. 3, June 1925, pp. 200-217, 24 figs. Discusses stability and liability of frictionless flow; variation of velocity profile by acceleration and deceleration of flow; development of differential equation for limit layer, its simplification and solution, etc.

FLUE-GAS ANALYSIS

CO_2. Electrical CO_2 Apparatus. World Power, vol. 4, no. 19, July 1925, pp. 49-53, 6 figs. Discusses fuel economy, general principles of electrical CO_2 meter, practical points, indicating instruments and recording instruments.

CO_2 RECORDERS. CO_2 Recorders Cut Fuel Bill 15.5 Per Cent in the Plant of the York Gas Company, C. L. Beegle. Combustion, vol. 13, no. 2, August 1925, p. 99. Report of results obtained, actual cost figures being given.

FORGING

DEVELOPMENTS. Progress in the Forge Shop with Reference to Quantity Manufacture (Durchgeführte und Mögliche Fortschritte in der Schmiede mit Bezug auf die endlose Massenfertigung), P. Schweissguth. Werkstattstechnik, vol. 19, no. 11, June 1, 1925, pp. 373-378, 23 figs. Discusses use of pulverized coal in swaging, suitable heating for quantity production, forging-machine application, old and new method of forging, etc.

FOUNDRIES

CORE-ROOM LOCATION. Obtaining Maximum Output From the Coreroom, R. Micks. Can. Foundryman, vol. 16, no. 7, July 1925, pp. 9-10. Points out that core room should be located as near molding department as possible; gives typical layout of sand-storage and mixing room.

COST ACCOUNTING. Foundry Costs and Their Proper Distribution, R. Micks. Can. Foundryman, vol. 16, no. 7, July 1925, pp. 10-11. Points out necessity for close co-operation between cost department and production manager; method of determining costs.

DESIGN AND CONSTRUCTION. The Modern Foundry. Mech. Wld., vol. 78, no. 2009, July 3, 1925, pp. 12-13, 4 figs. Discusses factors which must be considered when building a new plant or rehabilitating old one, layout, design, and construction.

GRAPHITE CRUCIBLES. Notes on Graphite Crucibles. Foundry Trade Jl., vol. 32, no. 468, Aug. 6, 1925, pp. 124-215. Annealing practice; importance of handling tools; other injurious factors; how casualties arise.

MALLEABLE-IRON. Britain's Largest Malleable Iron Foundry. Foundry Trade Jl., vol. 32, no. 463, July 2, 1925, pp. 9-15, 11 figs. Methods and equipment of Leys Malleable Foundries at Derby; chemical and physical control; pattern shop; metal patternmaking; pattern storage and organization of work; core-making shops; casting shop; melting plant; cleaning hard castings; annealing process.

STEEL. Steel-Foundry Management, R. A. Bull. Mech. Eng., vol. 47, no. 8, August 1925, pp. 653-657 (includes discussion). Gives brief analysis of industry, explaining technical and commercial divisions, and significance of each from standpoint of output; emphasizes subject of compensation both for workmen and foremen.

FRAMING

BUCKLING STRENGTH. Buckling Strength of Framework (Die Knicksicherheit von Fachwerken), R. V. Mises and J. Ratzersdorfer. Zeit. für angewandte mathematik und mechanik, vol. 5, no. 3, June 1925, pp. 218-235, 12 figs. Discusses calculation of limits of stability for ideal frames (frictionless joints), or load capacity; plane and spatial frames, lattice girders, etc., with examples.

FURNACES, BOILER

PULVERIZED-COAL. Boiler Furnaces for Pulverized Coal, A. G. Christie. Mech. Eng., vol. 47, no. 8, August 1925, pp. 632-635 and (discussion) 635-636. Analysis of fundamental principles in connection with combustion of pulverized coal and discussion of how these may be applied in design of suitable furnaces; methods of preparing, drying and firing coal and of handling ash.

Radiation in the Pulverized-Fuel Furnace, W. J. Wohlenberg and D. G. Morrow. Mech. Eng., vol. 47, no. 8, August 1925, pp. 627-632, 8 figs. Solves by analytical methods energy process occurring in boiler furnace. General theory is applicable to any boiler furnace, but special devices have been included for its particular application to pulverized-fuel furnace.

FURNACES, GAS

COMPRESSED AIR FOR. Compressed Air for the Gas Furnace, C. A. Dawley. Compressed Air Mag., vol. 30, no. 7, July 1925, pp. 1318-1319, 2 figs. Systems for obtaining mixture of air and gas of correct proportions: low-pressure air system; high-pressure gas system; premixing system; and high-pressure air system.

FURNACES, HEATING

EFFICIENCY OF. Efficiency of Heating Furnaces, E. H. Koenig. Iron Trade Rev., vol. 77, no. 5, July 30, 1925, pp. 249-253, 1 fig. Comparison of performance of continuous and intermittent types of heating furnaces indicates duties for which each is best fitted; close study of performance might influence design.

TYPES. Furnace Heating, R. J. Sarjant. Fuel, vol. 4, no. 7, July 1925, pp. 276-285, 7 figs. Development of reheating furnaces; new form of Siemens furnace; modern reheating furnaces; coal-fired furnaces; adaptation of air preheat to coal-fired furnaces; semi-gas fired furnaces; gas-fired furnaces.

FURNACES, INDUSTRIAL

CONVEYOR. Labor Saving Appliances, W. Trinks. Fuels & Furnaces, vol. 3, no. 7, July 1925, pp. 683-694, 14 figs. Recent development of high-temperature alloys has made possible application of conveyors to many high-temperature operations; deals with chain and roller conveyors, heating stock acting as its own conveyor, rocker bar furnaces, vertical conveying, other circular conveyors, and helical conveying.

RECUPERATION. The Development of the Recuperator, E. R. Posnack. Blast Furnace & Steel Plant, vol. 13, no. 8, Aug. 1925, pp. 327-329, 1 fig. Development of recuperator in Europe; the recuperator in America; field for recuperation.

FURNACES, METALLURGICAL

MELTING, PULVERIZED COAL FOR. Pulverized Coal for Melting Furnace. Combustion, vol. 13, no. 1, July 1925, pp. 46-47, 3 figs. Results obtained and equipment used in plant of Hunt-Spiller Mfg. Co. at South Boston, Mass.

G

GALVANIZING

TESTS ON GALVANIZED STEEL. Tests on Galvanized Steel. Metallurgist (Supp. to Engineer, vol. 140, no. 3631), July 31, 1925, p. 101. Theory of the immersion test and why it fails.

GARAGES

RAMPS AND SLANTING FLOORS, WITH. Garage With Warped Floor Areas Connecting Ramps. Eng. News-Rec., vol. 95, no. 6, Aug. 6, 1925, pp. 230-231, 2 figs. Grades between floors reduced without loss of parking space; special beam plan; car movements facilitated.

GAS

USE FOR POWER. Note on Town Gas for Motive Power, Dugald Clerk. Gas Jl., vol. 170, no. 3240, June 17, 1925, pp. 939-940 and (discussion) 940-942. Advantages of town gas for motive power; comparison of cost with anthracite fuel (suction gas). See also Gas World, vol. 82, no. 2134, June 13, 1925, pp. 586-590.

GAS ENGINES

CYLINDER CASTINGS, FRACTURES OF. Fractures of Gas Engine Cylinder Castings, E. Ingham. Power Engr., vol. 20, no. 232, July 1925, pp. 270-271. Causes of such trouble, and means to prevent it.

GASES

COMBUSTION. Air Required for Combustion of Gas, P. Hetzler. Am. Gas Jl., vol. 123, no. 3, July 18, 1925, pp. 46, 57-60, 1 fig. Method for determining air necessary for combustion and loss in stack when gas is used as fuel. Translated from Gas- und Wasserfach, 1925, p. 306.

HEAT TRANSMISSION. Present State of Knowledge of Heat Transfer of Gases (Der heutige Stand der Erkenntnis des Wärmeübergangs durch Gase), H. Lent. Stahl u. Eisen, vol. 45, no. 24, June 11, 1925, pp. 938-940, 1 fig. Review of investigations of heat transfer in gases through conduction, convection and radiation.

KINETIC THEORY. Kinetic and Electromagnetic Definitions of Thermodynamic Temperature of Gases (Über die kinetische und elektromagnetische Definition der thermodynamischen Temperatur eines Gases), E. Wertheimer. Zeit. für Physik, vol. 32, no. 8, June 5, 1925, pp. 596-619. Develops a theory, applying it to some problems, and shows that usual views based on kinetic theory of gases require changing.

GAS MANUFACTURE

THERMAL BASIS. The Economics of Gas Production on the Thermal Basis, George Evetts. Gas World, vol. 82, no. 2134, June 13, 1925, pp. 590-599 and (discussion) 600-602. Developments resulting from passage of Gas Regulation Act; data on relative values of coal, oil, and residual products; capacity and type of existing plant; data on net coal costs; capacity of distribution system; latest developments in manufacturing processes; operating costs.

GAS PRODUCERS

STRACHE. The Strache Mixed-Gas Producer, M. A. Grebel. Gas Jl., vol. 171, no. 3242, July 1, 1925, pp. 48-49, 3 figs. Abstracts of paper by Dr. Strache, describing mixed-gas producer; 35 Strache installations varying in capacity from 100 to 1000 cu. m. See also Gas World, vol. 82, no. 2137, July 4, 1925, pp. 8-9.

GAS TURBINES

EFFICIENCY. Thermodynamic Bases for Determining Efficiency to be Expected from Gas Turbines, H. Schmolke. Gas Engr., vol. 41, no. 590, June 1925, pp. 126-129, 4 figs. Gives synopses of investigations carried on during last ten years by prominent experts in thermodynamics.

GEARS

ELLIPTIC, TEETH INDEXING FIXTURE FOR. Fixture of Indexing the Teeth of Elliptic Gears, J. Williams. Am. Mach., vol. 63, no. 4, July 23, 1925, pp. 143-145, 5 figs. Describes fixture designed by engineers of New Britain Machine Co., for cutting teeth of elliptic gears used on the various machines built by that company; to operate geneva stop motion, indexing turrets; based on principle of ellipsograph; adaptable to different ratios of ellipse.

PLANETARY. Calculation of Planetary Gearing (Beitrag zur Berechnung von Planetenradgetrieben), A. Wolff. Zeit. des Osterr. Ingenieur- und Architekten-Vereines, vol. 77, nos. 25-26, June 26, 1925, pp. 224-226, 1 fig. Develops equations for calculating r.p.m., transmission ratios, coefficients of friction for teeth, progressive and regressive motion, etc.

TEETH. Constant Settings Chart for Gear Teeth. Machy. (Lond.), vol. 26, no. 667, July 9, 1925, pp. 466-467, 4 figs. It is possible, to find a position for tooth calipers such that settings will be independent of number of teeth in gear, thus rendering it unnecessary to have more than one reading of calipers for each pitch of gear.

TOLERANCES. Establishing Manufacturing Tolerances of Gearing, H. Hoisington. Am. Mach., vol. 63, no. 7, Aug. 13, 1925, pp. 267-269. Explains use of feelers for testing backlash of gears, describes a master rack for testing spur gears, and suggests tolerances for spur gears and close-fitting worm gearing.

GRAIN ELEVATORS

REINFORCED-CONCRETE. New Elevator at Edmonton. Can. Engr., vol. 49, no. 2, July 14, 1925, pp. 130-131, 3 figs. Reinforced-concrete elevator has storage annex with capacity of 2,000,000 bu.; modern machinery installed.

GRINDING MACHINES

GEAR. Hydraulic Gear Grinder. Machy. (Lond.), vol. 26, no. 668, July 16, 1925, pp. 502-503, 2 figs. Describes new hydraulically operated machine which has recently been developed by Garrison Gear Grinder Co., Dayton, Ohio, for grinding gear teeth on a production basis.

SEGMENTAL SURFACE. Segmental Surface Grinding Machines. Machy. (Lond.), vol. 26, no. 669, July 23, 1925, pp. 526-529, 8 figs. Describes the three standard sizes of segmental surface grinding machines built by Snow & Co., Ltd., Sheffield, England, viz., having disk of 32-, 20-, and 14-inch diameter.

H

HAMMERS

KANGO. *See Cutting Tools, Kango Hammer.*

HEAT

RADIATION. Light Quantum Theory and Heat Radiation (Zur Lichtquantentheorie der Wärmestrahlung), J. K. Syrkin. Zeit. für Physik, vol. 31, no. 11, Mar. 28, 1925, pp. 836-843. Discusses equilibrium of matter and radiation analogous to evaporation process and setting in of equilibrium between condensate and saturated steam; probability of light quanta of given number of oscillations.

HEATING, STEAM

CENTRAL. Central Heating Plants (Die Städteheizung), H. Schilling. Zeit. des Vereines deutscher Ingenieure, vol. 69, no. 27, July 4, 1925, pp. 889-893, 8 figs. Discusses American and German distance heating plants, their development, and construction, live- and exhaust-steam plants, hot-water heating plants, pipe lines, etc.

Efficiency of Central Heating Plants (Sul Rendimento degli impianti di Riscaldamento centrale), A. Marolda. Industria, vol. 39, no. 2, Jan. 31, 1925, pp. 33-35. Discusses increase of efficiency of hot water and low-pressure steam heating plants; temperature differences, variation in fuel consumption with load variation, comparative fuel consumption in hot water and in steam heating.

HEAT TRANSMISSION

GASES. *See Gases, Heat Transmission.*

SUPERHEATED STEAM. Heat Transmission in Condensing Superheated Steam (Der Wärmeübergang bei kondensierendem Heissdampf), W. Stender. Zeit. des Vereines deutscher Ingenieure, vol. 69, no. 27, July 4, 1925, pp. 905-909, 6 figs. Shows theoretically that heat transmission from superheated steam to water only takes place as long as steam does not condense; coefficient of heat transmission grows with increasing condensation up to the value of the coefficient for saturated steam to wall.

THERMAL CONDUCTIVITY. Heat Conductivity (Contribution à l'étude de la conductibilité calorifique), Ch. Roszak and M. Veron. Chaleur et Industrie, vol. 6, nos. 59, 60, and 62, Mar., Apr., and June 1925, pp. 111-115, 173-184, and 283-292, 22 figs. Variation of conductivity with temperature; theory; formulas for calculation; coefficient of conductivity; heat insulations and their calculation, values and variations of coefficients of heat transmission.

HYDRAULIC TURBINES

CALCULATION. Importance of Racing R.p.m. in Dimensioning Sets of Hydraulic Turbines (Die Bedeutung der Durchgehdrehzahl für die Bemessung von Wasserturbinensätzen), C. Reindl. Elektrotechnische Zeit., vol. 46, no. 18, Apr. 30, 1925, pp. 645-647, 2 figs. Examines effect of various protective devices and gives numerical examples for usual types of turbines.

REGULATION. Direct Acting Regulator for Hydraulic Turbines (Note sur un régulateur à action directe et à mouvement louvoyant applicable aux turbines hydrauliques), Crozet-Fourneyron. Revue de l'Industrie Minérale, no. 109, July 1, 1925, pp. 295-303, 12 figs. Details of design and operation of a regulator —an improvement over the watt type—by means of which hydro electric stations may be operated automatically.

HYDRO-ELECTRIC DEVELOPMENTS

SAN FRANCISCO, CAL. San Francisco's Hetch Hetchy Power and Water Project. Power, vol. 62, no. 7, Aug. 18, 1925, pp. 238-241, 5 figs. Ultimate project involves building 3 power houses with total capacity of 250,000 hp. and delivering 400,000,000 gal. of water a day to San Francisco; Moccasin power house has installed capacity of 100,000 hp. in four units to operate under net head of 1250 ft.; 4 penstocks serving plant are of plate steel and are nearly a mile long.

HYDRO-ELECTRIC PLANTS

AUTOMATIC. Automatic Hydro-electric Stations, C. W. Place. Gen. Elec. Rev., vol. 28, no. 6, June 1925, pp. 364-368, 7 figs. Advantages of automatically controlled hydro-electric stations; quick availability for load; freedom from hazards of manual stations; lessened labor problem; example of a model plant; how to divide load economically with steam stations; operational factors to be considered.

DIESEL ENGINES AND. Diesel Engines and Hydro-Electric Power Stations, A. Buchi. Engineer, vol. 140, nos. 3631 and 3632, July 31 and Aug. 7, 1925, pp. 120-121 and 146-148, 5 figs. Deals with special field of power production, and attempts to investigate question as to whether hydro-electric works alone are capable of satisfying all demands of various consumers in most advantageous manner; it is shown that combination of heat engines with hydro-electric works offers great advantages; conditions which prevail when Diesel engines are adopted are specially considered, but other types of heat engines, as steam turbines, steam engines, etc., could be employed in similar way.

NOVA SCOTIA, CANADA. Hydro-Electric Plant, Bridgewater, N.S., S. E. March. Can. Engr., vol. 49, no. 2, July 14, 1925, pp. 121-123, 4 figs. Reviews hydro-electric developments at Bridgewater since 1891; new plant has a capacity of 500 hp., and consists of two double-wheel turbines, governors, and generators.

PEAK-LOAD STEAM PLANTS. Steam Characteristics in Modern Central Stations (Caracteristicas del vapor en las modernas centrales térmicas), A. G. Mercadal. Revista de Obras Publicas, no. 14, July 15, 1925, pp. 332-338, 6 figs. Discusses steam plants as spares to make up for insufficient water power; boiler efficiency, losses in boilers, pipes, machines, condensers; increased temperatures and pressures, determination of most economic pressure and temperature of steam for a given station.

VENTURI METERS IN, USE OF. Venturi Meters Used in Hydro-Electric Plant Operation, J. M. Gaylord. Power, vol. 62, no. 4, July 28, 1925, pp. 137-138, 4 figs. Eleven meters installed in four plants with heads ranging from 800 to 2130 ft. to indicate, record, and integrate flow of water to wheels; use of these meters has resulted in a considerable increase in kilowatt output of stations.

I

ICE PLANTS

ELECTRIC DRIVE. Unbiased Comparison of Ice-Plant Drive. Elec. Wld., vol. 86, no. 6, Aug. 8, 1925, pp. 264-266. Individual power plants have economic place in some cases, but progressive central-station companies are offering rates that make such plants economically prohibitive.

IMPACT TESTING

ALLOYS. *See Copper Alloys, Impact Test.*

INDUSTRIAL MANAGEMENT

FURNITURE PLANTS. Southern Furniture Plants Apply Modern Management with Success, Chas. F. Scribner. Mgmt. & Admin., vols. 9 and 10, nos. 6 and 2, June and August 1925, pp. 521-524 and 83-86, 6 figs. June: Developing organization and fixing responsibility are first steps; definition of principles; inter-relation of principles; putting organization to work. Aug.: The plant, its arrangement and service facilities.

WORK-PROGRESS CONTROL. A Simple Progress Scheme, W. J. Hiscox. Metal Industry (Lond.), vol. 27, no. 5, July 31, 1925, pp. 97-98. Describes scheme of work-progress control applied to tin and copper-smith's department of small engineering works, and by means of which department in which there had been considerable delay was brought into line with rest of works organization.

INDUSTRIAL PLANTS

POWER-LOAD SURVEYS. How to Go About Making a Survey of the Power Load in an Industrial Works, H. E. Stafford. Indus. Engr., vol. 83, no. 7, July 1925, pp. 310-315 and 337, 8 figs. Discusses results that may be obtained by making a load survey, and gives procedure in making it as well as methods of analyzing data so obtained.

INTERNAL-COMBUSTION ENGINES

MULTI-CYLINDER, BALANCING OF. The Balancing of Multi-cylinder Engines, C. C. Pounder. Mech. Wld., vol. 77, no. 2008, June 26, 1925, pp. 406-407, 5 figs. Conditions for balance; discusses engine balancing and gives examples.

PARTS, PATENTS FOR. Internal-Combustion Engines, Arrangement and Disposition of Parts of (Including Construction of Parts Peculiar to Internal-Combustion Engines). Abridgments of Specifications, Period 1916-20, Class 7 (ii), 1925, 370 pp. Patents for inventions.

SUPERCHARGED. Increasing the Power of Internal Combustion Engines, G. Prayer. Nat. Advisory Committee for Aeronautics—Tech. Memorandums, no. 321, July 1925, 11 pp., 11 figs. Notes on supercharged engines; engines with preliminary compression; utilization of exhaust gases to drive compressor; driving compressor by means of battery carried in car; Zoller's compressor; Daimler supercharged engine; facts cited show that fundamental changes may be expected to take place before long, especially in construction of engines for racing cars. Translated from Motorwagen, Sept. 30, 1924.

See also, Airplane Engines; Automobile Engines; Diesel Engines; Gas Turbines; Oil Engines.

INSULATORS, ELECTRIC

LOCATION OF DEFECTIVE. Locating Defective Insulators, G. A. Iler. Elec. Wld., vol. 86, no. 6, Aug. 8, 1925, pp. 257-260, 4 figs. Description of a new type of live-line testing stick that permits quantitative comparisons, a direct-reading device that is light, portable and safe and adaptable to testing any type insulator.

IRON

STAINLESS. Stainless or Rustless Iron Correctly Described as Stable Surface Iron, P. A. E. Armstrong. Am. Soc. Steel Treating—Trans., vol. 8, no. 2, August 1925, pp. 163-189, 2 figs. States that rustless iron is not entirely resistant to surface corrosion; they are only stainless when conditions are favorable; such conditions, however, are quite destructive to ordinary iron and often to non-ferrous metals; cooking utensils are not free from danger; rustless iron seems to be without harmful effect; physical properties can be improved by use of alloys.

IRON CASTINGS

CHILLED. Chilled Casting Practice (Einiges aus der Praxis der Hartgussgiesserei), Friese. Giesserei-Zeitung, vol. 22, no. 13, July 1, 1925, pp. 397-399, 8 figs. Hard pig iron cast in sand molds and chilled casting; burden and composition; depth of hardening; examples of application.

CHILLED ROLLS. Experiments in the Manufacture of Chilled Iron Rolls, A. Allison. Foundry Trade Jl., vols. 31 and 32, nos. 459 and 464, June 4 and July 9, 1925, pp. 481-483 and 27-30, 13 figs. Result of experiments made on commercial scale; carbon content of chill rolls; silicon in chill-roll manufacture; role of manganese, sulphur and phosphorus; gas contents. July 9: Casting temperature and details; analysis and chill; service conditions; microscopy; conclusions.

GRAY-IRON, MOLECULAR EQUILIBRIUM IN. Molecular Equilibrium in Grey Iron Castings, I. Lamoureux. Iron & Coal Trades Rev., vol. 111, no. 2992, July 3, 1925, p. 24. Methods of examination; method of casting. Translated abstract of paper read at 4th Congress of Association Technique de Fonderie on behalf of Association Technique de Fonderie de Belgique.

PRODUCTION. The Production of Castings—with special reference to Iron Castings, R. Lehmann. Foundry Trade Jl., vol. 32, nos. 464 and 465, July 9 and 16, 1925, pp. 35-38 and 53-54, 98 figs. Outlines principles for correct construction of castings in relation to material, molding, casting and cleaning. Prize-winning paper in competition organized by Assn. German Iron Foundries. Translated from Giesserei.

IRON METALLURGY

PRINCIPLES. Principles of Metallurgy of Ferrous Metals for Mechanical Engineers, L. Cammen. Mech. Eng., vol. 47, no. 8, August 1925, pp. 637-642, 3 figs. Part VI. Discusses heat treatment.

BIBLIOGRAPHY. Current Literature on Ferrous Metallurgy. Blast Furnace & Steel Plant, vol. 13, no. 8, Aug. 1925, p. 319. Compiled by E. H. McClelland, Technology Librarian, Carnegie Library of Pittsburgh.

J

JOINTS

KEY. Determining Forces Active in Key Joints (Versuche zur Ermittlung der in Keilverbindungen virkenden Kräfte), R. Baumann. Maschinenbau, vol. 4, no. 14, July 16, 1925, pp. 663-666, 11 figs. Describes arrangement for testing, determines coefficient of friction for various lubrications, rising of wedges or keys as effect of active forces, behavior of wedge joints in driving in wedge by blows.

L

LABORATORIES

PHYSICAL TESTING. Organization of Physical Testing Laboratory. Can. Engr., vol. 49, no. 3, July 21, 1925, pp. 141-143, 4 figs. Topographical Survey of Canada has well equipped laboratory for testing, adjusting, and maintaining standards; function of laboratory; description of equipment in various sections.

LABOR TURNOVER

COST OF. The Cost of Labor Turnover—How Much—And Why, R. B. Williams. Am. Mach., vol. 63, no. 8, Aug. 20, 1925, pp. 329-330. Losses that can be attributed to labor turnover; making it difficult for good man to find excuses to quit by eradicating all "sore spots" and profiting by men's criticisms.

LEAD METALLURGY

SMELTING. Lead Smelting in Utah, B. L. Sackett, C. Bardwell, S. Jacobson and N. H. Jensen. Am. Inst. Min. & Met. Engrs.—Trans., no. 1486-D, Aug. 1925, 27 pp. Present-day smelting plants; pre-roasting; sintering; blast-furnace smelting.

LEATHER

ARTIFICIAL. Artificial Leather: with Special Reference to its Manufacture from Nitrocellulose, W. J. Jenkins. Chem. Age (Lond.), vol. 12, no. 315, June 27, 1925, pp. 628-629, 1 fig. Describes manufacture of artificial leather, particularly by nitrocellulose process; predicts production of artificial leather superior to natural leather within few years.

LIGHTING

FACTORIES. 28 Cases Where Good Lighting Paid, R. J. Waldo. Mgmt. & Admin., vol. 10, no. 2, Aug. 1925, pp. 63-66, 6 figs. Presents typical cases based on information which various executives have given permission to publish, bringing out factors of well-defined lighting practice in modern manufacturing plants.

STREET. Essentials of Good Street Lighting, L. B. W. Jolley. World Power, vol. 4, no. 20, Aug. 1925, pp. 76-80, 2 figs. Considers question from aspect of Public Lighting Authority, enumerating physiological and psychological points of importance.

LIGHTNING

DISTURBANCES AND PROTECTION. Lightning Disturbances and Protection (Gewitterstörungen und Blitzschutz), A. Matthias. Elektrotechnische Zeit., vol. 46, no. 24, June 11, 1925, pp. 873-880, 13 figs. Report of up-to-date findings of special research committee established in Germany for purpose of studying entire situation from electrical and meteorological standpoint; includes theoretical study of origin, nature and propagation of thunderstorms in general based on investigations of Norinder; data show that medium-voltage plants are more endangered than very high voltage plants; grounding cable above transmission lines is of undisputed benefit; grounding coils have given good service except those with inherent inductivity; reliable Y-grounding at several points is very much recommended; great hopes are entertained with research work with recently developed cathode-ray oscillograph.

LIGNITE

DRYING. Drying Lignite by Means of Hot Gases (Die Trocknung der Braunkohle durch Spülgase), Hilliger. Wärme, vol. 48, no. 21, May 22, 1925, pp. 273-278. 7 figs. Discusses drying by passing hot gases free from oxygen and simplifies calculations connected with it, developing curves, etc., for general application; bases for determining heat balance.

REFINING. Refining of Lignite (Die Braunkohlenveredlung), Przygode. Wärme, vol. 48, nos. 9, 20, 21, 22, and 24, Feb. 27, May 15, 22, 29, and June 12, 1925, pp. 115-117, 263-266, 278-280, 287-289, and 312-313, 24 figs. Lignite for traction purposes; briquetting; distillation; low-temperature carbonization; drying plants; dust-removal plants; pulverized coal dressing and grinding plants; pulverized coal firing.

LOCOMOTIVES

AIR PUMPS. Experiments with Locomotive Air Pumps (Versuche mit Lokomotiv-Luftpumpen), L. Schneider. Organ für die fortschritte des Eisenbahnwesens, no. 9, May 15, 1925, pp. 205-207, 4 figs. Discusses experiments carried out as to steam consumption of air pumps for locomotive air brakes, sand-spraying devices, reversing gears, bells and whistles, etc.

DESIGN AND CONSTRUCTION. Locomotive Design and Construction. Ry. & Locomotive Eng., vol. 38, no. 7, July 1925, pp. 191-201, 3 figs. Abstract of Am. Ry. Assn. report, dealing with comparative merits of hydrostatic and force-feed lubrication for locomotive cylinders and steam chests and best methods of application, standardization of taps and dies used by railways, bolt and screw-thread standardization, definition of engine failure, standardization of water columns, removable hand-rail columns and locomotive development.

DEVELOPMENTS. The Centenary of the Main-Line Steam Locomotive. Ry. Engr., vol. 46, no. 546, July 1925, pp. 248-249. Brief review of developments in locomotive design since earliest days of railways.

INTERNAL-COMBUSTION. Status of Oil-Engine Locomotives. Ry. Age, vol. 79, no. 2, July 11, 1925, pp. 88-90, 1 fig. Development of various types and future possibilities in railway service discussed at meeting of local sections of A.S.M.E., Am. Soc. Refrig. Engrs., and Am. Soc. Marine Designers, held in New York. Includes following abstracts: Characteristics of the Oil Engine Locomotive, E. B. Katte; The Diesel-Hydraulic Locomotive, E. A. Sperry; The Field for Internal-Combustion Locomotives, L. G. Coleman.

MOUNTAIN TYPE. Mountain Type Locomotive for Canadian National. Ry. Age, vol. 79, no. 7, Aug. 15, 1925, pp. 316-318, 3 figs. Built to traverse curves of 18 deg.

Santa Fe Type Locomotive Converted to 4-8-2. Ry. Age, vol. 79, no. 5, Aug. 1, 1925, pp. 239-240, 3 figs. Particulars of new mountain-type locomotive, known as Class T, built by Baltimore & Ohio at its Mt. Clare shops, Baltimore, Md.; designed for heavy passenger-train operation over mountain divisions between Washington, D.C., and Crafton, W.Va., and Washington and Pittsburgh, Pa.; rebuilt from a Santa Fe type locomotive known as Class S.

PULVERIZED-COAL FIRING. Pulverized-Coal Firing of Locomotives (Die Kohlenstaubfeuerung bei Lokomotiven), P. Wangemann. Feuerungstechnik, vol. 13, no. 16, May 15, 1925, pp. 193-195. Discusses possibility of using low-grade coals for locomotive firing, development and guidance of flame, arrangement of burners, central and individual pulverizing.

RACK-ADHESION. Rack-Adhesion Locomotive for the Nilgiri Railway. Engineering, vol. 120, no. 3110, Aug. 7, 1925, pp. 165-166, 11 figs. partly on supp. plate. Locomotive, supplied by Swiss Locomotive and Machine Works, Winterthur, for railway in South India, is 0-8-2 type, 4-cylinder compound, with low-pressure cylinders which operate rack drive situated above high-pressure cylinders, which are connected to adhesion axles.

STEAM VS. DIESEL. Diesel and Steam Traction Compared. Oil Engine Power, vol. 3, no. 7, July 1925, pp. 408-410, 1 fig. Particulars and results of parallel tests by Long Island Railroad indicating performance and cost of steam and Diesel units.

LUBRICATING OILS

VISCOSITY. Measuring Viscosity, Especially of Lubricating Oils (Die Messung der Viskosität, namentlich von Schmierölen), R. von Dallwitz-Wegner. Zeit. für Technische Physik, vol. 6, no. 6, 1925, pp. 221-225, 5 figs. Discusses old and new types of viscosimeters; describes viscoscope by means of which dependance of viscosity on oil pressure is determined.

M

MACHINERY

COIL-WINDING MACHINES. Automatic Coil-Winding Machine, A. A. Dowd. Machy. (N.Y.), vol. 31, no. 12, August 1925, pp. 964-967, 5 figs. Discusses general arrangement, magazine and feeding mechanism, feeding and winding mechanism, and wire cutting-off mechanism.

PACKING MACHINES. Design of Automatic Packing Machinery. Machy. (Lond.), vol. 26, no. 669, July 23, 1925, pp. 530-533, 5 figs. Factors to consider in designing machinery for packing; method of driving a cork into a bottle; tube packing and crimping machine; method of feeding cardboard tubes.

MACHINE TOOLS

STANDARDIZATION. Standardization of Machine Tools, S. Einstein. Mech. Eng., vol. 47, no. 8, August 1925, pp. 614-618, 5 figs. Status of standardization of machine tools in United States and the various agencies through which work is being performed.

MACHINING

AIR-BRAKE PUMP CYLINDER HEADS. Five Air-Brake Pump Operations. Am. Mach., vol. 63, no. 7, Aug. 13, 1925, pp. 257-258, 5 figs. Vertical and horizontal boring and milling machine work with special fixtures and tooling; marking center lines as locating points for future operations.

MAGNESIUM ALLOYS

ELECTRON METAL. Working Electron Metal (Bearbeitung von Elektronmetall), E. Mahle. Werkstattstechnik, vol. 19, no. 12, June 15, 1925, pp. 413-415, 9 figs. Discusses new machine tools, angles of cutting, speeds and feeds in turning, milling, drilling, and grinding.

MAGNETIC ANALYSIS

DETECTION OF FLAWS IN. Detecting Flaws by Magnetic Analysis, R. L. Sanford. Elec. World, vol. 86, no. 7, Aug. 15, 1925, pp. 309-310, 5 figs. Disturbing effects of stress must be eliminated or evaluated before reliable and satisfactory method is developed; describes investigations carried on in Bureau of Standards. Published by permission of Bur. of Standards.

MALLEABLE CASTINGS

CONTRACTION. The Contraction of Malleable Iron (Die Schwindung des Tempergusses), E. Schüz. Stahl u. Eisen, vol. 45, no. 28, July 9, 1925, pp. 1189-1195, 13 figs. partly on supp. plate. Malleable iron from open-hearth furnaces; method of investigation; white-heart and black-heart castings; contraction of pig iron and tempered steels; results.

ORDNANCE, IN. The Role of Malleable Cast Iron in Ordnance, A. G. Zimermann. Army Ordnance, vol. 5, no. 29, March-April 1925, pp. 735-736, 3 figs. Characteristics of malleable cast iron; author points out that material of these characteristics should certainly have its place in ordnance construction and equipment; it can be used in many places where bronze gives trouble; examples of whay can be done.

PRODUCTION. The Production of Malleable Castings (Aus der Praxis der Tempergusserzeugung), W. Schneider. Giesserei-Zeitung, vol. 22, no. 13, July 1, 1925, pp. 381-387. Composition, production, properties and use of malleable cast iron; layout and equipment of malleable-iron foundry.

MATERIALS HANDLING

SHOP EXPRESS SYSTEM. Westinghouse Shop Express System, S. M. Lowry. Mgmt. & Admin., vol. 10, nos. 1 and 2, July and August 1925, pp. 7-10 and 75-78, 12 figs. July: Speeds small package delivery with big cut in transportation cost. Aug.: Things to be considered when laying out system of shop express routes served by industrial electric trucks; how costs were cut to $0.044 per package.

MEASURING INSTRUMENTS

TORSION METERS. Torsion meters and Torsional Vibration of Shafting, I. V. Robinson. World Power, vol. 4, no. 20, Aug. 1925, pp. 63-71, 10 figs. Refers to some of earliest forms of torsion meters and describes types actually in commercial use at present time.

METALLOGRAPHY

METALS UNDER STRAIN. Metallography for Engineers, W. Rosenhain. Metallurgist (Supp. to Engineer, vol. 140, no. 3631), July 31, 1925, pp. 102-105, 7 figs. Metals under strain.

METALS

DENSITY MEASUREMENT. The Breuil Volume-Meter and the Density of Metals, H. O'Neill. Metallurgist (Supp. to Engineer, vol. 140, no. 3631), July 31, 1925, pp. 105-106, 1 fig. Instrument was designed to determine volume of weighed samples of wood and consequently their density; volume of smooth polished specimen of ferrous alloy having volume of 5 cu. cm. may be determined in volume-meter with error of not more than ±0.1 per cent.

HEAT CONDUCTIVITY. Heat Transmission Capacity of Wires and Bars (Das thermische Leitvermögen von Drähten und Stäben), T. Barratt and R. M. Winter. Annalen der Physik, vol. 77, no. 9, June 1925, pp. 1-15, 3 figs. Describes a method for determining coefficient of transmission from very small samples of platinum etc., as well as of glass and wood; develops equations and gives numerical examples of calculation.

OXIDATION. The Oxidation of Metals and Alloys at High Temperatures, Y. Udida and M. Saitô. Tôhoku Imperial Univ.—Sci Reports, vol. 13, no. 4, Mar. 1925, pp. 391-399, 3 figs. on supp. plates. Results of oxidation experiments at high temperatures measured by means of thermobalance designed by K. Honda; test wires were made from nearly pure iron, copper and aluminum.

STRAIN. *See Metallography, Metals under Strain.*

STRAIN HARDNESS. Strain Hardness in Monocrystals due to Alloying and Cold Working (Ueber Verfestigung von Einkristallen durch Legierung und Kaltreckung), P. Rosbaud and E. Schmid. Zeit. für Physik, vol. 32, no. 3, 1925, pp. 197-225, 19 figs. Shows that plastic deformation of metal crystals is dependent on reading a definite critical intensity of shear, which is independent of effective normal tension; experiments with ZN-Cd system.

X-RAY EXAMINATION. Examining Metals by Means of X-Rays (Beiträge zur Metalluntersuchung mittels Röntgenstrahlen), Th. Neeff. Zeit. für technische Physik, vol. 6, nos. 6 and 7, 1925, pp. 208-216 and 250-258, 22 figs. Examines factors entering into determination of flaws in metals, such as small visible contrasts in shades, method of developing, effect of intensifiers, effect and elimination of stray radiation suitable diaphragms for same, etc. Page 250: Calculation and effect of diaphragms, calculation of time for exposure, examples for application of stray-ray diaphragms.

MILLING CUTTERS

GRINDING OF. Grinding Face Milling Cutters, Machy. (Lond.), vol. 26, no. 668, July 16, 1925, pp. 486-487, 6 figs. How periphery, corners, and face of milling cutters inserted-blade type are sharpened.

MILLING MACHINES

FIXTURES FOR. Fixtures for Automatic Millers. Machy. (Lond.), vol. 26, no. 669, July 23, 1925, pp. 518-519, 5 figs. Describes work-holding fixtures that have been used on Cincinnati automatic milling machines with satisfactory results.

OVER-ARMS. Milling Machine Over-arms, F. Horner. Machy. (Lond.), vol. 26, no. 667, July 9, 1925, pp. 460-465, 26 figs. Discusses different types.

MINES

POWER GENERATION AND USE. The Generation and Use of Power in Mining, R. C. Rowe. Power House, vol. 18, no. 12, June 20, 1925, pp. 17-19 and 43, 5 figs. Emphasizes belief that internal-combustion engine is more economical although 75 per cent of power used in prospecting is derived from steam.

MOLDING METHODS

MACHINE. Machines Supplant Hand Molding Methods, P. Dwyer. Foundry, vol. 53, no. 16, Aug. 15, 1925, pp. 647-650, 6 figs. Describes how molds for radiator sections, fire pots, and feed sections are made at plant of Richardson & Boynton Co., Dover, N. J.

PIPE, SPECIAL. Moulding a Special Pipe. Metal Industry (Lond.), vol. 27, no. 2, July 10, 1925, pp. 33-34, 1 fig. Discusses general problems of making molds for special pipe castings, and then illustrates method used by author, that of loaming cores to give pattern, by particular example.

ROLLERS, MAKING. Making of Rollers, A. Greenhalgh. Foundry Trade Jl., vol. 32, no. 468, Aug. 6, 1925, p. 125, 3 figs. Author introduces a new method, doing away with wood pattern, which with constant use becomes battered and broken, and breaks mold when being drawn out; by making them with shell rings, rollers of different lengths can be made.

MOLDS

FORMED WITH CORES. Moulds Formed with Cores. Metal Industry (Lond.), vols. 26 and 27, nos. 23, 25, 3, and 6, June 5, 19, July 17, and Aug. 7, 1925, pp. 559-561, 607-608, 57-58, and 123-124, 32 figs. Deals with various aspects, giving practical examples of construction of molds with cores. June 5: Advantages and disadvantages of method; making large cylindrical casting. June 19: Making of mold for pulley castings. July 17: Making of rope sheaves. Aug. 7: Making mold for large circular face plate.

WEIGHTING. Weighting Moulds. Foundry Trade Jl., vol. 32, no. 465, July 16, 1925, pp. 47-48, 2 figs. Upward pressure of molten metal; sunk cores; extra weight due to other conditions; momentum lift; dull iron and its effect on buoyancy; calculating head pressure; weights used for holding down copes; clamps for turnover work.

MONEL METAL

SOLDERING AND BRAZING. Soldering and Brazing Monel Metal. Machy. (Lond.), vol. 26, no. 669, July 23, 1925, pp. 534-536. Practical problems involved; materials to use and method of procedure.

MOTOR BUSES

ADVANTAGES AND ECONOMICS. Motor Transportation as a Passenger-Carrying Agency, A. W. S. Herrington. Soc. Automotive Engrs.—Jl., vol. 17, no. 2, August 1925, pp. 157-160, 3 figs. Deals with vehicular-traffic congestion in large cities, most suitable means for minimizing it and economics of motor coach.

DOOR CONTROL. Door Control for Buses Is Interlocked with Air Brake System, P. M. Heldt. Automotive Industries, vol. 53, no. 4, July 23, 1925, pp. 144-146, 4 figs. Particulars of pneumatically operated doors on new Kansas City buses which can be opened only when brakes are set and must be closed before bus will start; brakes apply if driver releases wheel.

N

NICKEL

Estimation in Ores, Alloys, etc. Applied Methods of Estimating Nickel in Ores, Slags, Alloys, etc. Metal Industry (Lond.), vol. 26, no. 25, June 19, 1925, pp. 599-600. Methods which have been found to give most satisfactory results when dealing with materials found in ordinary works practice.

NOMOGRAMS

Weight of Raw Material for Stampings. *See Stampings, Weight of Raw Material for.*

O

OIL ENGINES

Air Filtering. Clean Air as an Aid to Efficient Operation. Oil Engine Power, vol. 3, no. 7, July 1925, pp. 397-399, 8 figs. Brings subject of clean air to attention of oil-engine operators and discusses some of the more obvious benefits attributed to use of filtered air. Simple devices on air intakes of oil engines protect lubricating oil against air-borne grit.

Hvid. Characteristics of Hvid-Engine Fuel Cup, A. J. Nicholas. Power, vol. 62, no. 6, Aug. 11, 1925, pp. 208-209, 8 figs. Hvid form of ignition depends on design of a steel cup; this has several small holes, parallel to each other, at bottom, number and size of holes depending upon size of engine and character of fuel used; engine employes compression pressures ranging from 425 to 475 lb. per sq. in., and ignition of fuel is brought about by generated heat of compression of air change; advantages; design of combustion chambers.

Lubricating Systems. Lubricating Systems for Oil Engines, D. L. Fagnan. South. Engr., vol. 43, no. 6, August 1925, pp. 59-62, 10 figs. Description of different types.

Lubrication. Engine Lubricating Systems and Their Care, A. B. Newell. Oil Engine Power, vol. 3, no. 6, June 1925, pp. 342-344, 4 figs. Selection of an efficient oil is just as important as keeping it free from grit and other foreign matter.

Power-Plant. Types of Modern Power Plant Oil Engines. Oil Engine Power, vol. 3, no. 6, June 1925, pp. 356 and 361-364, 8 figs. Describes airless-injection engine of Standard Motor Construction Co. of Jersey City, N. J., which has been installed in power plant of Schwarzenbach Huber Co., Stirling, N. J., a vertical 4-cycle 4-cylinder 8 in. by 10 in. trunk-piston unit developing 70 b.hp.

Solid-Injection. Representative Types of Solid Injection Engines, H. F. Birnie. Power Plant Eng., vol. 29, no. 16, Aug. 15, 1925, pp. 846-848, 6 figs. Characteristics of American and European designs featured by high-injection pressures and special pump constructions.

OIL FUEL

Auxiliary Equipment for Burning. Auxiliary Equipment for Oil Burning, K. Miller. Fuels & Furnaces, vol. 3, no. 7, July 1925, pp. 707-716, 21 figs. Discussion of oil heaters, meters, and valves for edification of operators of fuel-oil systems.

Storage. Selection of Fuel Oil Storage Facilities, R. Kraus. Forging—Stamping—Heat Treating, vol. 11, no. 7, July 1925, pp. 250-251, 3 figs. Underground pit is preferable where yard space is valuable and best fire protection is desired; preference is given to use of steel tanks.

ORE HANDLING

Bridges. Ore and Coal Bridges Made Safe, W. G. Hildebran. Blast Furnace & Steel Plant, vol. 13, no. 8, Aug. 1925, pp. 323-326 and 335, 11 figs. Wellman-Seaver-Morgan perfect safety-step equipment which withstands severest tests; details of important features and advantages.

ORE TREATMENT

Volatilization. The Chief Consolidated Volatilization Process and Mill, C. H. Wigton. Am. Inst. Min. & Met. Engrs.—Trans., no. 1490-B, Aug. 1925, 10 pp., 8 figs. Experimental plant consisted of gravity concentration and flotation unit and volatilization unit, and was designed to treat continuously about 5 tons of ore daily with equipment that duplicated, except in size, that which would be used in commercial plant; design and location of Chief Consolidated mill, near Eureka, Utah.

OVENS

Gas-Heated. The Realization of Economy in Gas-Heated Ovens, Arthur Forshaw. Gas Jl., vol. 171, no. 3242, July 1, 1925, pp. 34-38. Gives results of experimental work on improving performance of ovens in cooking operations;improvements in design and construction. See also Gas World, vol. 82, no. 2136, June 27, 1925, pp. 643-647.

P

PAINTS

Spectro-Photometric Measurements. Observations of Spectro-Photometric Measurements of Paint Vehicles and Pigments in the Ultra-Violet, Geo. F. A. Stutz. Franklin Inst.—Jl., vol. 200, no. 1, July 1925, pp. 87-102, 15 figs. Deals with determinations of absorption co-efficients of various paint vehicles and of reflection co-efficients of various paint pigments in ultra-violet spectrum; also of effect of light on paint films made up of some of pigments measured.

PAPER MANUFACTURE

Coloring. Paper Colors and Color Testing. Paper Trade Jl., vol. 81, no. 3, July 16, 1925, pp. 51-55. Considers acid, basic, direct, sulphur, and pigment colors and colors of eosine group. Translated from Papier.

Pulp for. Micrography of Sweet Gum Pulp, L. Vidal. Paper Trade Jl., vol. 81, no. 3, July 16, 1925, pp. 49-50, 1 fig. Consumption in United States; characteristic structure; resembles sycamore pulp. Translated from Moniteur de la Papeterie Française, vol. 56, pp. 204-205.

Pulp Manufacture. Possibility of Pulping with a Mixture of Lime and of Sodium Sulphate, M. Brot and H. Men. Paper Trade Jl., vol. 81, no. 4, July 23, 1925, pp. 50-52. Discusses commercial sulphate, conversion of niter cake into neutral sulphate, cost of soda in pulping, treatment of exotic plants, chlorine process, experimental work; pressure and causticizing, etc. Translated from Papier, vol. 27, Oct. 1924, pp. 1123-1129.

Pulp and Paper Making in the South, J. D. Rue. Paper Trade Jl., vol. 81, no. 3, July 16, 1925, pp. 59-62 and 64, 2 figs. Early states of paper making in United States; introduction of wood; geographic distribution of wood-pulp industry; wood-pulp industry of South; paper fiber other than wood; etc.

Wood-Pulp Testing. Standard Methods of Testing Wood Pulp for Strength, G. Hall. Paper Trade Jl., vol. 81, no. 4, July 23, 1925, pp. 45-49. Standardization efforts in Finland; suggestions on standard methods.

PAPER MILLS

Power Plants. *See Steam Power Plants, Paper Mills.*

PATTERNMAKING

Dovetail Joints. Patternmaker Relies Greatly on Dovetail Joints, W. C. Ewalt. Foundry, vol. 53, no. 16, Aug. 15, 1925, pp. 666-667, 13 figs. Example of use of dovetail joints; laying out joint.

Plates, Production of. A New Method for the Production of Pattern Plates (Ein neues Verfahren zur Herstellung von Modellplatten), L. Schmid. Giesserei-Zeitung, vol. 22, no. 12, June 15, 1925, pp. 365-368, 1 fig. Production of pattern-plate molds; melting and casting of pattern plates; cleaning and finishing of plates and their mechanical and physical properties; occurrences of casting stresses and contraction cracks.

Template Construction. Types of Templates for Making Up Connections, J. McLachlan. Can. Foundryman, vol. 16, no. 7, July 1925, pp. 11-12, 6 figs. Discusses important points to be remembered if patternmaker seeks to obtain results expeditiously.

PATTERNS

Estimating and Costing. Estimating and Costing of Patterns, J. R. Moorhouse. Foundry Trade Jl., vol. 32, no. 468, Aug. 6, 1925, p. 112, 1 fig. Points out that if accurate costing is required, it is most important that fullest details be given along with working drawings and method of construction; half the difficulties in costing is eliminated when decision has been made with respect to class of pattern desired, method of molding, and method of construction; ratio of costs is given for time in construction.

PEAT

Dewatering. Method of Dewatering Peat (Neue Methoden der Torf-Entwässerung), Chemiker-Zeitung, vol. 49, no. 55, May 7, 1925, pp. 391-392. Freshly cut peat is pulped and run on to a suction filter and covered with a layer of a liquid lighter than and immiscible with water, e.g., petroleum; vacuum is then applied and water is sucked through peat, followed by petroleum; from peat containing 85 per cent of water a product containing 25-28 per cent of water and 0.5 per cent of petroleum is obtained, and this burns readily.

Hydropeat. Hydropeat. Engineering, vol. 120, no. 3110, Aug. 7, 1925, pp. 177-179, 11 figs. partly on p. 168. It is claimed for most recent and promising method of winning peat, the hydropeat process, that peat is easily won, when otherwise it would be almost unexploitable, and that it is obtained in condition particularly suitable for chemical treatment and subsequent drying.

PHOTOELASTICITY

Gear Stresses, Measurement of. Photoelasticity and its Relation to Gear Wheels, A. L. Kimball, Jr. Am. Mach., vol. 63, nos. 1 and 2, July 2 and 9, 1925, pp. 7-10 and 51-54, 22 figs. Methods and instruments used in determining stress distribution on gear teeth under static load; results of stress in celluloid models easily transferred to steel; internal angles and fillets generally points of high local stress; strains due to improper mounting; results shown by graphs; simple impact machine.

PIPE, CAST-IRON

Centrifugally Cast. Progress in the Field of Centrifugal Casting (Neuerungen auf dem Gebiete des Schleudergusses), C. Pardun. Stahl u. Eisen, vol. 45, no. 28, July 9, 1925, pp. 1178-1180. Development of process; critical discussion of modern applications; technical details; points out that recently developed processes for production of pipe all prove to be based on earlier methods with addition of new ideas which, however, have little bearing on centrifugal process.

PIPE LINES

Wood-Stave. Construction of Wood Stave Pipe Line, J. B. Holdcroft. Can. Engr., vol. 49, no. 1, July 7, 1925, pp. 101-102, 4 figs. Continuous pipe line 24-in. in diameter and 29,891 ft. long supplies water to pulp mill.

PLANERS

Electric Drive. The Individual Electric Motor Drive of Planing Machines, L. Miller. Engineering, vol. 120, no. 3110, Aug. 7, 1925, pp. 172-175, 5 figs. Author examines and analyzes various forms of individual motor drives of planing machines to make clear their particular characteristics.

Spiral Bevel Gear. Spiral Bevel Gear Planing. Engineer, vol. 140, no. 3631, July 31, 1925, pp. 112-114, 7 figs. Describes recent design of patented spiral-bevel-gear planing machine, known as Rath, manufactured by A. Herbert, Ltd., Coventry, Eng.; its construction and features of planing process which it employs.

POLES, WOODEN

Calculation. Calculation of Wooden Poles (Formules et abaques pour les poteaux en bois), H. Neulat. Revue Générale de l'Electricité, vol. 17, no. 16, Apr. 18, 1925, pp. 605-609, 3 figs. Mathematical formula is derived, giving simple relation between height, taper, top diameter and permissible maximum horizontal pull of line for wooden poles; choice is given between safety factors of three and five; to avoid mathematical calculations, and to arrive quickly at results sought, author has constructed 2 curve sheets for 2 safety factors, from which can be read directly maximum permissible horizontal pull for poles of any given height and taper.

POWER

Oil and Gas for. Oil and Gas Power. Mech. Eng., vol. 47, no. 8, August 1925, pp. 648-652. Salient points of papers presented during Oil and Gas Power Week, Apr. 20-25, 1925. Oil-engined locomotives; fuel oil and its supply; trend of oil-engine design; oil engines in plants requiring steam; gas-fuel problems; oil and gas conservation.

POWER FACTOR

Correction. Power Factor in Practice, L. W. W. Morrow. Elec. Wld., vol. 86, no. 5, Aug. 1, 1925, pp. 213-217, 2 figs. Experience in Pittsburgh district; successful results obtained by Duquesne Light Co., and West Penn Power Co.; details of installations.

Low, Cost and Prevention of. Cost and Prevention of Low Power Factor, P. C. Jones. Elec. World, vol. 86, no. 7, Aug. 15, 1925, pp. 316-317, 2 figs. Problem considered from industrial motor user's viewpoint; significant figures that demand bestowal of more attention upon this question; world-wide epidemic of underloaded motors.

POWER PLANTS

Comparison. Comparison of a Steam Turbine and a Diesel-Engine Plant of 7500-Kw. Peak Load in America and Germany (Vergleich zwischen einer Dampfturbinen- und einer Dieselmotorenanlage von 7500 kw. Spitzenleistung in Amerika und in Deutschland), F. Ohlmüller. Elektrotechnische Zeit., vol. 46, no. 28, July 9, 1925, pp. 1025-1030, 8 figs. Details of comparison made by N.E.L.A.; calculation of the same plants according to German conditions; shows that American prices are twice as high as German; a comparison of American and German prices rather than of plants.

Fuel Conveyors. *See Conveyors, Power Plants.*

Oil Engines. *See Oil Engines, Power-Plant.*

POWER TRANSMISSION

Rope Drive. Transmission of Power by Rope. Power Engr., vol. 20, no. 232, July 1925, pp. 261-262. Gives most important facts required for intelligent application of ropes.

PULVERIZED COAL

BOILER FIRING. Investigating Pulverized-Coal Firing (Forschungen an einer Kohlenstaubfeuerung), F. Ebel. Glückauf, vol. 61, nos. 25 and 26, June 20 and 27, 1925, pp. 757-768, and 789-793, 37 figs. June 20: Details of eight 24-hr. evaporation tests with 4 different loads; measuring feedwater, steam, coal; coal analysis. June 27: Cause of fluctuations, effect of fineness of coal, heat transmission, etc.; essential effect of distribution of air into primary and secondary.

Thermodynamic and Economic Bases of Pulverized-Coal Firing (Die thermodynamischen und wirtschaftlichen Grundlagen der Kohlenstaubfeuerung), Rosin. Braunkohle, vol. 24, no. 11, June 13, 1925, pp. 241-259, 4 figs. Makes calculations based on a dry central German lignite of stated properties; degree of fineness, surface and volume reaction, ignition, time of combustion, ash content, excess air, heat losses by transmission, radiation, etc. See also translation in Combustion, vol. 13, no. 2, Aug. 1925, pp. 94-95.

BOILER FURNACES FOR. *See Boiler Furnaces, Pulverized Coal, for.*

STEAM POWER PLANTS. Pulverized Fuel and Its Relation to Modern Power Plant Design, D. Wilson. Engineering, vol. 120, no. 3109, July 31, 1925, pp. 147-149. Description of Lopulco system. (Abstract.) Paper read before Instn. Mech. Engrs.

BOILER FIRING. Pulverized Fuel, D. Brownlie. Instn. Min. Engrs.—Trans., vol. 69, Pt. 3, June 1925, pp. 245-271 and (discussion) 272-279, 5 figs. Gives, more particularly from point of view of mining industries, a brief description of most recent developments of pulverized-fuel firing as applied to steam-generation, and bearing of this matter on subject of low-temperature carbonization.

PUMPING PLANTS

STEAM. A Steam Pumping Plant. Power Engr., vol. 20, no. 233, August 1925, pp. 308-309, 2 figs. Brief account of uniflow steam engines and centrifugal pumps installed by Metropolitan Water Board in connection with their new reservoir at Littleton, England.

PUMPS

OSCILLATING. Oscillating Pump (Die Schwungpumpe), A. Gratzl. Zeit. des Osterr. Ingenieur- und Architekten-Vereines, vol. 77, no. 27-28, July 10, 1925, pp. 239-241, 4 figs. Schwung pump is defined as a pump in which part of water in pressure piping acts as an additional piston and doubles the quantity of water conveyed, saving pressure valve; details of design, operation, and calculations.

PYROMETERS

OPTICAL. Bases for an Optical Temperature Scale (Grundlagen für Verwirklichung der optischen Temperaturskale), F. Henning and W. Heuse. Zeit. für Physik, vol. 32, no. 11-12, 1925, pp. 799-822. Results of experiments using a tungsten-ribbon lamp as source of radiation which was frequently heated to black temperature of 2300 deg. cent. and a colored-glass pyrometer.

QUANTA

THEORY. Researches on the Quantum Theory (Recherches sur la théorie des quanta), L. de Broglie. Annales de Physique, vol. 3, Jan.-Feb. 1925, pp. 22-128, 6 figs. Historical review; phase wave; principle of Maupertuis and principle of Fermat; conditions of stability of trajectories; quantification of simultaneous movements of two electric centers; light quanta; diffusion of X and Gamma rays.

R

RAILWAY CONSTRUCTION

CENTRAL OF GEORGIA COLUMBUS-BIRMINGHAM LINE. Central of Georgia Reconstructs Columbus-Birmingham Line. Ry. Age, vol. 79, no. 2, July 11, 1925, pp. 75-78, 10 figs. Difficult and extensive revisions necessary to provide better grades and less curvature; work necessitated construction of 48 miles of new line and revision of grade and line on large proportion of remainder of 133 miles of old line.

RAILWAY ELECTRIFICATION

ENGLAND. Suburban Electrification on the Southern Railway. Ry. Gaz., vol. 43, no. 3, July 17, 1925, pp. 113-118, 8 figs. Electric traction from Waterloo to Dorking and Guildford, and from Holborn Viaduct, St. Paul's and Victoria to Orpington and Crystal Palace inaugurated; particulars regarding electrification.

RAILWAY MANAGEMENT

MATERIALS INSPECTING AND TESTING. Inspecting and Testing Materials, J. O. Meyer. Ry. Age, vol. 79, no. 1, July 4, 1925, pp. 39-40. Facilities for this purpose essential to correct railway purchasing. (Abstract.) Paper presented before Great Northern Stores Assn.

RAILWAY MOTOR CARS

GASOLINE-ELECTRIC. A New Type Gas-Electric Car for the Reading Company. Ry. & Locomotive Eng., vol. 38, no. 7, July 1925, pp. 213-214, 1 fig. Describes car now under construction, which will be of Brill Company's light-weight type, approximately 60 ft. overall length; width over posts 9 ft. 6 in.; two trucks, center distance 44 ft. 6 in., and truck wheelbase 6 ft. 6 in.; will comprise a baggage compartment, a pasenger compartment seating approximately 50, and engine compartment will be provided at one end of car.

INTERNAL-COMBUSTION. Mechanical Power Transmission in Motor Cars with Internal-Combustion Engines (Die mechanische Kraftübertragung für Triebwagen mit Verbrennungsmotor), Plünzke. Verkehrstechnik, no. 26a, June 1925, pp. 504-511, 16 figs. Transmission gear is coupled with engine on flywheel side by means of friction coupling; describes flywheel and couplings, etc.; compares systems of drive and their efficiency.

RAILWAY SHOPS

LITTLE ROCK, ARK. Little Rock Shop Methods, H. Campbell. Am. Mach., vol. 63, no. 2, July 9, 1925, pp. 55-58, 10 figs. Methods and equipment of Missouri Pacific Ry. shops at Little Rock, Ark.; standard mechanical equipment augmented by labor-saving devices; milling and grinding operations; a quick-acting clamp; turning and tumbling-shaft bearings; bench and floor fixtures.

RAILWAY SIGNALLING

ECONOMICS. The Economic Aspect of Signalling, A. E. Tattersall. Ry. Engr., vol. 46, no. 546, July 1925, pp. 230-232, 4 figs. How signalling may be arranged to reduce operating expenses.

RAILWAY TIES

LIFE OF. What Is the Average Life of Railroad Crossties, W. F. Goltra. Ry. Rev., vol. 77, no. 7, Aug. 15, 1925, pp. 236-240, 2 figs. Mathematical rather than physical law is said to be correct bases for determining longevity of tis troups; presents table for finding average of mean life of railway crossties and explains its use.

REAMERS

MANUFACTURE. Making Kelly Reamers. Macby. (Lond.), vol. 26, no. 665, June 25, 1925, pp. 395-398, 9 figs. Design of boring and reaming tools; making cutter bodies and blades; important operations on bars.

REFRACTORIES

BOILER-FURNACE. Preliminary Findings in Refractory Investigations, R. A. Sherman, P. D. Helser, H. W. Brooks and G. A. Bole. Power, vol. 62, no. 7, Aug. 18, 1925, pp. 234-237, 2 figs. Progress report on investigation of conditions governing proper application of refractories in boiler furnaces.

GAS-WORKS. The Study of Refractory Materials. Gas World, vol. 82, no. 2135, June 20, 1925, pp. 622-623 and (discussion) 623-624. Report of research committee to Institution of Gas Engineers. New refractoriness test; difficulties about standard load test.

HIGH TEMPERATURES, FOR. Materials of Construction for Very High Temperatures, H. von Wartenberg. Fuels & Furnaces, vol. 3, no. 7, July 1925, pp. 699-701. Review of materials available, including carbon, zirconia, fused silica, siliceous substances and metals, in chemical investigations above 1000 deg. cent. (1832 deg. Fahr.).

RETORTS. Experiences with Refractories in Vertical Retorts, T. F. E. Rhead and R. E. Jefferson. Gas World, vol. 82, no. 2135, June 20, 1925, pp. 625-628, 7 figs. Discusses need for tests to determine (1) at what temperature a refractory starts to deform under actual working conditions; (2) how rapidly this deformation increases with rise of temperature, and chemical attack of vapour, gases, flue dust, etc.

REFRIGERATING PLANTS

BRINE COOLERS. Care and Operation of Sheel Type Brine Coolers, F. M. Bennett. Power Plant Eng., vol. 29, no. 16, Aug. 15, 1925, pp. 858-859, 3 figs. Heat transmission is affected greatly by quantity of ammonia in circulation, dead liquid, oil and other impuritics.

REFRIGERATION

COMPRESSION SYSTEM. Manufacturing "Cold" With Efficient Equipment, C. W. Gibbs. Power House, vol. 18, no. 12, June 20, 1925, pp. 33-34 and 42, 2 figs. Simple explanation of so-called compression system as applied to modern refrigeration methods, with description of common types of condensers.

ROAD MACHINERY

ELEVATING GRADER WAGON. The Wagon and the Elevating Grader, J. L. Harrison. Pub. Roads, vol. 6, nos. 2, 3 and 4, Apr., May and June 1925, pp. 25-33 and 41, 59-67 and 73-80, 17 figs. Deals with operation of elevating grader which is excavating and loading machine depending upon wagons for hauling materials which it excavates. Apr.: Operation of grader and various factors affecting its production. May: Influence of design on costs. June: Estimating cost of elevating-grader work.

ROLLERS. Universal Steam Road Roller. Engineering, vol. 120, no. 3111, vol. 120, no. 3111, Aug. 14, 1925, p. 208, 5 figs. partly on pp. 200 and 205. Describes machine constructed by Marshall, Sons & Co., which can be used with equal success for consolidating road bottoms or for laying top surfacings without developing defects of corrugations.

ROADS, BRICK

ASPHALT MASTIC FILLER FOR. Improved Asphalt Mastic Filler for Brick Pavements, E. J. Kelley. Eng. News-Rec., vol. 95, no. 7, Aug. 13, 1925, pp. 266-268, 3 figs. Sand beater developed in recent New Orleans paving which assures quick and hot mixture of sand and asphalt; advantages of mastic over plain filler.

S

SCREW THREADS

MEASURING TOOLS FOR. New Thread-Measuring Tools. Automobile Engr., vol. 15, no. 204, July 1925, pp. 232-233, 4 figs. Notes on modern methods in screw-thread gaging.

TESTING. Testing Screw Threads (Prüfung von Gewinden), E. Schuchardt. Maschinenbau, vol. 4, No. 14, July 16, 1925, pp. 676-680, 8 figs. Discusses a thread gage which may be used even by unskilled hands in quantity production and quantity application of thread parts.

SCREWS

TYPES. *See Lock Nuts, Types.*

SEWAGE DISPOSAL

ACTIVATED SLUDGE. Activated Sludge Works in East York. Contract Rec. & Eng. Rev., vol. 39, No. 28, July 15, 1925, pp. 690-695, 6 figs. Details of sewage disposal system; the Detritus tank; digestion and drying.

SLUDGE DISPOSAL. The Pressing of Precipitated Sludge, J. T. Thompson. Contract Rec. & Eng. Rev., vol. 39, no. 26, July 1, 1925, pp. 657-658. Experiences of Leeds, Eng., in connection with disposal of sewage sludge; pressing of septic sludge; comparisons of pressing time; pressing-cloths.

SEWERS

STORM-WATER, RE-ARCHING OF. Re-Arching a Storm Water Sewer at Brooklyn, N. Y., F. W. Skinner. Cornell Civil Engr., vol. 33, no. 7, Apr. 1925, pp. 138 and 151-152, 1 fig. How construction of an inner concrete arch against original soffit extended life of old structure without interrupting its service.

SHAFTS

WHIRLING SPEEDS OF. The Whirling Speeds of Shafts Carrying Concentrated Masses, R. C. J. Howland. Lond., Edinburgh, & Dublin Philosophical Mag. & Jl. Sci., vol. 39, no. 294, June 1925, pp. 1131-1145, 1 fig. General method of computing whirling speeds; derivation of Dunkerley's rule; error in Dunkerley's rule; application of method in non-uniform shafts.

SHOVELS

ELECTRIC. Electric Shovels, D. J. Shelton and D. Stoetzel. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 8, Aug. 1925, pp. 873-878, 9 figs. Discusses special requirements of service, and explains characteristics and advantages of various types of equipment available.

Electric Shovels and Caterpillar Tractors at Bingham, H. C. Goodrich. Min. & Metallurgy, vol. 6, no. 224, Aug. 1925, pp. 373-374, 1 fig. Experiences of Utah Copper Co. with use of two railroad-type electric shovels; comparative costs of operation of steam and electric shovels.

STANDARDIZATION

MACHINE TOOLS. *See Machine Tools, Standardization.*

STANDARDS

GERMAN N. D. I. REPORTS. Report of the German Industrial Standards Committee (NDI-Mitteilungen). Maschinenbau, vol. 4, nos. 12 and 13, June 18, July 2, 1925, pp. 599-606 and N109-N116. Proposed standards for extension pieces for screw taps; colors for distinguishing pipe lines; graphic symbols for distinguishing materials; dimensions of revolving tool-box hobs; Whitworth and metric screw threads; groove cutters; underground hydrants; standpipe supports. July 2: Proposed standards for load books.

STEAM

PRODUCTION FROM GAS COKE. The Use of Gas Coke for Raising Steam, E. W. Dickinson. Elec. Rev., vol. 97, no. 2486, July 17, 1925, pp. 87-89, 2 figs. Results obtainable on a commercial basis.

STEAM ACCUMULATORS

RUTHS. The Ruths Steam Accumulator, A. J. T. Taylor and F. A. Wettstein. Mech. Eng., vol. 47, no. 8, August 1925, pp. 619-623, 8 figs. Description of system and automatic control valves; application to sugar refinery and steel works analyzed.

The Steam Accumulator, G. E. Lofgren. Eng. Jl., vol. 8, no. 8, August 1925, pp. 352-355, 11 figs. Its principles and application to various industries.

STEAM ENGINES

UNIFLOW. Developments in Uniflow Engines. Power Engr., vol. 20, no. 233, August 1925, pp. 290-291. Discusses some features of early uniflow engines and desirability of their reintroduction.

STEAM PIPES

WATER REMOVAL FROM. Removing Water From Steam Mains, C. C. Hermann. Power Plant Eng., vol. 29, no. 15, Aug. 1, 1925, pp. 787-788, 3 figs. Damage is often caused by slugs of water passing through steam mains to prime mover; dead end and water leg header construction.

STEAM POWER PLANTS

BANK BUILDINGS. Brotherhood of Locomotive Engineers Extends Banking Facilities, R. G. Nairn. Power Plant Eng., vol. 29, no. 15, Aug. 1, 1925, pp. 778-784, 5 figs. Describes power plant of new bank building at Cleveland, Ohio, which provides light, heat, and power for both new building and old building which is located across street; connection between buildings made by tunnel beneath street; mechanical and electrical equipment.

PAPER MILLS. Modernising a Paper-Mill Power Plant. Power Engr., vol. 20, no. 232, July 1925, pp. 263-268, 9 figs. Large economy has resulted from provision of high-pressure Garrett steam plant at Chartham paper mill of W. Howard & Son; this and other interesting gears are described.

WOOD-REFUSE BURNING. Wood Waste Used as Fuel for Power Plants. Power Plant Eng., vol. 29, no. 16, Aug. 15, 1925, pp. 837-840, 6 figs. Physical character and high moisture require special furnace design for burning hogged refuse in lumber industry. Abstract of papers presented at A.S.M.E. meeting at Portland, Ore., by H. W. Beecher, C. C. Simeral and C. L. Young.

STEAM TURBINES

BLADING. How Multi-Exhaust Turbine Blades Are Manufactured. Power, vol. 62, no. 7, Aug. 18, 1925, pp. 246-249, 4 figs. Methods and equipment employed at new blading shop of Westinghouse Elec. & Mfg. Co. at its South Philadelphia Works.

ERSTE BRUNNER. The "Erste Brünner" Steam Turbine, E. A. Kraft. Electrician, vol. 94, no. 2461, July 17, 1925, p. 65, 3 figs. Economy and its effect on design; steam velocity of fundamental importance; use of multi-casings.

MILL DRIVING, FOR. Steam Turbine for Mill Driving. Engineering, vol. 120, no. 3109, July 31, 1925, pp. 127-130, 47 figs. partly on supp. plate. Turbine of 1250-b.hp. rating constructed by Hick, Hargreaves & Co. of Soho Iron Works, Bolton, Eng., for driving mill machinery either by ropes or by electric transmission.

VACUUM CORRECTION CURVES. Determining the Vacuum Correction Curves for Turbine Units, L. T. Levit. Power, vol. 62, no. 6, Aug. 11, 1925, pp. 200-203, 3 figs. Shows how to determine vacuum-correction curves; points out turbine losses; economical vacuum and limiting vacuum; multi-flow exhaust; figuring leaving loss.

STEEL

NOTCHED-BAR TEST. Effect of Temperature, Form of Test Bar, and Rapidity of Test on the Notched-Bar Strength of Iron and Steel (Einfluss der Temperatur, die Probenform und der Versuchsgeschwindigkeit auf der Kerbzähigkeit von Eisen und Stahl), R. Mailänder. Wärme, vol. 48, no. 22, May 29, 1925, pp. 283-286, 10 figs. Discusses dependence of notched-bar strength on temperature; cold and hot-brittleness, fracture by separation and deformation; explanation of "blue brittleness," notched-bar tests of boiler plate, etc.

RECRYSTALLIZATION. Recrystallization and Hot Deformation (Rekristallisation nach Warmverformung), H. Hanemann and F. Lucke. Stahl und Eisen, vol. 45, no. 28, July 9, 1925, pp. 1117-1122, 4 figs. Discusses recrystallization experiments with soft iron, steel, and refined electrolytic copper. The so-called critical strain hardness of iron is interpreted as lower limit of recrystallization capacity.

STEEL CASTINGS

FACTORS AFFECTING COSTS. Reviews Factors Affecting Costs of Steel Castings, W. J. Corbett. Foundry, vol. 53, no. 16, Aug. 15, 1925, pp. 640-644, 6 figs. Notes on electric furnaces; foundry practice; green and dry sand; influence of chills; difference in cost of castings.

HEAT TREATMENT. The Heat Treatment of Steel Castings, A. N. Conarroe. Am. Soc. Steel Treating—Trans., vol. 8, no. 2, August 1925, pp. 150-162. Describes annealing, normalizing, quenching and tempering and case carburizing; also various ways in which heat treatments are carried out; heat treatment of castings which have developed abnormal conditions due to melting practice; discussion of melting practice and defects which may develop in steels; inclusions.

STEEL, HEAT TREATMENT OF

ANNEALING. *See Electric Furnaces, Annealing Iron and Steel in.*

CARBON TOOL STEEL. Tools of Plain Carbon Steel. Iron Age, vol. 116, no. 7, Aug. 13, 1925, pp. 411-412, 1 fig. Latest recommended heat-treatment practice as formulated by Am. Soc. for Steel Treating.

COLD-DRAWN. Cold-Drawn Steel (Contribution à l'étude des aciers étirés à froid), Delhart. Académie des Sciences—Comptes Rendus, vol. 180, no. 12, Mar. 23, pp. 934-937. Influence of heat treatment; examination of cold-drawn soft, semi-hard, and hard steels showed that cementite was coalesced and that heat treatment up to 650 deg. caused gradual reduction in value of breaking stress accompanied by corresponding increase in ductility; these values show minimum and maximum respectively at 650-750 deg., and below this temperature range structure is that of deformed ferrite with globular pearlite.

QUENCHING. On the Effect of Repeated Quenching on the Hardness of Carbon Steels, A. Kattô. Tôhoku Imperial Univ.—Sci. Reports, vol. 13, no. 4, Mar. 1925, pp. 373-383, 6 figs. Results of investigation that if in virtue of relatively low quenching temperature, hardness of quenched steel is small, second quenching produces decided increase of hardness, but further repeated quenchings do not increase it; annealed steel reaches maximum hardness by first quenching in oil, and its hardness is not increased by repeated quenchings; explanation of above phenomena is given.

STEEL, HIGH-SPEED

CHARACTERISTICS. The Characteristics of High-Speed Steels (Das Wesen der Schnellarbeitsstähle), E. Maurer and G. Schilling. Stahl u. Eisen, vol. 45, no. 28, July 9, 1925, pp. 1152-1169, 21 figs. Physical, microscopic and thermal investigations of high-speed steels and series of tungsten, chrome and molybdenum steels in comparison with carbon steels; secondary and red-heat hardness; effect of tungsten, chromium, and vanadium in high-speed steel.

STRUCTURAL STEEL

FIREPROOFING. The Fireproofing of Structural Steel, A. W. Sinnamon. Contract Rec. & Eng. Rev., vol. 39, no. 26, July 1, 1925, pp. 655-656. Basic principles to be considered in devising methods for protecting steel frame buildings from the effects of fire; efficacy of plaster on metal lath. (Abstract.)

STRUCTURES

EFFECT OF WIND ON. Introduction to a Study of the Wind, Robins Fleming. Can. Engr., vol. 49, no. 2, July 14, 1925, pp. 125-126. Study of wind pressure in relation to design of steel structures; preparation for study of atmospheric circulation; study of rational effect of the earth; explanation of gravitational pressure gradient; gradient velocities.

SUBSTATIONS

AUTOMATIC. Automatic Equipment for Alternating-current Substations, J. F. Spease. Gen. Elec. Rev., vol. 28, no. 6, June 1925, pp. 381-383, 1 fig. Tendency toward small automatic substations well located with respect to load; utility of a.c. motor mechanism; variations in reclosing feeder programs; influence of reclosing cycle on equipment rating; preferred-line emergency-line operation; self-cooled transformer operation; multiple transformer bank operation.

T

TANKS

REINFORCED-CONCRETE. The Rational Design of Reinforced Concrete Tanks, A. S. Milinowski. Mun. & County Eng., vol. 68, no. 6, June 1925, pp. 288-299, 4 figs. Indicates fallacies in old method of design of reinforced-concrete tanks which are responsible for failures; explains new and rational method of design, proposed by Wm. S. Hewett, of Minneapolis, which has been proved out in water tank built for village of Barnum, Minn.

THERMOSTATS

ELECTRIC-FURNACE. A Modified Form of High Temperature Thermostat, F. Adock. Jl. Sci. Instruments, vol. 2, no. 9, June 1925, pp. 273-280, 4 figs. Describes apparatus for purpose of maintaining an electric furnace at a constant temperature for considerable periods of time (weeks or months) in spite of fluctuations in supply voltage.

TOLERANCES

SYSTEMS. A Basic Allowance and Tolerance System, W. L. Hindman. Machy. (N. Y.), vol. 31, no. 12, August 1925, pp. 933-937, 2 figs. Important features of uni-hilateral system, and practical advantages as compared with other systems.

TRANSFORMERS

LEAKAGE REACTANCE. Resolution of Transformer Reactance into Primary and Secondary Reactances, A. Boyajian. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 8, Aug. 1925, pp. 842-846, 10 figs. Stand is taken that resolution of leakage reactance of pair of windings into individual reactances of two windings is indeterminate unless referred to a third winding and that therefore it varies with object in view when making resolution; formulas are given for resolutions, and experimental methods described; problem is also considered from standpoint of flux distribution and linkages, and limitations of some common views are pointed out.

V

VALVES

BACK-PRESSURE. Principles of Atmospheric Relief and Back-Pressure Valves, R. A. Cultra. Nat. Engr., vol. 29, no. 8, August 1925, pp. 369-370, 4 figs. Construction and operating details of different types of valves.

VENTURI METERS

HYDRO-ELECTRIC PLANTS, USE IN. *See Hydro-electric Plants, Venturi Meters, Use of.*

W

WATER FILTRATION

BIOLOGICAL SURFACE. Water Purification (Epuration des eaux), F. Diénert. Académie des Sciences—Comptes Rendus, vol. 180, no. 16, Apr. 20, 1925, pp 1228-1229. Water may be rendered sterile by standing over ferrous sulphide under anaerobic conditions; this method of sterilization probably occurs in subsoil giving rise to pure subterranean waters containing no dissolved oxygen or nitrates, but possibly traces of hydrogen sulphide; biological surface filters take considerable period to become accustomed to water with which they have to deal; method of acclimatizing filters for removal of particular substances may be applied to purification of trade effluents.

WELDING

MACHINE CONSTRUCTION BY. Building Machines by Welding. Machy. (Lond.), vol. 26, no. 664, June 18, 1925, pp. 371-373, 8 figs. Examples that show possibilities of using welded members in construction of machinery.

WIND POWER

PLANTS. Wind-Power Plants Overseas Klein, (Windkraftanlagen für Uebersee-länder), Kurt Lubowsky. Elektrotechnische Zeit, vol. 46, no. 26, June 25, 1925, pp. 949-953, 4 figs. Discusses small-size plants and their application for agriculture and other purposes; fundamental properties of wind power.

WINDING ENGINES

ELECTRIC. Geared Electric Winder at Castle Eden Colliery. Iron & Coal Trades Rev., vol. 110, no. 2991, June 26, 1925, pp. 1035-1036, 2 figs. Describes winder built by Vickers, Ltd., at their Barrow works, England, and being installed at Horden Collieries' Castle Eden Colliery; electrical equipment supplied by Metropolitan-Vickers, Elec. Co., Ltd.; driven by a 940-h.p. motor and has drum 14 ft. 6 in. diam. by 8 ft. 3 in. wide provided with two sets of anchored post brakes, these being applied by dead weight and released and controlled by Vickers' oil-brake system.

X

X-RAYS

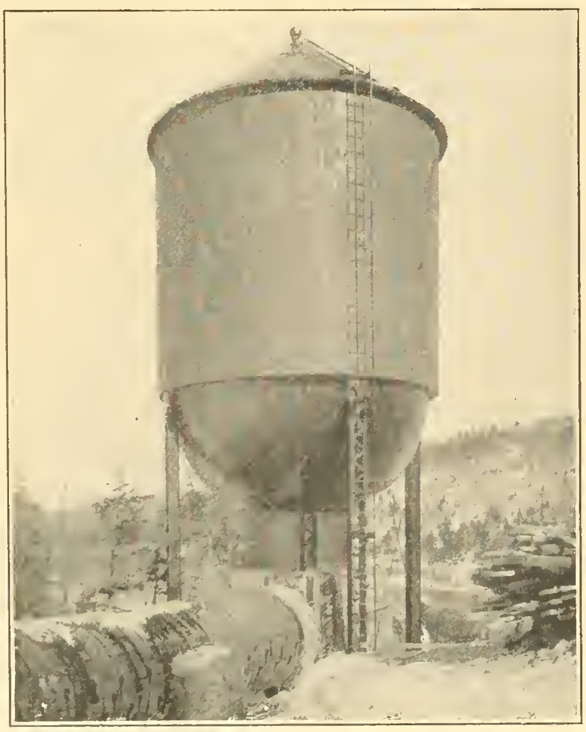
INDUSTRIAL APPLICATION. X-Rays in Industrial Control (Les Rayons X dans le Contrôle Industriel), H. Pilon. Société Française des Electriciens—Bul., vol. 5, no. 42, Feb. 1925, pp. 121-136, 14 figs. Discusses industrial applications, Coolidge tubes, current generators, photographic methods and means of protection; application in radio metallography, crystallography, and ionometry.

Z

ZINC METALLURGY

SINTERING. Sintering Zinc Ores, B. F. Buff. Eng. & Min. Jl.-Press, vol. 120, no. 6, Aug. 8, 1925, pp. 211-215, 9 figs. Describes first American installation, at National Zinc Co.'s Bartlesville plant, Okla.; in operation for a year and a half, makes good record for economy and efficiency.


CUT
GEARS



Purchaser's Classified Directory

A Selected List of Equipment, Apparatus and Supplies

For Alphabetical List of Advertisers see page 60

A

Acetylene:
Dominion Oxygen Co., Ltd.
Acids:
Nichols Chemical Co., Ltd.
Acid Towers:
Horton Steel Works Ltd.
Agitators:
Horton Steel Works Ltd.
Air Brakes:
Canadian General Electric Co., Ltd.
Air Compressors:
Lancashire Dynamo and Motor Co. of Can. Ltd.
Air Coolers:
Laurie and Lamb.
Air Hose Clamps:
Knox Mfg. Co.
Air Hose Couplings:
Knox Mfg. Co.
Air Receivers:
Horton Steel Works Ltd.
Air Valves, Throttle:
Knox Mfg. Co.
Alumina Sulphate:
Nichols Chemical Co., Ltd.
Ammonia Controlled Water Regulators:
Riley Engineering & Supply Co. Ltd.
Ammonia Valves and Fittings:
Crane Ltd.
Anchorage Equipment:
Canadian Line Materials, Ltd.
Angle Bars:
British Empire Steel Corp., Ltd.
Angles:
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co.,Ltd.
Arches, Flat Suspended:
Combustion Engineering Corp., Ltd.
Riley Engineering and Supply Co., Ltd.
Asbestos Products:
Canadian Johns-Manville Co., Ltd.
Asphalt:
Imperial Oil Ltd.
Asphalt Flooring:
Geo. W. Reed & Company
Ash Handling Equipment:
Combustion Engineering Corp., Ltd.
Link-Belt Ltd.
Automatic Air Valves:
Jenkins Bros., Ltd.
Automatic Underfeed Stokers:
Combustion Engineering Corp., Ltd.
Riley Engineering and Supply Co., Ltd.
Taylor Stoker Co., Ltd.

B

Baffle Walls:
Canadian Johns-Manville Co., Ltd.
Bale Ties:
British Empire Steel Corp., Ltd.
Balls, Chromang Grinding:
William Kennedy & Sons, Ltd.
Balls, Steel:
Openshaw & Bennet Ltd.
Barbed Wire:
British Empire Steel Corp., Ltd.
Barking Drums:
Horton Steel Works Ltd.
Bars, Reinforcing:
Algoma Steel Corp., Ltd.
British Empire Steel Corp., Ltd.
Burlington Steel Co., Ltd.
Steel Co., of Canada, Ltd.
Bars, Steel & Iron:
Burlington Steel Co., Ltd.
Steel Co., of Canada Ltd.
Batteries, Dry:
Dominion Battery Co., Ltd.
Beams:
Dominion Bridge Co., Ltd.
Hamlton Bridge Works Co., Ltd.
Bearings, Ball:
Openshaw & Bennet, Ltd.
N. Slater Co., Ltd.
Belting:
Jones and Glassco, Regd.
Bending Machines:
John Bertram & Sons Co., Ltd.
Billets, Blooms and Slabs:
British Empire Steel Corp., Ltd.
Bins:
Horton Steel Works Ltd.
Blankets:
Grant-Holden-Graham, Ltd.
Blowers, Centrifugal:
De Laval Steam Turbine Co.
Blue Print Machinery:
Montreal Blue Print Co.
Boiler Feed Water Controllers:
Riley Engineering and Supply Co., Ltd.
Boilers:
Combustion Engineering Corp., Ltd.
Wm. Hamilton Co. Ltd.
E. Leonard & Sons, Ltd.
Mussens Limited.
Boilers, Electric:
Dominion Engineering Works, Ltd.
Boilers, Heating:
Combustion Engineering Corp., Ltd.
E. Leonard & Sons, Ltd.
Taylor Stoker Co., Ltd.
Boilers, Marine:
Combustion Engineering, Corp., Ltd.
Boilers, Portable:
E. Leonard & Sons, Ltd.
Boilers, Return Tubular:
Babcock-Wilcox & Goldie-McCulloch Ltd.
E. Leonard & Sons, Ltd.
Bolts:
British Empire Steel Corp., Ltd.
N. Slater Co., Ltd.
Steel Co., of Canada, Ltd.
Bonds, Rail:
Dominion Insulator & Mfg. Co., Ltd.
Boring and Turning Mills:
John Bertram & Sons Co., Ltd.,
Boxes, Valve:
Jenkins Bros., Ltd.
Brass, Sheets, Rods, Tubes:
Openshaw & Bennet Ltd.
Brick Calcine:
Canadian Johns-Manville Co., Ltd.
Bridge Designs and Engineering Service:
Strauss Bascule Bridge Co.
Bridges, Steel:
Canadian Bridge Co., Ltd.
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co.,Ltd.
Broadcasting Equipment:
Northern Electric Co., Ltd.
Buckets, Clamshell:
F. H. Hopkins & Co., Ltd.
Buckets, Grab:
F. H. Hopkins & Co., Ltd.
Buckets, Orange-peel:
F. H. Hopkins & Co., Ltd.
Bucket Loaders:
Link-Belt Ltd.
Mussens Ltd.
Building Papers:
Barrett Co., Ltd.
Buildings, Steel:
Canadian Bridge Co., Ltd.
Combustion Engineering Corp., Ltd.
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co.,Ltd.
Bus-Supports:
Canadian Line Materials, Ltd.

C

Canvas Goods:
Grant-Holden-Graham, Ltd.
Car Dumpers:
Link-Belt Ltd.
Car Equipment Specialties:
Dominion Insulator & Mfg. Co. Ltd.
Car Pullers:
Link-Belt Ltd.
Car Steps, Safety:
Irving Iron Works Co.
Car Wheels, Chilled Iron:
Canada Iron Foundries, Ltd.
Cars, Dump:
F. H. Hopkins & Co., Ltd.
Mussens Ltd.
Casements, Steel:
Can. Metal Window & Steel Products, Ltd.
Trussed Concrete Steel Co., of Canada, Ltd.
Castings:
Babcock-Wilcox & Goldie-McCulloch Ltd.
William Kennedy & Sons, Ltd.
Castings, Brass:
N. Slater Co., Ltd.
Superheater Co., Ltd.
Castings, Iron:
Canada Iron Foundries, Ltd.
Dominion Engineering Works Ltd.
Gartshore-Thomson Pipe and Foundry Co., Ltd.
Wm. Hamilton Co. Ltd.
E. Leonard & Sons, Ltd.
Superheater Co., Ltd.
Catenary Materials:
Canadian Line Materials, Ltd.
Dominion Insulator & Mfg., Co. Ltd.
N. Slater Co., Ltd.
Cement, High Temperature:
Canadian Johns-Manville Co., Ltd.
Cement, Manufacturers:
Canada Cement Co., Ltd.
Chain Grate Stokers:
Babcock-Wilcox & Goldie-McCulloch Co., Ltd.
Riley Engineering and Supply Co., Ltd.
Chains:
Link-Belt, Ltd.
Chains, Silent:
Jones and Glassco, Regd.
Link-Belt Ltd.
Channels:
Dominion Bridge Co., Ltd.
Hamilton Bridge Works Co.,Ltd.
Chemist, Industrial:
Milton Hersey Co., Ltd.
Chimneys:
Combustion Engineering Corp., Ltd.
Horton Steel Works, Ltd.
Chip Tanks:
Horton Steel Works, Ltd.
Circuit Breakers:
Dominion Engineering Agency, Ltd.
Clamps, Double Bolt:
Knox Mfg. Co.
Clamps, High Pressure Hose:
Knox Mfg. Co.
Clamps, Rock Drill:
Knox Mfg. Co.
Clamps, Sectional:
Knox Mfg. Co.
Clamps, Single Bolt:
Knox Mfg. Co.
Coal:
British Empire Steel Corp., Ltd.
Coal Handling Equipment:
Combustion Engineering Corp., Ltd.
Dominion Bridge Co. Ltd.
Link-Belt, Ltd.
Mussens Limited.
Coke:
British Empire Steel Corp., Ltd.
Combustion Control System:
Riley Engineering and Supply Co., Ltd.
Compressors:
Babcock-Wilcox & Goldie-McCulloch Co., Ltd.
Combustion Engineering Corp., Ltd.
General Supply Co., of Canada, Ltd.
Compressors, Air:
Canadian Westinghouse, Co., Ltd.
Lancashire Dynamo and Motor Co. of Can. Ltd.
Mussens Limited.
Compressors, Ammonia:
Taylor Stoker Co., Ltd.
Compressors, Centrifugal:
De Laval Steam Turbine Co.
Concrete Armouring, Surface:
Irving Iron Works Co.
Concrete Mixers:
General Supply Co., of Canada, Ltd.
F. H. Hopkins & Co., Ltd.
Mussens Ltd.
Condensers, Synchronous & Static:
Canadian General Electric Co., Ltd.
Griswold & Co., Ltd.
Lancashire Dynamo and Motor Co. of Can. Ltd.
Conduit, Telephone Cable:
Pacific Coast Pipe Co. Ltd.
Conduit, Underground Fibre:
Canadian Johns-Manville Co., Ltd.
Conduit, Underfloor Duct:
Canadian Johns-Manville Co., Ltd.
Connecting Rods:
British Empire Steel Corp., Ltd.
Construction Material Electrical:
Northern Electric Co., Ltd.
N. Slater Co., Ltd.
Contractors:
E. G. M. Cape & Co.
Randolph MacDonald Co., Ltd.
D. P. Robinson & Co. Inc.
Contractors' Plant and Supplies:
F. H. Hopkins & Co., Ltd.
Mussens Limited.
Contractors' Pumps:
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Controllers, Electric:
Canadian Westinghouse Co. Ltd.
Conveyors:
Combustion Engineering Corp., Ltd.
Link-Belt Ltd.
Conveyors, Portable Belt:
Link-Belt Ltd.
Mussens Ltd.
Copper, Sheets, Rods, Tubes:
Openshaw & Bennet, Ltd.
Couplings, Air Hose:
Knox Mfg. Co.
Couplings, High Pressure Hose:
Knox Mfg. Co.
Couplings, Rock Drill:
Knox Mfg. Co.
Couplings, Steam Hose:
Knox Mfg. Co.
Couplings, Suction Hose:
Knox Mfg. Co.
Cranes:
Babcock-Wilcox & Goldie-McCulloch Ltd.
Combustion Engineering Corp., Ltd.
F. H. Hopkins & Co., Ltd.
Link-Belt Ltd.
Cranes, Locomotives:
Clare Osborn, Ltd.
F. H. Hopkins & Co., Ltd.
Link-Belt, Ltd.
Mussens Ltd.
Cranes, Travelling:
Dominion Bridge Co., Ltd.
Creosote Oils:
Barrett Co., Ltd.
Cross Arm Braces:
Burlington Steel Co., Ltd.
N. Slater Co., Ltd.
Crushers, Jaw, Gyratory, Stone:
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F. H. Hopkins & Co., Ltd.
Culvert Pipe:
Gartshore-Thomson Pipe and Foundry Co., Ltd.
Cutters, Milling:
Pratt & Whitney Company of Canada, Ltd.
Cutting-off Machines:
John Bertram & Sons Co., Ltd.

D

Damper Regulation:
Riley Engineering & Supply Co. Ltd.
Dampproof Coating:
Canadian Johns-Manville Co., Ltd.
Derricks:
F. H. Hopkins & Co., Ltd.
Mussens Ltd.
Die Screw Plates:
Pratt & Whitney Company of Canada, Ltd.
Dies:
Pratt & Whitney Co., of Canada, Ltd.
N. Slater Co., Ltd.
Digesters:
Horton Steel Works, Ltd.
Doors, Fireproof:
Mussens Limited.
N. Slater Co., Ltd.
Dredges:
Combustion Engineering Corp., Ltd.
F. H. Hopkins & Co., Ltd.
Drills:
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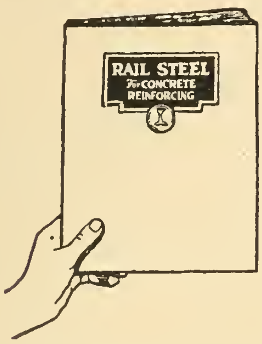
Drilling Machines, Metal:
John Bertram & Sons Co., Ltd.
Drill Sharpeners:
Lancashire Dynamo and Motor Co. of Canada Ltd.

BURLINGTON STEEL COMPANY LTD.

HAMILTON **Canada**

F. G. Engholm, Con. Engr. Goldie Construction Co. Limited, Contractors



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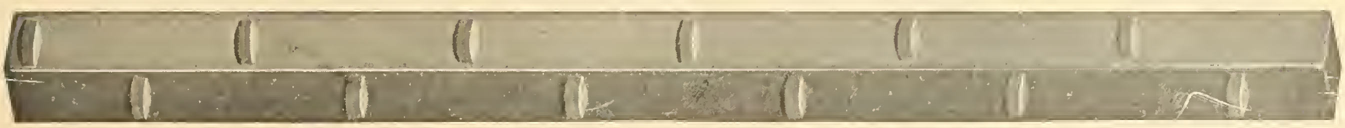

Purchaser's Classified Directory

E

Economizers:
Babcock-Wilcox & Goldie-McCulloch Ltd.
Combustion Engineering Corp., Ltd.

Electric Control Gear:
George Ellison.

Electric Motors:
Lincoln Electric Co., of Canada, Ltd.

Electric Railway Car Couplers:
Dominion Insulator & Mfg. Co., Ltd.

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George Ellison.

Electric Welders:
Lincoln Electric Co., of Canada, Ltd.

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Electrical Supplies:
Northern Electric Co., Ltd.

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Dominion Paint Works, Ltd.

Enamels, Industrial Lighting:
Dominion Paint Works, Ltd.

End Mills:
Pratt & Whitney Company of Canada, Ltd.

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Combustion Engineering Corp., Ltd.

Engines, Steam:
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Combustion Engineering Corp., Ltd.
Laurie and Lamb.
E. Leonard & Sons, Ltd.
Riley Engineering and Supply Co., Ltd.

Excavators:
Mussens Limited.
F. H. Hopkins & Co., Ltd.

Excavators, Dragline:
F. H. Hopkins & Co., Ltd.
Link-Belt Ltd.

Exhaust Steam Injectors, Locomotive:
Superheater Co., Ltd.

F

Fan Engine Regulators:
Riley Engineering & Supply Co Ltd.

Feed-Water Heaters, Locomotive:
Superheater Co., Ltd.

Fence Posts, Steel:
Burlington Steel Co., Ltd.

Files:
Simonds Canada Saw Co. Ltd.

Fillers, Wood and Metal:
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Flange Couplings:
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Flanges, Companion:
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Files, Valve:
Jenkins Bros., Ltd.

Flooring, Fireproof:
Irving Iron Works Co.

Flooring, Open Steel:
Irving Iron Works Co.

Flooring, Steel:
Irving Iron Works Co.

Flooring, Non-Slipping:
Irving Iron Works Co.

Flooring, Ventilating:
Irving Iron Works Co.

Floors, Monolithic:
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Dominion Bridge Co., Ltd.
N. Slater Co., Ltd.

Friction Clutches:
Link-Belt Ltd.
Canadian Johns-Manville Co., Ltd.

Fuel, Oil:
Imperial Oil, Ltd.

Furnaces, Automatic:
Riley Engineering & Supply Co., Ltd.

G

Galvanizing, Hot Dip:
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Gasoline:
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Gasoline Storage Tanks:
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Gears:
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Hamilton Gear & Machine Co.
Link-Belt, Ltd.

Gears, Machine Cut:
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Gears, Double Helical:
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Gears Reduction:
De Laval Steam Turbine Co.

Generators:
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Canadian Westinghouse Co. Ltd.
Griswold & Co., Ltd.
Lancashire Dynamo and Motor Co. of Can. Ltd.

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Ground Shafting:
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Guards, Truck Radiator:
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H

Hammers, Steam:
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Hangers:
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Hangers, Door:
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Headlights, Electric Railway:
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Heaters, Boiler Feed-Water:
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Combustion Engineering Corp., Ltd.
Riley Engineering and Supply Co., Ltd.

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Hobs:
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Mussens Ltd.

Hoists, Electric:
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Link-Belt Ltd.
Taylor Stoker Co., Ltd.

Hoists, Hydraulic:
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Hoists, Mono-Rail:
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Taylor Stoker Co., Ltd.

Hose Couplings, High Pressure:
Knox Mfg. Co.

Hydraulic Press Control Systems:
Taylor Stoker Co., Ltd.

Hydraulic Turbines:
Boving Hydraulic & Engineering Co.
Dominion Engineering Works, Ltd.
Wm. Hamilton Co. Ltd.

I

Ignition Batteries:
Dominion Battery Co., Ltd.

Industrial Electric Control:
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Dominion Engineering Agency, Ltd.

Insulated Rail Joints, Continuous:
Rail Joint Co., of Canada, Ltd.

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Insulation, Underground Systems:
Canadian Johns-Manville Co., Ltd.

Insulators, Porcelain:
Dominion Insulator & Mfg., Co. Ltd.

J

Joints, Filler Paving:
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K

Kerosene:
Imperial Oil Ltd.

L

Ladder Steps, Steel:
Irving Iron Works Co.

Lathes:
John Bertram & Sons Co., Ltd.

Lightning Arrestors:
Canadian General Electric Co., Ltd.
Dominion Engineering Agency, Ltd.

Lighting Equipment, Industrial and Street:
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Mussens Ltd.

Locomotives, Electric:
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Canadian Westinghouse Co.,Ltd.

Lubricating Oils & Greases:
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Lumber, Asbestos:
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M

Machine Knives:
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Machine Tools:
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Dominion Engineering Works, Ltd.

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Mussens Limited.

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Trussed Concrete Steel Co. of Canada, Ltd.

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Pratt & Whitney Co., of Canada, Ltd.

Milling Machines:
John Bertram & Sons Co., Ltd.

Mine Hoists, Steam and Electric:
Lancashire Dynamo and Motor Co. of Can. Ltd.

Mining Machinery:
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William Kennedy & Sons, Ltd.

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Dominion Engineering Agency Ltd.
Lancashire Dynamo and Motor Co. of Can. Ltd.

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Canadian Westinghouse Co., Ltd.
Ferranti Meter & Transformer Mfg., Co., Ltd.
Lancashire Dynamo and Motor Co. of Can. Ltd.
Lincoln Electric Co., of Canada Ltd.

Motor Oils:
Imperial Oil Ltd.

N

Nails:
British Empire Steel Corp., Ltd.

Nipples, High Pressure Hose:
Knox Mfg. Co.

Nipples, Pneumatic Hose:
Knox Mfg. Co.

Nipples, Rock Drill:
Knox Mfg. Co.

Nozzles, Malleable Iron:
Knox Mfg. Co.

Nuts:
British Empire Steel Corp., Ltd,

Oil Storage Tanks:
Horton Steel Works, Ltd.

O

Oil Burning Equipment:
Combustion Engineering Corp., Ltd.

Oil Purifiers, Centrifugal:
De Laval Steam Turbine Co.

Oil Storage Tanks:
Horton Steel Works, Ltd.

Oxy-Acetylene Welding & Cutting Apparatus and Supplies:
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Oxygen:
Dominion Oxygen Co., Ltd.

P

Packings, Asbestos Sheet:
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Packings, Rod and Plunger:
Canadian Johns-Manville Co., Ltd.

Paints, Metal Protectives:
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Paving Contractors:
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Pencils:
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Penstocks:
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Pacific Coast Pipe Co., Ltd.

Pinions:
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Jones & Glassco, Reg'd.

Pipe Coils:
Superheater Co., Ltd.

Pipe Couplings, Union:
Dart Union Co., Ltd.

Pipe Cutting and Threading Machinery:
Riley Engineering and Supply Co., Ltd.

Pipe Fittings:
Crane Ltd.

Pipe, Lead:
Steel Co. of Canada, Ltd.

Pipes, Cast Iron:
Canada Iron Foundries, Ltd.
Gartshore-Thomson Pipe and Foundry Co., Ltd.
Kennedy & Company, Ltd.
National Iron Corp., Ltd.

Pipe Insulations:
Canadian Johns-Manville Co., Ltd.

Pipe Riveted:
Horton Steel Works, Ltd.

Pipe, Wood Stave:
Pacific Coast Pipe Co., Ltd.

Pipes, Wrought Iron
Crane Ltd.

Planing Machines, Metal:
John Bertram & Sons Co., Ltd.,

Plate and Tank Works.
Horton Steel Works, Ltd.

Plate Rolls:
John Bertram & Sons Co., Ltd.,

Plates, Brass and Copper:
Openshaw & Bennet, Ltd.

Plates, Steel:
British Empire Steel Corp., Ltd.
Hamilton Bridge Works Co.,Ltd.
Vulcan Iron Works, Ltd.

Plumbing Material:
Crane Ltd.

Pole Line Hardware:
Canadian Line Materials, Ltd.

Posts, Indicator:
Jenkins Bros., Ltd.

Porcelain, Insulators:
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Combustion Engineering Corp. Ltd.
Riley Engineering and Supply Co., Ltd.

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William Hamilton Co., Ltd.
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Pulpwood Machinery:
Combustion Engineering Corp., Ltd.
Wm. Hamilton Co. Ltd.
Pulverized Fuel Systems:
Combustion Engineering Corp., Ltd.
Riley Engineering & Supply Co. Ltd.
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Riley Engineering & Supply Co. Ltd.
Pump Valves:
Jenkins Bros., Ltd.
Pumps:
Canadian Fairbanks-Morse Co., Ltd.
Dominion Engineering Works, Ltd.
General Supply Co., of Canada, Ltd.
F. H. Hopkins & Co., Ltd.
Jones & Glassco, Reg'd.
Mussens Limited.
Pumps and Condensers:
Babcock-Wilcox & Goldie-McCulloch Ltd.
Pumps, Centrifugal:
De Laval Steam Turbine Co.
Dominion Engineering Works, Ltd.
F. H. Hopkins & Co., Ltd.
Laurie & Lamb.
Pumps, Hydraulic:
Taylor Stoker Co., Ltd.
Pumps Oil:
Taylor Stoker Co., Ltd.
Punches and Punch Dies:
Pratt & Whitney Company of Canada, Ltd.
Punches and Shears:
John Bertram & Sons Co., Ltd.

R

Radiator Traps:
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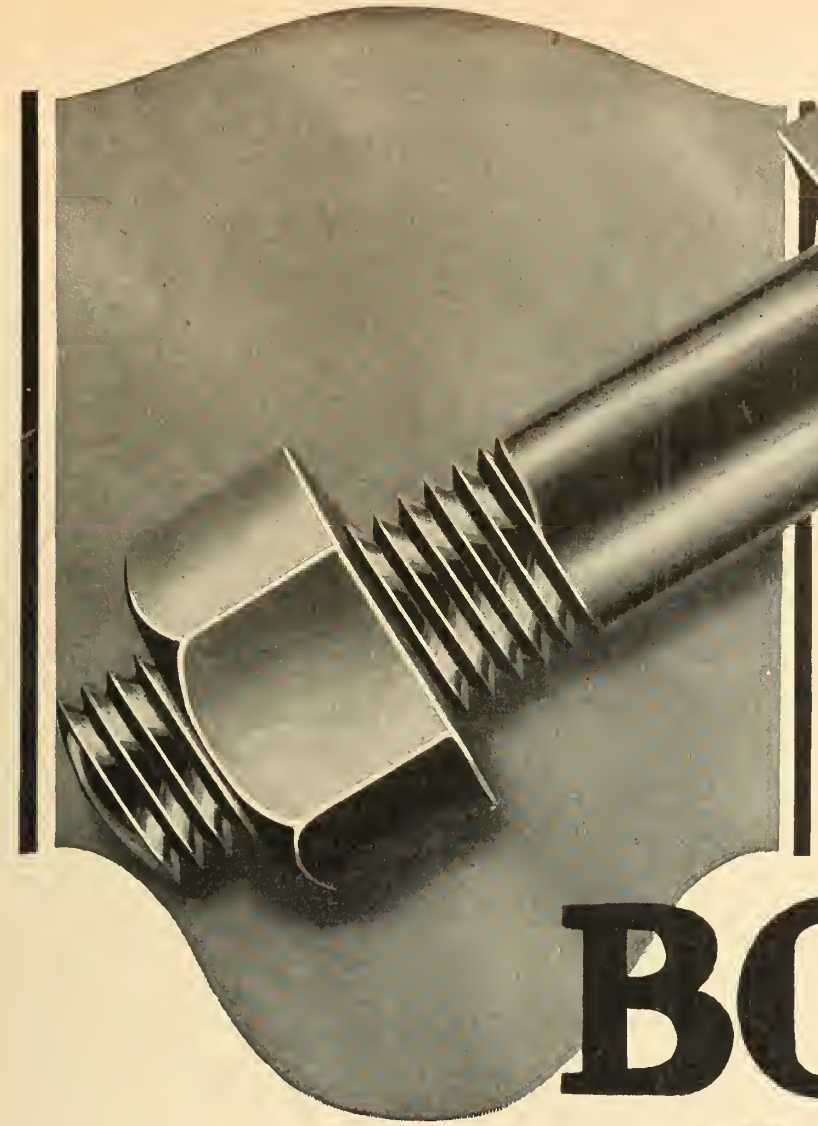

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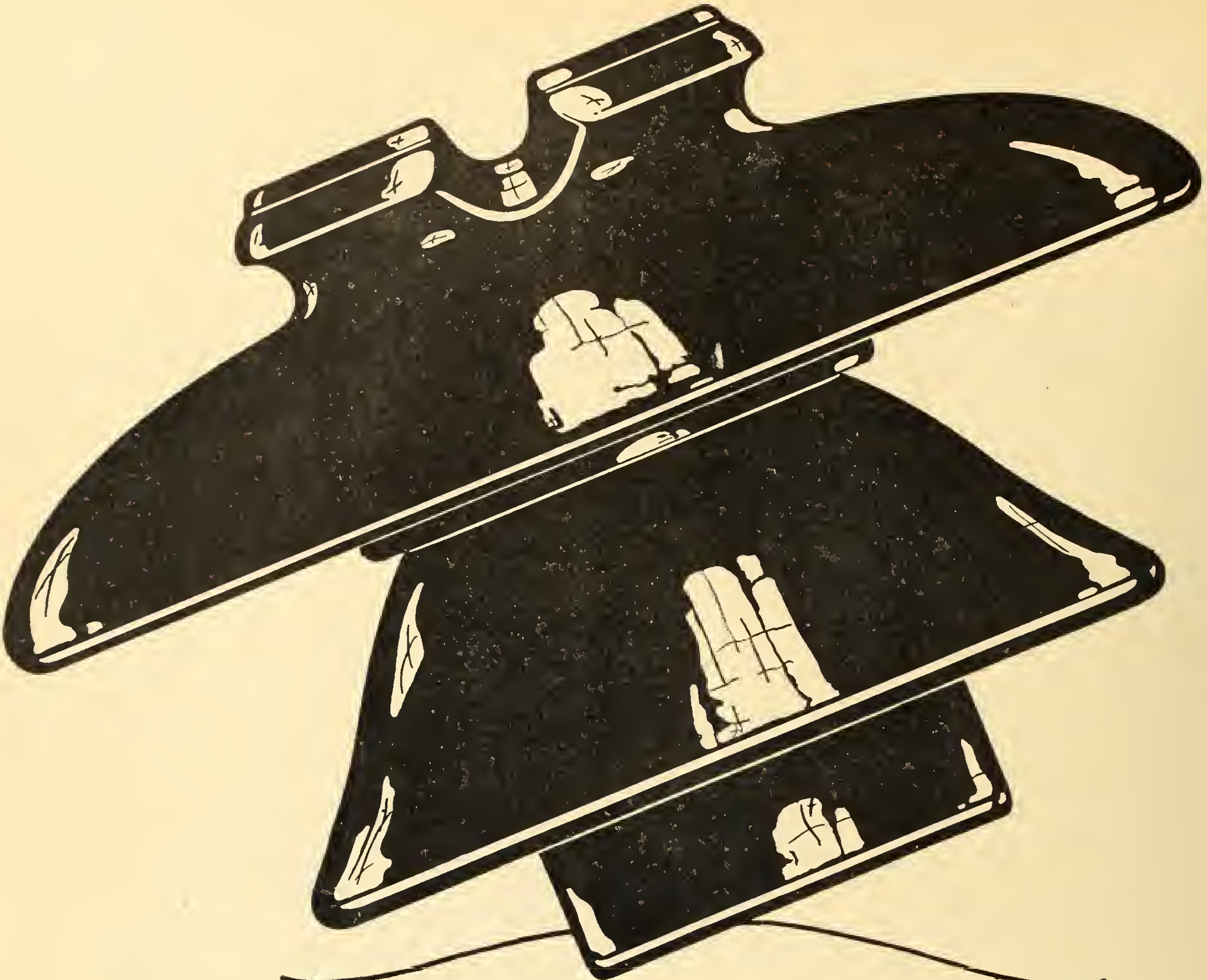
"TO FACILITATE THE ACQUIREMENT AND INTERCHANGE OF PROFESSIONAL KNOWLEDGE AMONG ITS MEMBERS, TO PROMOTE THEIR PROFESSIONAL INTERESTS, TO ENCOURAGE ORIGINAL RESEARCH, TO DEVELOP AND MAINTAIN HIGH STANDARDS IN THE ENGINEERING PROFESSION AND TO ENHANCE THE USEFULNESS OF THE PROFESSION TO THE PUBLIC"

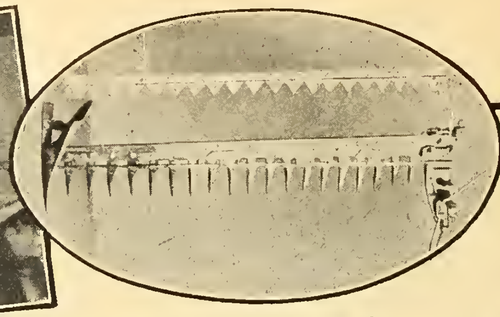
NOVEMBER 1925

PUBLISHED MONTHLY BY THE ENGINEERING INSTITUTE OF CANADA

AT 176 MANSFIELD STREET, MONTREAL

Vol. VIII No. 11



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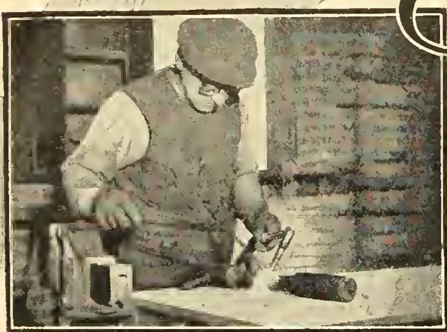

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Who fumbled the ball?

Scene 1:—President's office before game was called in plant

President: "He may be the best guard Tech ever had, but this shows what college amounts to."

Consulting Engineer: "Did he have the correct data as to your requirements?"

President: "Measured everything himself, when he was home last summer, and his mother begged me to let him show what was in him. It's cost me a clean $5,000. If it wasn't for the big game Saturday I'd wire him now to come home, get in the factory and learn something practical."

Consulting Engineer: "What does the contractor say about it?"

President: "You and Murphy can fight it out." (Turning to 'phone) "Send in Mr. Murphy, the contractor. We're ready for him."

Mr. Murphy (entering): "I got your letter, and my answer is that any changes will have to be charged at regular rates. The whole trouble is in the small sizes of pipes that your son specified."

Consulting Engineer (studying the blueprints): "Just a minute. This is all right. Can't help but deliver 80 lbs. pressure if the boy knew what to specify. Looks to me like faulty installation. Where can I get a copy of the specifications on this job?"

President: "I kept a copy myself. Here they are."

Consulting Engineer: "Will you come over to the new extension with me, Mr. Murphy? And, I think (turning to the President) if you want to save money in the future you might tag along too."

Scene 2:—Game called in the plant

AS THE three men entered the extension the President got the surprise of his life. His undergraduate son in overalls was standing on a step-ladder wielding a wrench; a section of the piping near the door had been dismantled.

Son: "Hello, dad, this is a crime; no wonder mother wired me. Did you write that telegram?"

President: "What telegram?"

Son: "About mother passing the ball to me. That I fumbled it? What I'd like to know is who fumbled my specifications. Look at these strap-iron hangers, and this archaic pipe cutting."

Consulting Engineer: "Just what I thought. The specifications call for reamed pipe."

President: "What do you mean, 'reamed'?"

Consulting Engineer: "The burrs on the inside of this pipe. Feel them. This pipe has been cut by hand and never reamed. Those burrs caused accumulations of sediment and nearly stopped up some of the lines."

Son: "And the specifications call for hangers fully adjustable so that the pipe lines can be properly aligned after installation. (Turning to Murphy)—With hooks like these how do you propose to take care of the usual sagging of pipe lines in a new building? Hangers like these only breed fat repair bills for some one to pay."

Murphy: "Hangers, adjustable after the pipe is up? I never heard of anything like that."

Son: "Every contractor and dealer in piping has a catalog of Grinnell adjustable hangers. The recommendation accompanying my specification was to buy from Grinnell Company all the welded headers, hangers and fittings and have them cut the pipe to sketch with fittings made on. The job would have gone through like the Tech team cleaning up the scrubs. That company always reams every foot of pipe it cuts. What became of my recommendation?"

President (sheepishly): "Blame me, my boy. I held out that last page when I told the purchasing department to get estimates."

Consulting Engineer: "Same old mistake in a new garb. You've always killed my recommendations if they limited competition and it has cost you many thousands. This time you were determined not to be such a fatherly fool as to let your own son cut out all price competition on the work. You admit it cost you $5,000 in money and more than that in worry."

President: "Hereafter I guess I'll stay in the grandstand and root for the Skill team against the Bungle team from Priceville."

Send for the "Revelation Bag"

We'll send you the "Revelation Bag" free *on this one condition:* That you will compare the Grinnell Fittings it contains with the fittings you are now using and judge the difference. See for yourself what 100% fittings look like.

IF it's an industrial piping specification of any kind, see Grinnell Company, Ltd., about the materials or suggest to your contractor the simplicity and satisfaction of placing all orders for piping supplies with one large and responsible firm. Address all inquiries to Grinnell Company of Canada, Ltd., 2440 Dundas Street, West, Toronto.

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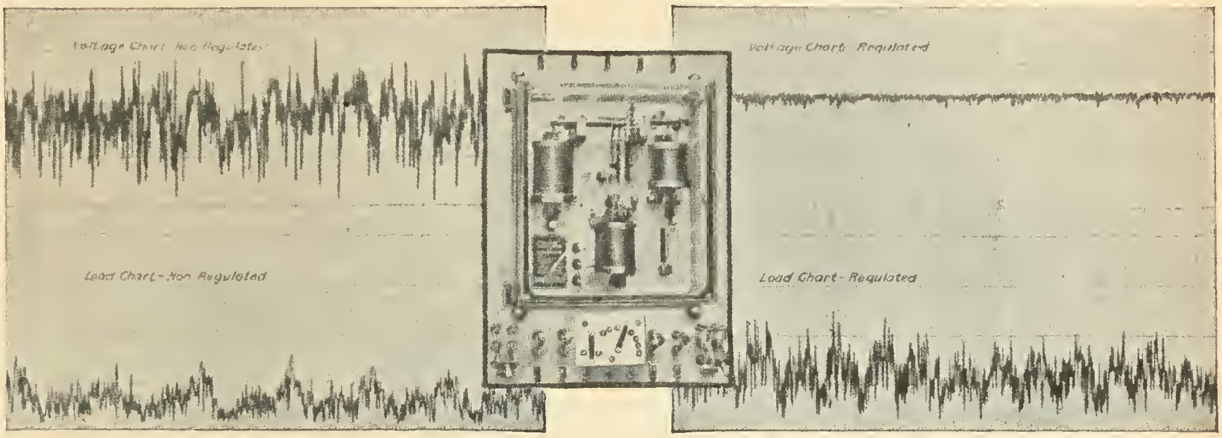
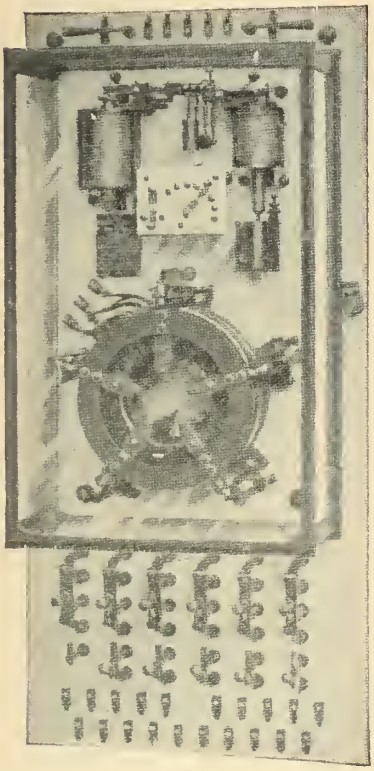
Close Voltage Regulation not only permits the power company to provide satisfactory service for the consumer, but it also makes possible economies in operation which would otherwise be unattainable — Do not be without C.G.E. Generator Voltage Regulators.



Voltage and load charts taken before regulator was installed *Voltage and load charts taken after Regulator was installed*

PERFORMANCE CHARTS SHOWING THE IMPROVEMENT IN VOLTAGE REGULATION ATTAINED BY THE INSTALLATION OF A TYPE TA GENERATOR VOLTAGE REGULATOR



TYPE TA, FORM F-5 REGULATOR

C-G-E GENERATOR VOLTAGE REGULATORS are to your service what the governor is to your engine and do what no human being can do.

They automatically regulate the voltage to meet the constantly changing conditions of load and speed on your generating units and the variations of speed in the prime movers.

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Concrete construction was also adopted for the Sewage Disposal Plant.

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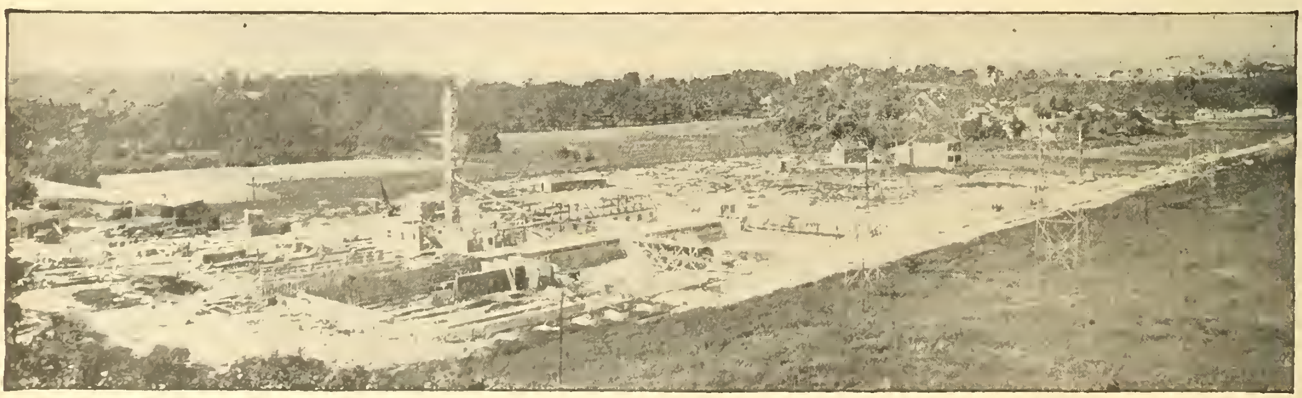
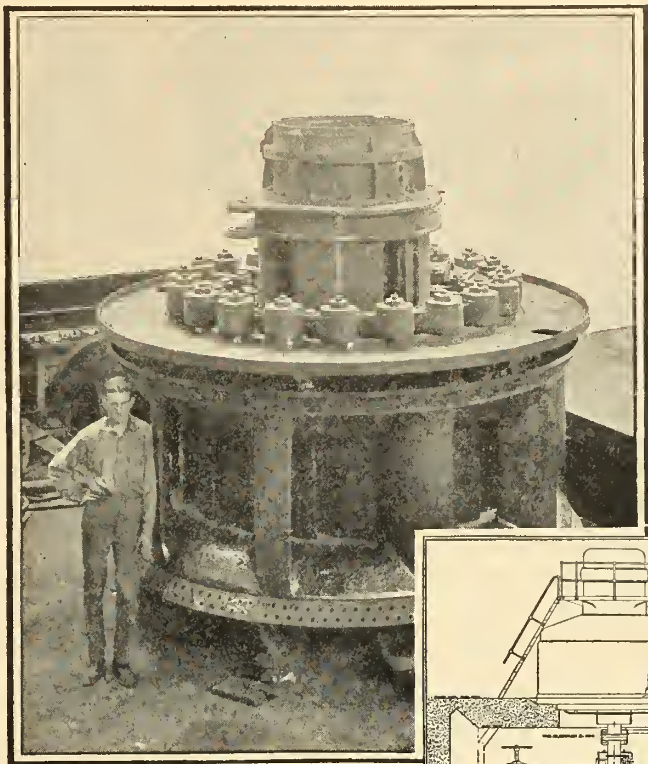
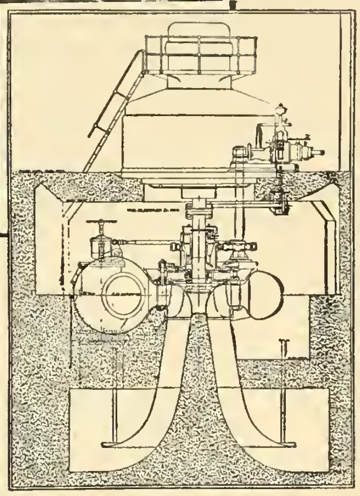


View of York Township Sewage Disposal Plant, under Construction.





Illustrations show—Shop Assembly View and Sectional Elevation of the 13,500 H.P. I.P. Morris Hydraulic Turbine built for the Powell River Company Limited, at Powell River, B.C.

13,500 H.P. Powell River Development

This unit is built to operate at a speed of 250 R.P.M. under 157-ft. head.

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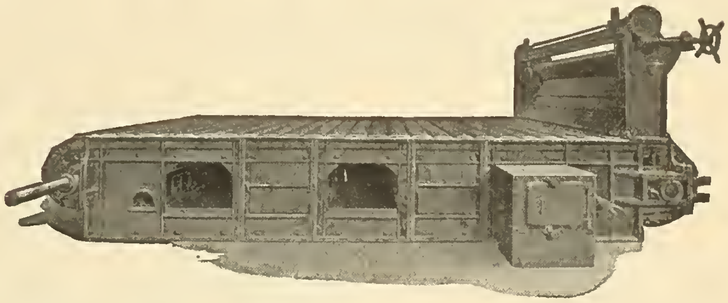

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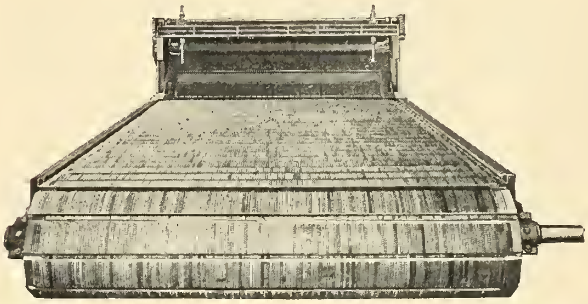
300% to 350% Rating in 3 to 5 minutes

The Coxe Stoker will develope maximum efficiency at points between 150% and 250% of rating and is capable of being brought to 300% or 350% of rating in 3 to 5 minutes, and held at the higher rating as long as desired, subject only to the ability of the furnace to stand the temperature. The higher rating is obtained with but small reduction in efficiency and with no additional effort on the part of the operator.



The speed of the Coxe Stoker is increased as is the pressure under the grate; no effort other than the inspection of the fires is necessary.

Send for performance data on the Coxe Stoker.

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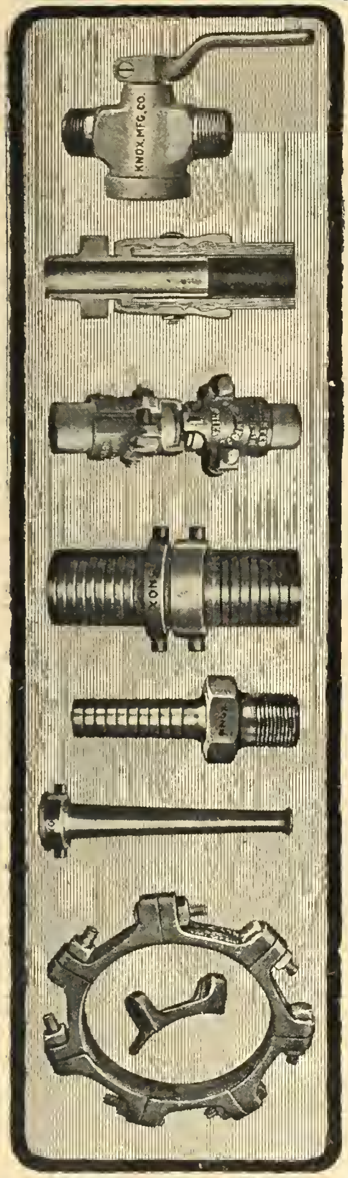

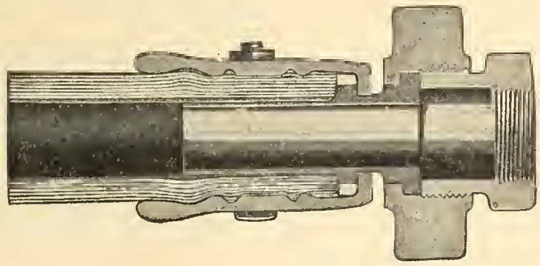

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It does not leak

It is a Time Saver
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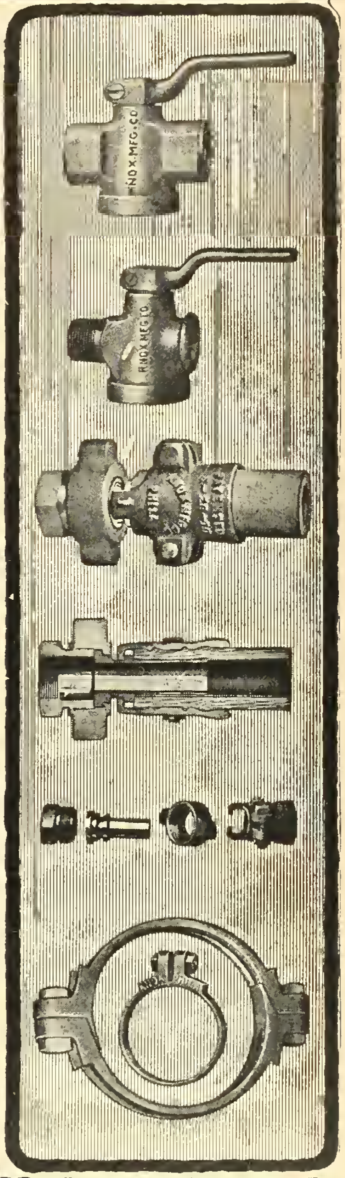
and protect it from injury by
the end of the stem

And therefore a Cost Reducer

Make us prove these statements



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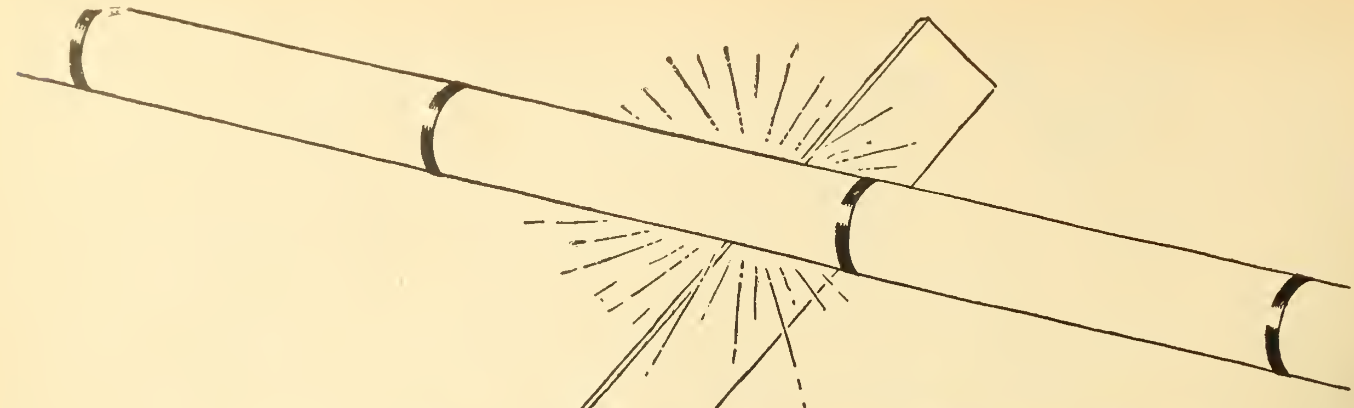

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Hydraulic Regulating Gates

Field Engineering and Erection Problems in Connection with various Types of Hydraulic Regulating Gates.

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Paper read before the Montreal Branch, The Engineering Institute of Canada, October 8th, 1925.

To develop the water power in a stream one always desires to make use of as much head as it is possible to obtain and at the same time provide sufficient pondage in front of the units to ensure that this head is maintained at practically a constant level. These conditions are usually secured by building a dam across the stream so that the crest is at the normal high-water level required, and into this dam are built as many gates as may be necessary to take care of the excess water under maximum flood conditins.

Gates Designated According to Location

The term "hydraulic regulating gates" is used with reference to all types of gates, etc., used to control the flow of water in a stream, for the generation of hydro-electric power. These gates have been given certain names specifying their uses, although in general design they may be practically the same.

Sluice Gates

The gates in the dam are generally called "sluice gates" or "crest gates", and usually have a large width compared with their height or head; the head of water being approximately equal to the height of the gate. The gate may be of the sliding, fixed roller, Stoney or live roller, or taintor type, depending upon the size, the head of water, and the operating conditions.

Head Gates

At the entrance to the penstock, or to the scroll case of the turbine, gates are placed to cut off the supply of water to the unit in case of shut-down for repair, etc., and are known as "head gates". These gates may be of any of the types mentioned above, and in addition to these types "butterfly gates" have sometimes been used. The butterfly gate is particularly suited for high heads and large openings, on account of ease of operation in both closing and opening under full head. It can also be rendered practically water-tight. The more common types are either the fixed roller or the Stoney roller, although, with low heads and comparatively small sizes, sliding gates can be used to advantage. Head gates usually operate in a totally submerged position and therefore have to be sealed around the four sides of the opening. Furthermore, as the repair work to the unit has to be carried on with these gates as the only protection from the water, it is essential that the gates should be made as watertight as possible.

In the case of high heads, where the distance from the top of the gate, when closed, to the gate house floor is greater than a practical length for operating screws, the gate hoisting mechanism must be of the rope hoist type. This means that the weight of the gate must be greater than the frictional resistance produced under full head or, in other words, the gate must be self-closing, requiring either the fixed roller or the Stoney roller type.

Emergency Gates

In front of the head gate, on the upstream side, slots and bedded parts should be provided for emergency gates or stop logs, depending upon the head and size of opening. One set of gates or logs may be provided for a number of units, as they are required only in case of repairs to the head gates, or when it is necessary to remove a head gate and at the same time keep the unit unwatered. Openings for these gates are unfortunately not always provided, but they are of such value when required that they should be considered as an essential item in any hydro-electric power development. These gates are generally of the sliding or of the fixed

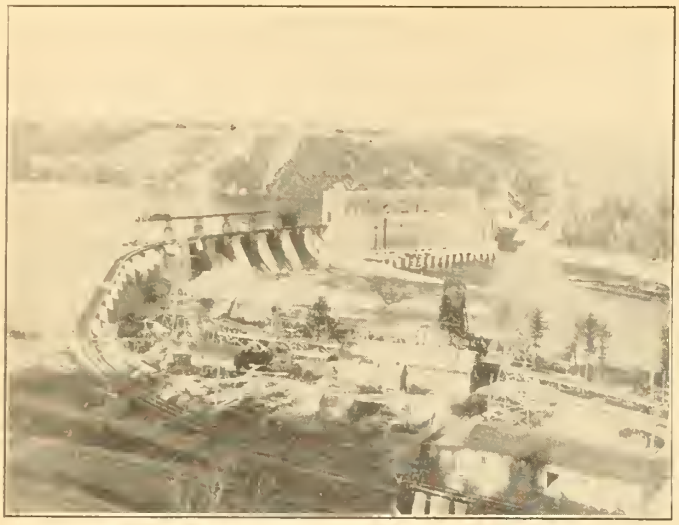

Figure No. 1.—General View of An Hydraulic Power Development Showing Sluice Gate in Dam, also Power House with Gate House on the upstream side in which are the Head, Regulation and Emergency Gates.

roller type, since they have to be used in slots on the upstream side of the units. They reach from the sill to above the maximum high-water level and are built in sections of such size that they can be readily handled with the gate house crane after they are relieved of the head of water by passing the water through the top and second sections, or by other means.

Regulating Gates

Where a further regulation of the water is required than that obtained by means of the sluice gates, regulating gates are provided for in the power house bulkhead. These are of the same design and characteristics as the head gates, although generally of the Stoney roller type. However, special care should be taken with regard to the design of the roller train guides on account of the very high velocity of water usually passing through these gates. The hoisting mechanism and self-closing feature is also similar to that required for head gates.

Tail Race Gates

In cases where the elevation of the tail race water comes above the unit it may be necessary to provide gates in the tail race opening in order that the unit may be unwatered for inspection and repair purposes. These gates are generally of the low head emergency type; that is, they are arranged so that one set of gates can be used in any of the tail race openings, as desired, and are either of the sliding or fixed roller type operated by an overhead crane or gantry. The gates are lowered into the water with the head equalized on both sides of the gate and are only raised after the water level has again been equalized by opening the head gates slightly. Due to the absence of hydrostatic pressure to force the gates against their seats or sealing faces, during the initial stages of unwatering the tail race, it is advisable to provide these gates with some mechanical arrangement which will jack the gates into position and ensure a reasonably watertight seal.

Types of Gates

As we have referred in the above paragraphs to various types of gates such as sliding, fixed roller, Stoney roller, etc., it would be as well to describe their general characteristics at this point.

Sliding Gate

This consists of a skin plate supported by horizontal girders and vertical stiffeners. The horizontal girders are in turn supported by vertical end girders provided with bearing strips on the downstream flange in such a manner as to engage with bearing faces bedded into the concrete and forming a seal down the vertical edges. The top and bottom edges of the gate are sealed, if necessary, in the same way, or the bottom may be sealed by contact between the skin plate, or a wood block and the sill beam.

Fixed Roller Gate

The general design of skin plate and girders is the same as for a sliding gate, except that the end girders are of box section and have their webs bored for pins which carry rollers arranged to transfer the water pressure from the gate to a roller path bedded in the masonry. The vertical and top sealing is obtained by means of stanching rods or spring brass seals, while the bottom is sealed by the fit of the planed bottom edge of the skin plate on a planed sill beam bedded in the concrete, or by the fit of a timber beam on the bottom of the gate to a planed sill beam.

Stoney or Live Roller Gate

This gate is similar in design and sealing arrangements to the foregoing, except that the end girders are of single web construction, fitted on the downstream flange with a roller path, constructed so as to allow of a uniform loading over the face of the rollers, by compensating for the deflection of the horizontal girders of the gate under load and any small transverse mis-alignment of the bedded parts which might take place during erection. The rollers for these gates are built in roller train units separate from the gate. These units consist of steel bar or angle sides supporting bronze pins at the required distance to allow of uniform pressure per roller over the entire length. On these pins the rollers turn freely and the train, being placed between the roller path on the gate and the one bedded in the masonry, transmits the pressure of the water from the gate to the concrete piers. The roller train is suspended at its upper end on a sheave and two part rope, one end of the rope being attached to the gate and the other end to the masonry or towers at a point which allows full travel to the gate, and also keeps the travel of the roller train

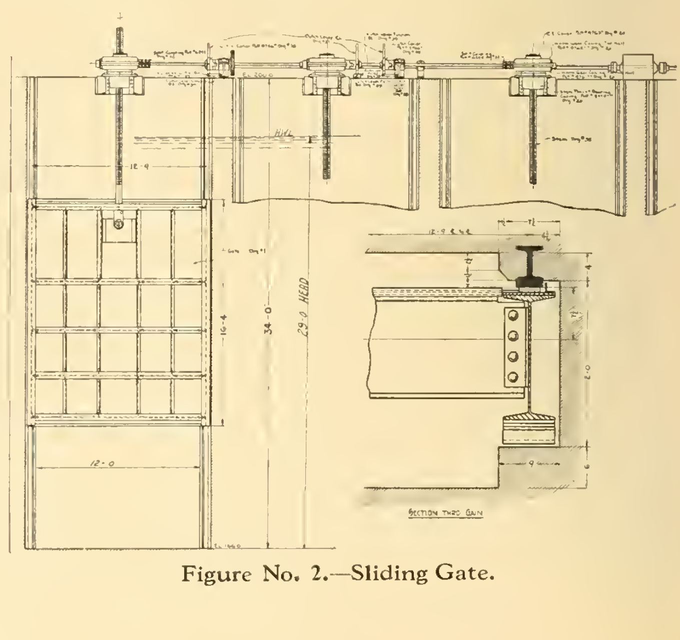

Figure No. 2.—Sliding Gate.

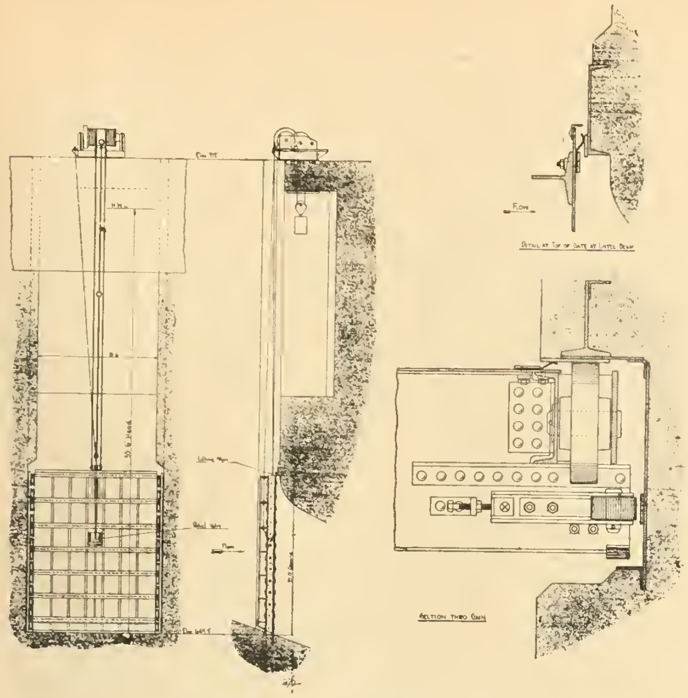

Figure No. 3.—Fixed Roller Gate.

to one-half the travel of the gate, so that the roller train will be suspended at its proper elevation, even if the gate tends to move away from the fixed roller path.

Taintor Gate

The skin plate of this gate is curved and has its convex face upstream, the pressure of the water is transmitted from the skin plate to horizontal stiffeners supported by vertical end or end and centre girders, which are in turn supported by triangular truss framing in such a manner as to transmit the hydrostatic load to trunnions or gudgeon pins embedded in the masonry. The seal at the bottom is effected by one of the methods mentioned above and on the sides and top by a spring sealing device or floating wood block.

Butterfly Gate

This gate consists of a heavy steel cast horizontal centre piece rotating on trunnions at each end in bearings attached to the bedded cast iron sealing frame. To this centre piece are attached two cast iron wings by means of forged steel shrink links and bolts, the whole being capable of rotation through 90° about a horizontal axis, by means of a connecting rod, attached to the lower end of the valve and operated through a crosshead by a screw reduction gearing.

The sealing is accomplished around the lower edges by means of a planed metal to metal contact between the gate wing and the bedded part, and around the upper edges by means of a spring brass seal. The seal is necessary on account of the deflection of the gate wings due to pressure and for this reason the upper wing or leaf has to pass through the bedded part while the lower wing lifts away from it. The seal should also be made of sufficient strength to carry the full water pressure upon it as well as having the required flexibility.

Combined Fixed Roller and Sliding Gate

These have been used under some conditions and are similar to the fixed roller gate already described, except that the roller path is provided with an inclined notch which allows the gate to come forward, at the point of closing, on to a sliding seat and seal, these notches and the spacing of the rollers are so arranged that only at the point of closing is there more than one pair of rollers over a notch.

Combined Live Roller and Sliding Gate

Gates similar to the Stoney gate described above have been used, in which the roller train is of the caterpillar type and rolls on a track at an incline to a sliding seat in such a way that when the gate is closed the sliding seats are in contact and form a seal.

Bedded Parts

In the design of bedded parts, the all-important point to keep in mind is the method and facility of erection, and secondary only to this is the ease of machining and retention of their alignment during handling and when set in place in the field. To adequately take care of these features one must be fully acquainted with conditions at the site and the method to be adopted in placing the bedded parts in their final position.

As a rule, the best procedure is to construct the mass concrete of the piers first, leaving a void large enough to take the bedded parts with sufficient grouting room behind them, and placing in the forms of the mass concrete sufficient anchors, to which the bedded parts can be readily attached and adjusted for final alignment by the field engineer before the grouting is poured behind them to make a monolithic whole with the mass already set.

Attempts have been made to set the bedded parts by attaching them to the forms for the mass concrete and pouring the whole of the concrete work with the steel work in place. This has not been very successful up to the present time. In the first place, it must be remembered that the bedded parts are often thirty or more feet in length and the forming and pouring of the concrete can only be done in suitable lifts of ten feet or so, thus allowing an unsupported length of steel to be standing in the air subjected to warping and deflection while the lower portion of the concrete is being placed. Secondly, it is

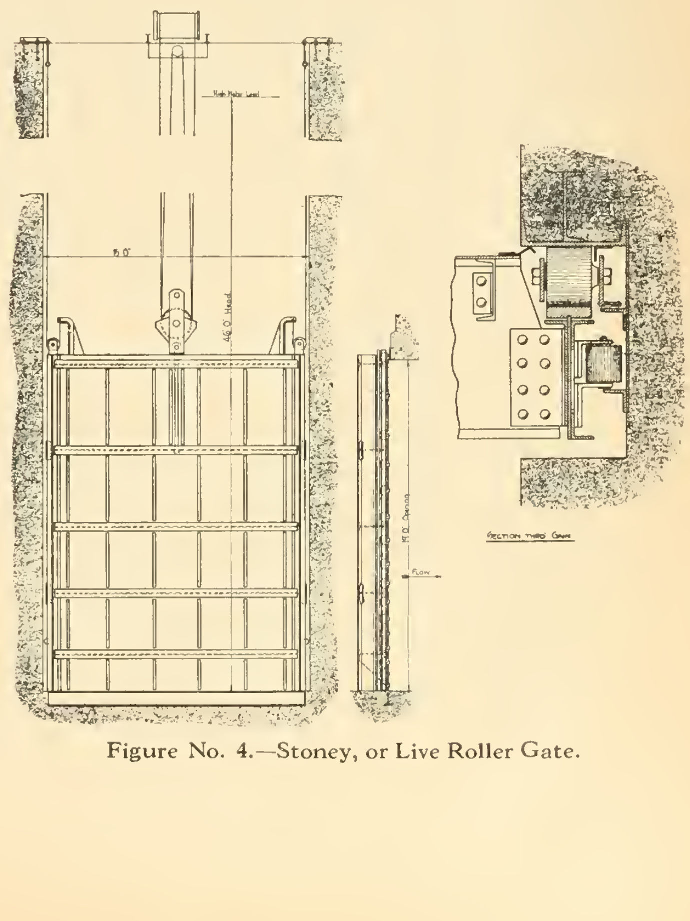

Figure No. 4.—Stoney, or Live Roller Gate.

almost impossible to keep the steelwork in true alignment due to the contraction and expansion of the forms under the varying atmospheric conditions during the operations. In one instance, where the general direction of the dam was north and south, the readings for the alignment of the steel would vary morning and evening depending on the position of the sun.

The general idea of placing the steel at the same time as the mass concrete is a good one, and is still being given serious consideration in some quarters, as it allows the whole of the concrete work at that place to be done at one time. However, if it is to be successful, the bedded parts should be provided with a very rigid set of temporary bracing which would definitely determine and fix the alignment in all planes, or the bedded parts of adjacent gates should be built as rigid towers, which would be self-supporting during the pouring of the mass concrete. This, of course, means that the order for the gate work should be placed early enough to allow the bedded parts to be on the site before the masonry contractor starts work on this portion of the development.

Sometimes bedded parts have to be provided for gains already left in the masonry, originally provided for the extension of an existing plant, where there is no provision for anchors and no room left for grouting between the steel and the existing concrete. This is a condition which should be avoided under all circumstances, as it entails an enormous amount of extra work in unwatering and drilling for the anchors and cutting away concrete in places where it is unsuitable for the steelwork. Also, it is almost impossible to obtain an alignment of the steel which will provide a satisfactorily watertight gate. The design of steel work in such cases would have to be specially considered for each installation and generally causes trouble in both shop and field due to a want of rigidity of the member in consequence of the restrained room at one's disposal for the placing of the steel.

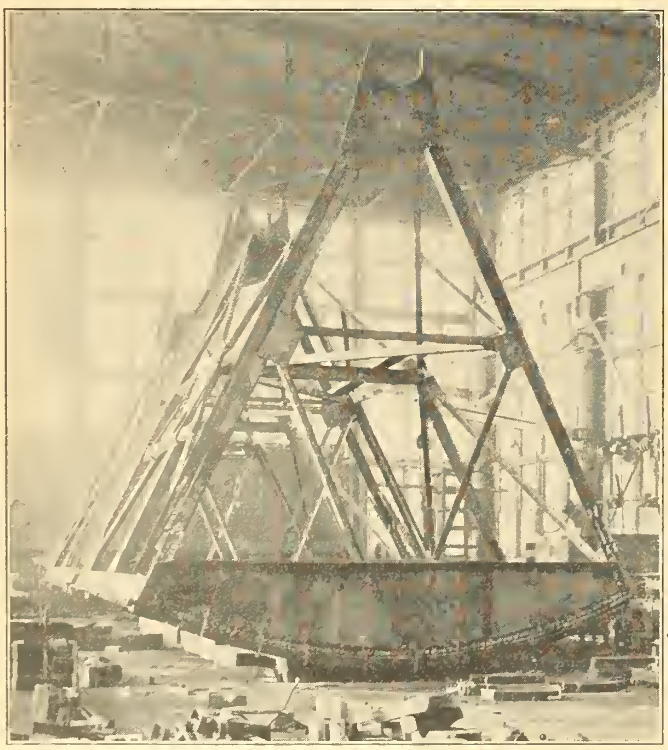

Figure No. 5.—Taintor Gate—Being assembled in Shop.

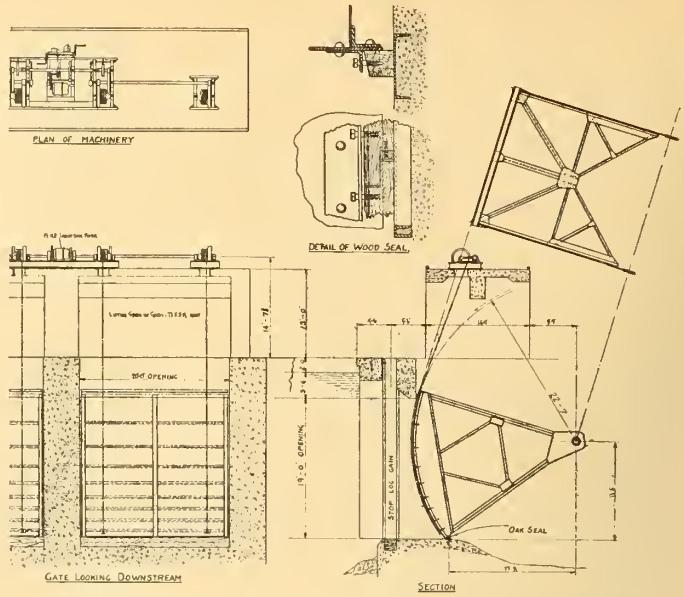

Figure No. 6.—Tainter Gate with Rope Hoist.

Bedded parts should provide for roller or sliding paths, sealing faces for the sides, bottom, and top where required, guides for the roller trains where necessary, and both back and end guides for the gate. These provisions should be designed as separate units and the field engineer must be relied upon to place them in their correct relationship to the concrete.

A better arrangement, however, is to design the whole of the bedded parts as a complete steel unit definitely spacing the various parts in their correct location and assembling them as a complete frame in the shop for final field alignment by the anchors, additional temporary bracing being used where necessary, the use of such bracing always being an advisable precaution in order to ensure good results.

Anchors for bedded parts have been made by providing through pipes in the piers, which were set in place during the forming of the mass concrete, and through these pipes were inserted long rod bolts with double nuts at each end to secure the bedded parts in their correct positions. It is, however, a difficult matter to place the heavy and unwieldy bedded parts on the anchors, and the arrangement of such anchors generally provides for adjustment only in one direction.

A later and better arrangement is to bed, in the mass concrete, angles having the two legs flattened together at the ends, and holes drilled at each end to take independent hook bolts at the required intervals and arranged in such a manner that the bedded parts can be aligned in both planes, necessary holes being provided in the steel to take the hook bolts. These bolts are provided with two nuts for adjustment, or wedge blocks may be provided between the steel and concrete and the bolts tightened against the blocks. This arrangement of anchor and hook bolts has the advantage that the bedded anchor angle does not have to be as accurately placed in the forms, as in the case of the bedded pipes.

The location of anchors should be so arranged that projecting nuts and ends of bolts cannot by any means foul the gate or moving parts, and it is preferable, if possible, to place the anchors so that the gate and roller trains move in a perfectly smooth gain, as projections

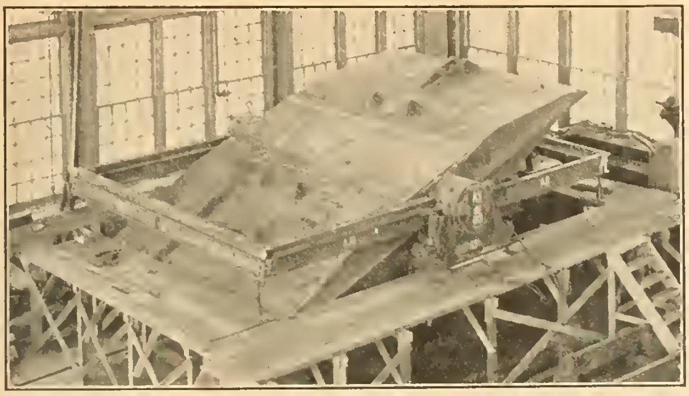

Figure No. 7.—Butterfly Valve—Size 15 ft. 6 ins. by 21 ft. 10 ins. Assembled in Shop with Frame and Bearings.

are not only liable to foul moving parts under unforeseen conditions, but also form a place where debris, floating objects, and ice can lodge and possibly cause considerable trouble.

For the same reason the guides for the gates and roller trains should be of smooth construction throughout and places of entry should be well set back, chamfered, or rounded, to permit ease of entry of the gate and prevent any jamming taking place during operation. It might be well to mention here that all conditions should be considered and provided for by the designer, however improbable they may seem to be.

Roller Trains

The earlier forms of roller trains consisted of live steel rollers rotating on bronze pins located in such a manner that the spacing of the rollers is evenly proportioned to the head of water, thus providing a uniform unit pressure on each roller. The bronze pin is supported by steel bars, bar and angle, or angle sides to give a stiffness to the member as a whole, in the direction of the flow of the water, and the sides projecting beyond the face of the roller to form a guide for the train on the edge of the roller path.

This type is quite satisfactory for low heads and low velocities, and might even be so with head gates where the velocity does not exceed about 10 feet per second, but with the advent of larger gates and higher heads and velocities it was found necessary to provide a very definite guide to the roller train in both the direction of the flow and at right angles to the same.

Here, let us try and visualize the quantity and velocity of water passing through a gate when fully open. Take, for example, a sluice gate 50 feet wide by 30 feet high, with a head of water of 30 feet. The weight of water flowing per second would be about 850 tons at a velocity of 30 feet per second, or the equivalent of nearly three large locomotives at a speed of over 20 miles per hour each second.

Further, take for example a regulating gate 15 feet wide by 30 feet high, with a head of water at the sill of 60 feet. The weight of water flowing per second would be about 750 tons at a velocity of 50 feet per second, or the equivalent of over two large locomotives at a speed of about 35 miles per hour each second.

If we consider this mass of water pouring through the gate opening every second at such a high velocity it will be seen that there must be considerable eddy and swirl in the gains due to the various projecting surfaces. Furthermore, when the gate is fully open, the roller train is only one-half of that distance from the sill, e.g., if a gate is raised 30 feet, the roller train will project below the bottom of the gate 15 feet, and unless that portion of the roller train is properly guided it is subject to a cantilever action from the bottom of the gate downwards by any forces from the flow of the water which may come upon it.

Attempts have been made, where the design has to be worked into a restricted space, to provide a guide on one side of the roller train only. This, however, is not very satisfactory as it is impossible to transfer stresses from one side of the roller train to the other on account of the absence of torsional stiffness.

In cases where the design has been quite free, the roller train sides are made of two unequal leg angles placed with their backs out and the rollers spaced between them, the short legs being turned in and projecting beyond the face of the rollers. The roller path is made of two bars, a narrow and a wide one, the narrow bar

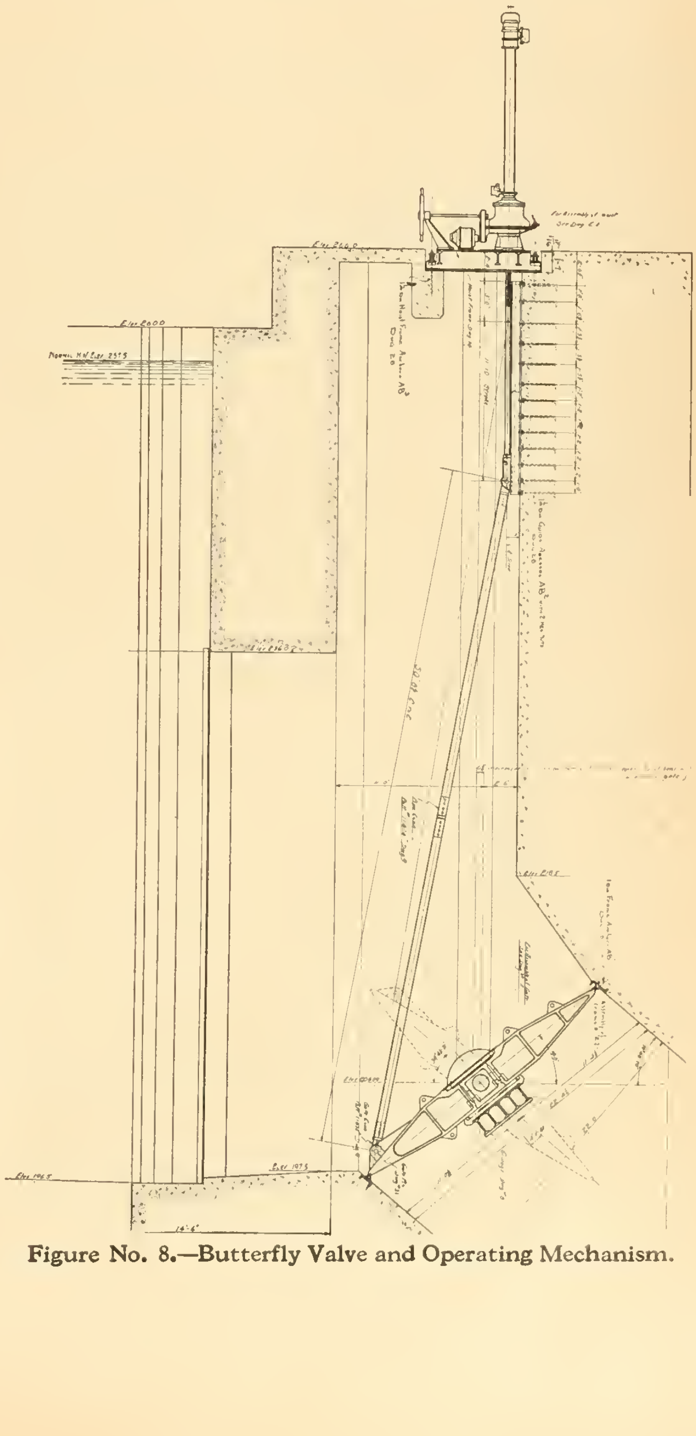

Figure No. 8.—Butterfly Valve and Operating Mechanism.

Figure No. 9.—Sluice Gate Piers showing Voids left for Bedded Parts.

being underneath and the whole rivetted to the structural framework of the bedded part so as to allow the short legs of the roller train sides to be guided on each side in the recess thus formed.

The edges of the outer roller path bar can be planed at the same time as the roller face and the edges of the short leg and backs of the angle should be planed to provide liberal, though minimum, clearance in all positions of the roller train. The bottom of the roller path should not extend as far as the sill beam. Sufficient space should be allowed in order that silt and debris may be washed out, or cleared away if any collects. It is also advisable to cut off the short legs of the roller train angles a short distance above the bottom of the train so that any debris which does collect in the recesses will not stop the free action of the roller train.

Another method of guiding the roller train is to turn the side angles with their backs in and short legs outstanding, and provide only one bar on the roller path, and two additional angles which will act as guides to the outstanding legs of the roller train and form a sealing face for the seal. This method, however, is not as good as the one previously described as it is impossible to allow clearance at the bottom for silt and cleaning, and also necessitates caulking of the inner angle to ensure watertightness.

Under certain conditions, viz: where the water pressure is not too high and the weight of the gate is sufficient to allow it to close under full head, a gate having rollers revolving on fixed pins in the webs of the end girders is a better operating arrangement than the live roller gate. This is on account of the small number and larger size of moving parts below the water level, and also because it is easily possible to lift the gate with its rollers clear of the water at any time for inspection and lubrication, or if desired, the gate may be maintained in the open position, above the water level, ready to be dropped instantly into the closed position when required.

In order to provide a certain degree of resistance to rusting, the rollers should preferably be made from chilled iron treads and bushed with self-lubricating bushings, or provided with compression grease cups, and the pins made from about a 3 per cent nickel steel. Stainless steel could with advantage be used for the pins, but would add considerably to the cost of same.

The side guides for the gate should consist of one roller on each side of the gate, to prevent the possibility of jamming when the gate is forced cornerways. These rollers should be placed as close to the bottom of the gate as possible and be provided with a liberal and easily accessible screw adjustment, so as to allow for any inaccuracy in the alignment of the bedded parts and at the same time reduce to a minimum the amount of side play.

Moving Roller Paths

These apply to Stoney roller gates only, since in the case of gates with fixed rollers, the path on the gate is dispensed with. These paths, which are usually made of a rolled or forged steel bar, require to transmit the water pressure from the web of the end girders into the rollers and should act in such a manner as to transmit this pressure uniformly over the face of the roller. To do this under varying deflections of the cross girders of the gate, and in order to provide for any inaccuracy of alignment of the fixed roller paths, it is necessary that the moving path should be capable of equalization over the web of the girder. The best method of accomplishing this is to project the planed edge of the web of the girder beyond the flange angles and plane a groove down the back of the roller path to fit very loosely over the projected web of the girder so as to restrain the path from any side displacement and at the same time to allow the path to rock freely on the planed edge of the web.

The path is then drilled and counterbored for the attaching bolts which are provided with pipe spacers of sufficient length to keep the path from falling off the edge of the web and at the same time allow a reasonable rock to the path.

Sealing Devices

These may generally be divided into two types; the stanching rod type, and the flat, more or less, spring type. The former are preferable for crest or sluice gates where they will be subjected to severe ice conditions, on account of their greater mechanical strength, while the latter are better for head and all totally submerged gates, where ice conditions are not effective, on account of their greater degree of watertightness.

In the case of the round stanching rod, the matter of attachment is a most important one. It should be flexible enough to allow the pressure of the water to take the sealing rod up to the sealing faces under all positions of the gate, and at the same time it should be strong enough to resist action from the ice and allow the removal of the ice for winter operation.

Figure No. 10.—Erecting Bedded Parts before pouring the Mass Concrete.

The best method of attachment is by means of a heavy flexible suspension from the upper end capable of resisting both the upward and downward thrust which occurs when the gate is being operated, but entirely free in the direction parallel to the skin plate of the gate. The rod is restrained within the required limits of flexibility by strong steel retaining fingers placed at

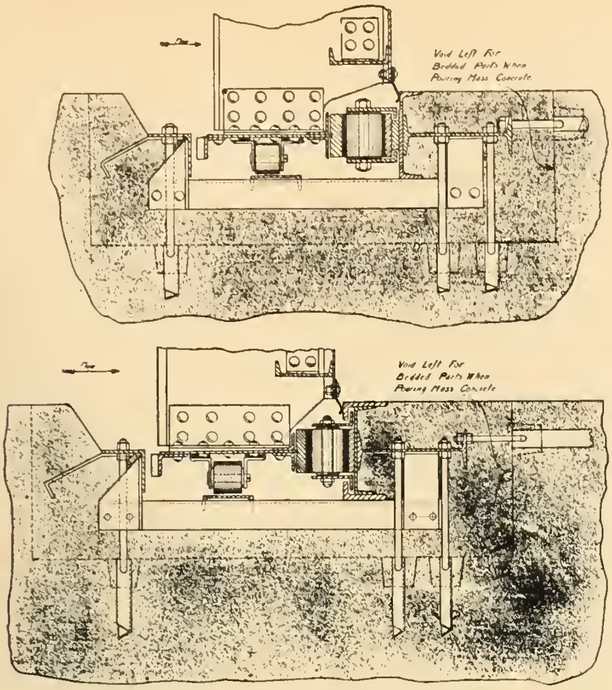

Figure No. 11.—Sections through Bedded Parts, showing Anchors, also Roller Trains, Guides, Moving Roller Paths, and Spring Seals.

intervals along the rod and fastened to the gate by heavy bolts. These fingers and bolts should be made in such a manner that they are not easily damaged by ice and can be cleared of ice without loosening or breaking the attaching bolts. The design of the sealing attachments is one that will bear considerable thought and study.

The spring type of seal is sometimes made from a thin flat brass strip with a D-shaped brass bar reinforcing one edge, or alternatively, of a thin flat brass strip bent with an offset to keep it away from the face of the gate and allow a space for attaching bolts, also having the front edge bent back to allow practically a line contact with the sealing face under all conditions. The seal is usually attached to the downstream face of the gate in such a manner that the water pressure will force it against the sealing face.

Where gates are totally submerged, these seals are applied to both sides and top of the gate and have to be mitered at the corners. The opening which will occur, at times, at this mitre, is closed with a piece of flat rubber and reinforcing plate attached to one seal strip only. A projecting angle is provided above the top seal to prevent objects, which may have fallen from the coping level, lodging behind the seal, thus preventing it from operating.

Some seals of this type have been provided with a rubber hose between the skin plate and the seal to prevent this condition arising, but these have not yet been in operation long enough to warrant the expression of a definite opinion regarding the effectiveness of this arrangement.

In the case of head gates, particularly, the question of seals is the most important one to be considered, whether in office, shop, or field, and too much attention cannot be paid to them if a watertight gate is to be obtained. The gate should be completely assembled in the shop with the seals placed in as accurate straightedge alignment as it is possible to obtain.

If the gate is small enough to be shipped and handled at the site in one piece, ample wood protecting strips should be provided to take care of the seals during shipment and handling at the site. Any handling of the gate in the field after the protecting wooden strips are taken off should be done with the greatest care, and every precaution should be taken to ensure that the seals are in nowise damaged when the gate is being lowered into position.

If the gate has to be taken apart for shipment, sufficient reamed holes and fitted bolts should be provided to ensure the gate being assembled in the field in the same alignment as it was in the shops and the seals should be again fitted to the gate to straightedge before it is dropped into its final position.

After the gate is in position the opening at the coping should be carefully covered in order to be quite sure that no falling object will get between the seals and the gate, and that the roller paths are kept in clean condition before the gate is lowered into place. Where this is not done it has repeatedly been found that stray bolts, pieces of wood, and even the unwanted portion of a barrow of concrete has become lodged on the roller path and behind the seals, with a consequent dissatisfaction regarding the working of the gate, resulting generally in considerable cost to the erectors of the gates and a delay to the job.

The above mentioned methods of sealing apply to gates of the Stoney and fixed roller types, and in both cases particular attention should be given to clearance between the moving seals and fixed parts of the bedded members. This clearance should be ample in all positions of the gate and should allow for a maximum amount of adjustment of the side rollers, and at the same time provide against any possible chance of the seal leaving or even approaching the edge of the sealing face.

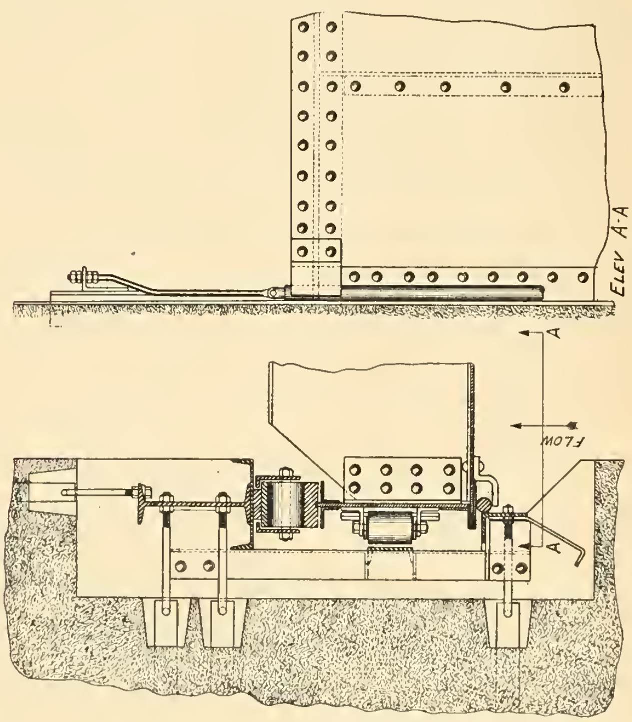

Figure No. 12.—Section through Sluice Gate Bedded Parts, showing Anchors and Void left in Mass Concrete for erecting the Bedded Parts, also Roller Train, Guides, Moving Roller Path, and Stanching Rod with method of attachment.

In cases of head gates where it is often necessary for the operator to go into the scroll case, with only the head gate between him and the full head of water, it should be remembered that everything depends on the efficiency of the seals and there should be absolutely no chance of these breaking through under any condition of operation whatever.

In the case of gates of the Stoney roller type the provision of clearances between the seal and the moving roller train should be carefully looked into, and it should be remembered that there is bound to be some relative movement sideways, between the gate and the roller train, the maximum of which should also be taken into consideration and duly provided for.

The question of the effect of deflection of the top girder of the gate, under maximum head, on the top seal should be taken into account when considering the clearance between the top seal and the lintel of the bedded parts and concrete above this lintel.

The bottom seal of the gate is generally formed by the fit of the planed edge of the skin plate or special sealing bar on a planed sill beam bedded into the concrete and forming one of the members of the bedded parts. In cases where the gate is too wide to make this fit by planing, the sealing bar has to be chipped to fit, or the sill beam may be attached to the gate by temporary lug angles and wedged firmly against the bottom of the gate after it is in place, and then the concrete poured and allowed to set before the clips are removed and the gate lifted.

In some cases the necessary sealing is obtained by means of a heavy planed oak beam attached to the web of the lower beam in which case care should be taken to see that the sealing edge is in reasonably close vertical alignment with the sealing face of the vertical seals to prevent leakage at the corners. A further precaution of a hemp rope or rubber hose partially bedded into a groove in the sealing timber will often assure a more watertight seal at this point.

Bottom of Gates

In the case of sluice or crest gates, where the skin plate is on the upstream face of the gate and where the head is comparatively low, the bottom of the gate can be left approximately square with its front face, as there is very little chance of a vacuum being formed to cause a sudden downward pull on the operating mechanism, when the gate has been opened a few inches. A few large holes should also be provided in the web of the bottom girder to provide for drainage and to break any vacuum which might have formed.

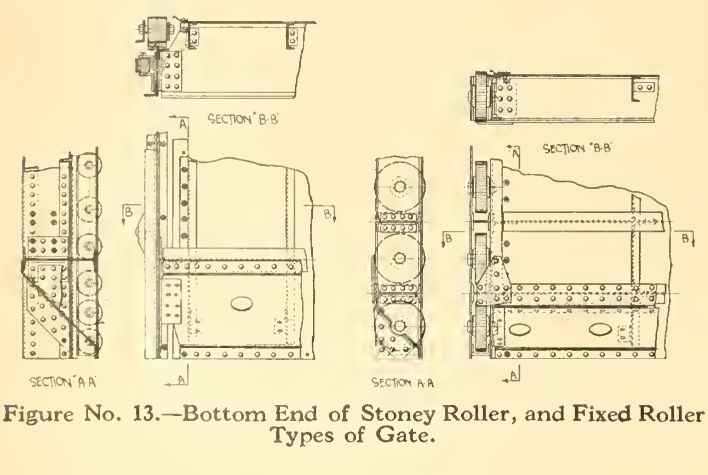

Figure No. 13.—Bottom End of Stoney Roller, and Fixed Roller Types of Gate.

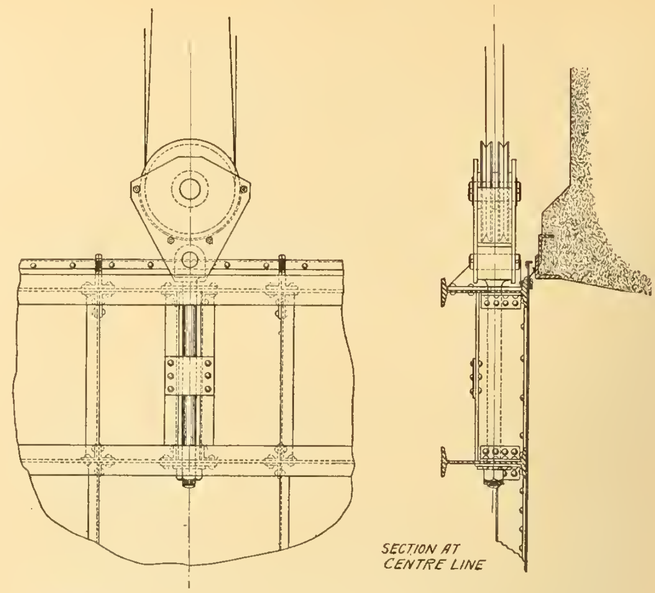

Figure No. 14.—Head Gate Lifting Attachment.

In the case of head gates, however, where the skin plate is on the downstream side and where the head is considerably over the top of the gate, a vacuum will be formed when the gate has been lifted a few inches, if the bottom of the gate is left square with the skin plate. To guard against this the bottom of the gate must be pointed, having a fairly acute bevel on the upstream side so as to allow the water to flow smoothly over this surface without leaving the same. This places the bottom girder some distance from the bottom of the gate and the water pressure on this portion of the gate has to be transferred to this girder and probably to some extent to the girder next the bottom one.

The design of the bottom end of the gate is one of the difficulties which have to be considered in gates of the fixed roller type, as the pointed end renders it difficult to get the bottom roller into its correct position, as close to the bottom of the gate as required, and in some cases a special roller may have to be designed for this location.

Lifting Attachments

In sluice or crest gates, where the width is generally very much in excess of the height, the gate is lifted at two points, usually by means of screws attached to the end girders and the pull is applied equally at each line of resistance. In head gates, where the width is generally much less than the height, the gate is usually lifted at the centre and the load has to be transferred to the end girders. This is done on the skin plate side by means of the skin plate, and on the other side diagonal bars may be provided to transmit the load from the flange of the beam to the end girders. As the gate is sometimes lifted from a horizontal position on the gate house floor to a vertical position by means of the lifting or reach rod, these diagonal bars may be placed in compression and become bent and practically useless for tension purposes.

A better design is to carry the reach rod down to the second girder and transfer the whole of the load into the skin plate by means of a pair of heavy channel stiffeners. These stiffeners should have their flanges as nearly as possible equally spaced about the reach rod, and should be tied together by batten plates to prevent buckling transversely. If this is done, the stiffeners will take load in either direction and form a very effective means of resisting the stresses due to handling the gate. The batten plates also provide handy stepping places for the operator to descend to the reach rod and lifting sheaves for inspection, lubrication, and repair.

Hoisting Mechanism

Screw Hoists

In the case of sluice gates, or where the height from the top of the gate to the machinery floor is such that the length of the screw is practicable and the gates do not have to be closed quickly, a screw type of hoist has been established as the most suitable method of operation.

In the case of gates, where width is equal or greater than the height, two screws should be used to each gate in order that they will not jam or tend to jam in lowering or raising. Where the height of a gate is greater than the width, a single centrally applied screw may be used.

The screws may be operated from a single motor with gearing and line shaft, equipped with clutches to operate each gate independently, or separate motor units may be used on each gate, in which case the speed of operation of the gate, and consequently the size of the motors, can be reduced, as it is possible, when necessary to provide for sudden fluctuations in the pond level, to operate one or more gates at the same time. These, however, are questions which have to be decided from a knowledge of the requirements and conditions at the site.

Where there are a number of gates operating in a line in the dam, a travelling type of screw hoist is the most suitable and economical. The gates must be provided with suitable pin suspensions to the bridge and towers supporting the travelling hoist so that the hoist can be released for operating the next gate. Also, the screws must be provided with suitable splines and keyways to prevent them from rotating while they are being lowered into position to pick up the next gate. The gearing should preferably be of the bevel and spur gear type, in order to keep the pitch of the screw as small as possible and provide a hoist in which the mechanism is non-reversing. Even in such cases it is advisable to provide a brake which can be locked into position to prevent the gate from lowering of its own accord when left suspended on the screws. The usual method of operation in such installations is to always keep one gate attached to the screws for quick operation, either raising or lowering as the case might be.

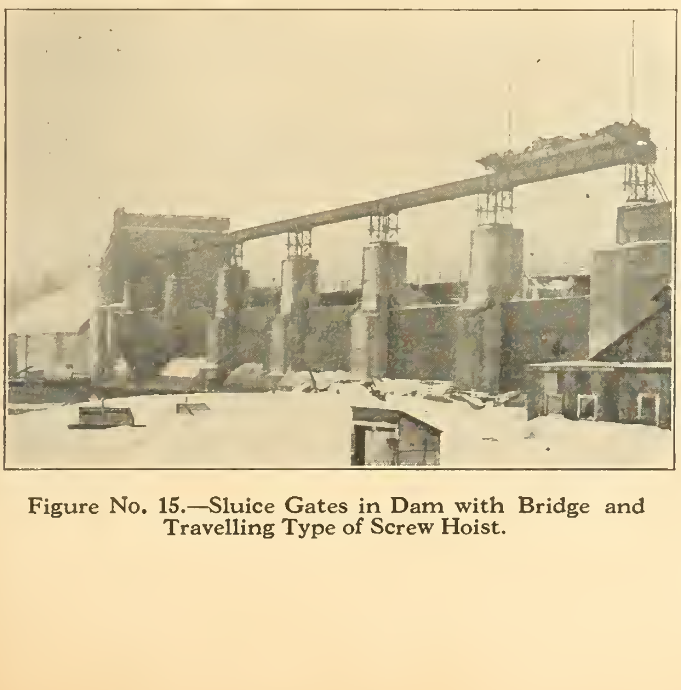

Figure No. 15.—Sluice Gates in Dam with Bridge and Travelling Type of Screw Hoist.

A further advantage of the travelling screw hoist is that it can readily be equipped with a spur geared rope drum hoist for operating the stop logs in front of the sluice gates in case of emergency, or to unwater a sluice gate for examination, painting, or repair.

The provision of electrical limit switches for the control of the travel of sluice gates at their upper and lower limits is a matter which has lately come under considerable discussion. If these are provided and an obstacle comes under the gate when it is being lowered, there is the grave danger that the operator has become careless as a result of his assumed limit switch protection, and damage may be done to the gate or operating mechanism by jamming the gate on the obstacle with the full power of the motor.

A better arrangement would be to have a system of light signals or warning bells, which would notify the operator when the gate was about a foot or so from closed or open position, and again in the fully closed or open position; the gate being inched up or down over the last remaining portion of its motion, which precaution should always be taken whether a signal system is provided or not.

In the case of travelling hoists, efficient and substantial clamps should be provided to ensure that the hoist is not lifted clear from the rail in case the gate is forced down on to the sill or obstacle between the bottom of the gate and sill beam. These clamps should be strong enough to withstand the load which can come upon them from the full torque of the motor and are especially essential where the stop log hoist is cantilevered out from one side of the travelling hoist, in which case those on the far side from the hoist should be strong enough to resist the overturning moment on the hoist due to the maximum force which the motor can exert on the stop logs.

Screw operated sliding type gates have been used to advantage on low head type of head gates, and electrical limit switches have been used on gates of this type, to control the limits of travel of the gates. With the aid of these switches a system of remote control

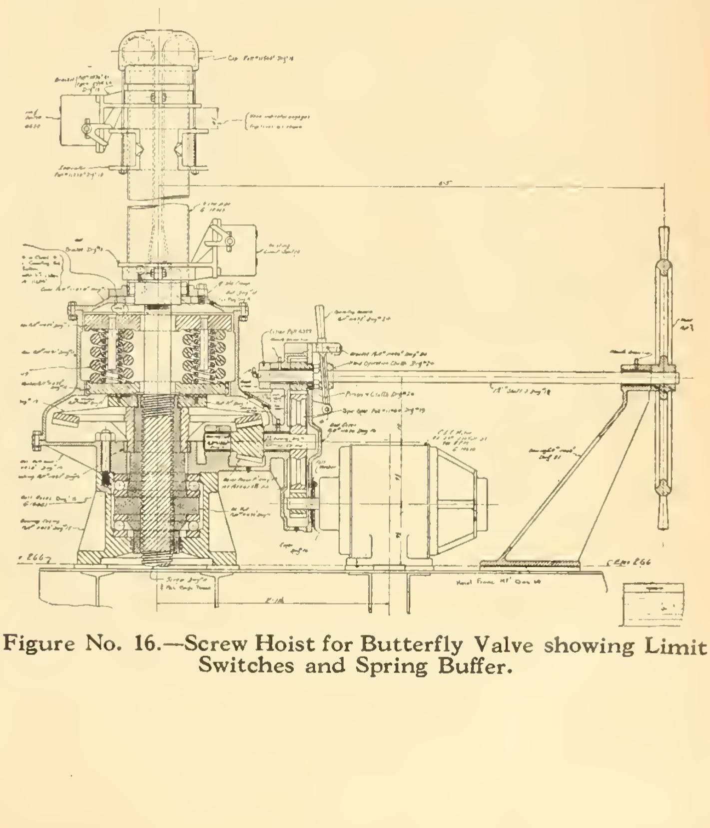

Figure No. 16.—Screw Hoist for Butterfly Valve showing Limit Switches and Spring Buffer.

has been installed so that the gates can be opened or closed from the power house, but operated in the closing direction only from the gate house.

Butterfly type head gates are also screw operated with limit switch control. In addition, however, spring buffers may be inserted in the hoisting mechanism on the lowering side only, so that in case the limit switches should fail to act the motor would be brought to rest, when the gate is closed, without any apparent impact to the machinery and operating mechanism; the machine being designed to withstand the full torque of the motor determined from the setting of the overload coil on the circuit breaker.

Rope Hoists

These are undoubtedly the best type of hoist to use on head and regulating gates where quick closing is required and the distance from the gate house floor to the top of the gate in the closed position is great. They have also been very successfully employed for taintor gate operation, and are in many ways preferable to chain hoists for any gate operating purpose.

Rope hoists for head gates generally consist of a spur geared unit at each gate, operated through a line shaft and clutches from a single motor operated reduction unit, by which means any one gate can be lifted or lowered independently of the others.

On account of the tremendous damage that may occur by a serious breakdown of a unit, it is generally considered essential, especially in high head installations, to have the head gates quick acting in the lowering direction, and preferably self-closing. This can be accomplished by sustaining the gate on a combined brake and free wheel in such a manner that the wheel is free in the raising direction, when the gate is being raised by the motor, but locks in the lowering direction, thus holding the gate open until the brake is released by the operator. Care should be taken that the clutch between the motor unit and gate unit is free when the gate is being lowered, otherwise the motor will be driven at too great a speed by the fast lowering of the gate.

It will be seen from the foregoing that the safety of the gate is entirely in the hands of the operator, and gates have been dropped to the bottom by an inexperienced or careless operator, with disastrous effects. In order to overcome this, most hoists are provided with a safety device in the form of a centrifugal lowering brake, in addition to the sustaining brake. By means of this centrifugal brake the speed of lowering of the gate is limited to a predetermined velocity and will arrive at the bottom with a very high velocity compared with the speed of raising, but without acceleration.

A velocity even as high as 240 f.p.m., is only equal to that obtained by allowing the gate a free fall in air of 3 inches, but a velocity as high as this is not necessary and would not be allowed, partly because of the high pitch speed of the gearing which would be caused, and partly because the operator would generally restrain the gate by the holding brake before such speeds are attained. A maximum of 60 to 100 f.p.m., is high enough for emergency operating purposes.

In addition to the centrifugal brake, the hoist is usually equipped with a mechanical device limiting the travel of the gate by throwing the sustaining brake into action just before the gate reaches the closed position. This is done, not to retard the gate in any way, but to prevent the overrun of the drum and gearing and a consequent loosening and possible tangling of the operating ropes.

All of these operations have been arranged for remote control from the power house, either by air or electricity, and in one instance the mechanism was also supplied with a governor which would automatically set the sustaining brake at any point in the travel of the gate, should, for any reason, the gate overspeed through the failure of the action of the centrifugal brake.

Rope hoists on taintor gates are preferably of the simple spur geared drum type, although with wide gates two drums may be required, connected by a rigid squaring shaft with ample adjustment and take-up devices to allow of the gate being hoisted squarely with its axis of rotation. Also, if an alternating current motor is used a mechanical load brake will be required to prevent the load overrunning the motor when the solenoid brake is released. In the case of direct current, dynamic braking can be used.

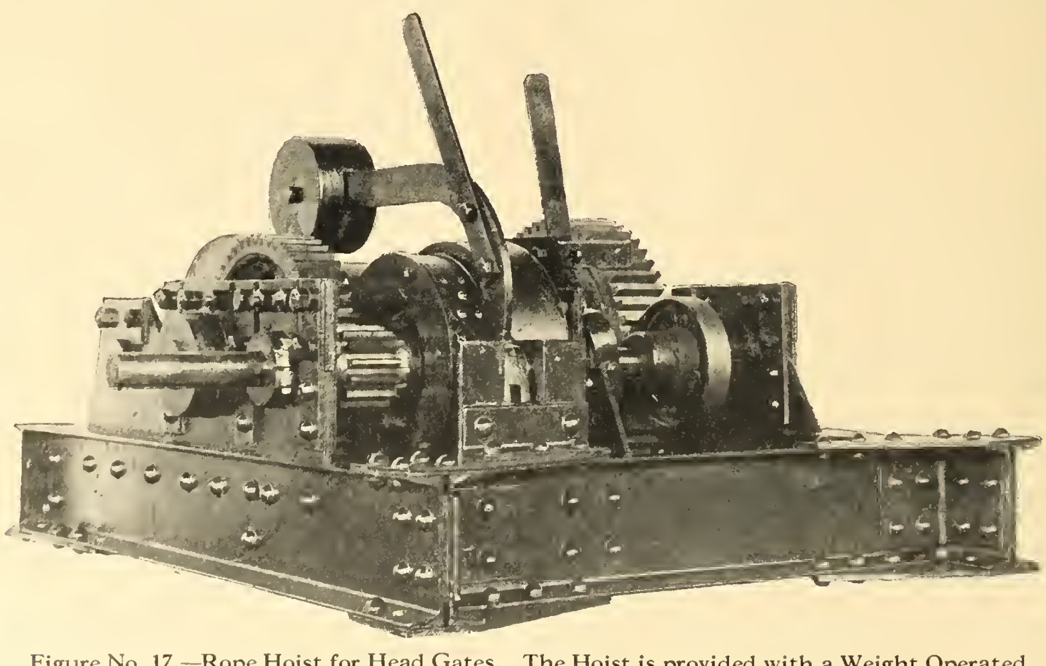

Figure No. 17.—Rope Hoist for Head Gates. The Hoist is provided with a Weight Operated Sustaining Brake and a Centrifugal Brake to control the Speed of Lowering.

Chain Hoists

These have been used on sluice gates, head gates and taintor gates, but with very little success, it being difficult to obtain a chain which will at all times work satisfactorily in conjunction with a sprocket or pocket wheel, unless the pin and bar side type is used, in which case the chains become excessively heavy and difficult to handle and are also very expensive.

The usual reason for consideration being given to a chain hoist is that the chain does not rust as readily as the wire rope, but it would be preferable to use an oversize of wire rope to allow for rusting and to see that all reasonable care and lubrication is given to the wire rope, rather than have all the troubles that are incident to the use of chains.

If the chains are used, the drum type of hoist is preferable to a pocket or sprocket wheel type, especially with the use of ordinary link load chain. This is on account of the difficulty of assuring a good fit between the chain and pocket wheel throughout the entire length of the chain. Difficulties are bound to arise in this connection, even when the pocket wheel is made to a sample of the chain, and the wheels are sent to the chain manufacturer to have the chain stretched and blocked to the wheel. Wear is bound to take place between the links of the chain, causing a change of pitch and some irregularity of stretch may also occur to cause the same effect.

Even with the best conditions prevailing it is necessary to provide a very rugged and substantial guide over the pocket wheel to keep the links firmly in their place on the sprockets and prevent them from riding over the teeth. It will also be found necessary to provide a stripper for the free end of the chain to prevent it from following the sprockets too far.

The great weight of chain per foot is a considerable drawback to its use, particularly if one travelling hoist is used for a number of gates and the chain has to be handled on and off the sprocket wheel.

If a drum hoist is used, the drum requires to be of large diameter to provide for sufficient strength and to prevent an undue bending moment on the links of the chain, unless the drum is made of special shape to overcome the moment. This large size of drum with its heavy loads tends to large gearing with a consequent increase in the cost of the hoist.

Conditions Governing Choice of Gate

These can only be considered in a very general and broad way, as each particular case should be studied before a decision can be reached. However, it may usually be assumed that the simpler the gate the more serviceable it will be, and for this reason the sliding type of gate will receive first consideration.

Sliding gates must be screw operated, consequently the gates cannot be fast closing in case of emergency, and further, the frictional resistances must not be too great so that the machinery may be of a reasonable size. They are, however, due to their rugged simplicity, subject to less wear and tear than any other type, and can be made reasonably watertight when properly machined and erected, unless the water contains a very large quantity of sandy silt.

Taintor gates can also be used to advantage where the size of opening is not too great and ease of operation is required.

If the gate is to be self-closing and the head is not too great compared with the size of the gate, it may be possible to use a fixed roller type of gate. In that case, this type should be used on account of its freedom from a large number of small moving parts under water, and because it is possible to remove the whole of these parts for lubrication and inspection by raising the gate out of the water. Further, if one gate is required for a number of openings, or if it is desirable to keep the gate, when not in use, raised above the high water level, it is easily possible to do so.

Figure No. 18.—Ice formed on the Roller Path, and Guides under open Sluice Gate.

On the other hand, if the pressure in the two foregoing types is so great as to cause high frictional resistances compared with the weight of the gate, it may be necessary to use a Stoney type of gate to reduce these resistances to a minimum and allow the gate to become self-closing, or to keep the operating machinery to reasonable proportions. Butterfly type gates might also be used under these conditions, because of their control and watertightness, although they are more expensive than the Stoney gate.

Ice conditions do not trouble the operation of head gates, which are well submerged, provided the gate house is reasonably heated and the curtain wall in front of the openings extends below the minimum water level which obtains during the winter season.

On the other hand, if it is necessary to operate a sluice gate during the winter, heating appliances must be provided for both the gate and the bedded parts. This can be done by boarding over the downstream face of the gate and applying electric heaters in the boxlike sections thus formed, and, by providing pipes in the concrete, close to the roller path and seals, down which heaters can be dropped to thaw out the ice from the rollers, etc. These pipes have also been placed in the gain between the gate and bedded parts, but are not as effective as when placed in the concrete, since the heat tends to be carried off by the cold air, rather than to warm up the roller path, etc.

Air bubblers in the front of the gate have also proved quite satisfactory for keeping the ice formation away from the face of the gate and consequently allowing winter operation.

In this paper, an endeavour has been made to cover the salient features of hydraulic regulating gates, but before closing, it should be borne in mind that a gate with its component parts is not a self-contained unit which can be fabricated and tested in the workshop and sent out as a complete whole. Whatever type of gate is decided upon by the purchaser's engineers, however suitable that gate might be for the work it is called upon to perform, and, no matter how well the gate and its parts may have been fabricated, the whole is rendered unsatisfactory if not properly erected and installed. It is most important that this part of the work be done by those who are fully qualified and experienced.

Further, as a good deal of the work around the bedded parts, such as final concreting, is in the hands of the general contractor it is essential that there should be thorough co-operation between the purchaser's engineers, the gate fabricators and erector, and the contractor, not only to ensure that the work is properly carried out in all its aspects, but to be sure that proper protection is given to all the working parts from the time of their arrival at the site until the plant is put into operation. It is certain that where this has been done, an installation has been obtained which is entirely satisfactory to the purchaser, and reflects credit on all those who have been engaged upon the work.

Discussion on Hydraulic Regulating Gates

Discussion by T. H. Hogg, M.E.I.C.
Chief Hydraulic Engineer,
Hydro-Electric Power Commission of Ontario.

I have read with much interest the paper "Hydraulic Regulating Gates" by Mr. Fred Newell, and I wish to congratulate Mr. Newell on the clear and comprehensive style in which he has treated the subject. The section of the paper dealing with the erection of imbedded parts is especially timely, as it is due to inaccuracies of setting and wrong methods during construction that many of the difficulties encountered in operation are due.

In the introduction no mention is made of the use of stop logs for control purposes. This omission is probably due to the author's need of confining himself to the subject of gates, owing to the broad field to be covered.

In passing, however, I beg leave to point out that stop logs have a field of use and under the proper conditions meet all requirements in a most satisfactory manner. Where the character of the river is such that sudden rises in water level are not encountered and where too great depths are not required, stop logs may be used with good results. A combination of gates and stop logs may be used to advantage in a dam where the latter permit of the passing of ice with the loss of a minimum of water and also enable regulation to a much closer degree than with a gate which should be operated fully opened or closed.

Under "head gates" the author points out the necessity for watertightness to enable repair work to turbines to be carried out behind them. While the gates should be made as watertight as possible, it is essential that ample drains be provided from the penstocks or wheel pits.

In dealing with "tail race gates" the author points out the advisability of providing some mechanical means of jacking the gate into position in the absence of water pressure before pumping has commenced. Where the depth is very great and the gate of large dimensions, such an apparatus may prove difficult to operate and a very simple expedient which has proven quite satisfactory may be resorted to. Steel plate springs free at one end are attached to the upstream side of the gate at the ends so as to come in contact with the upstream face of the gate check. A very small clearance, (1/8 inch or less), is left between the overall depth of gate and spring and the gate check. This holds the gate, while being lowered, against or very close to the sealing face and at the same time the flexibility of the spring prevents interference with free dropping of the gate. The leakage through the small space between the gate and seat can then be reduced within the capacity of the pumps and as the water inside lowers the unbalanced pressure moves the gate up to a tight fit with the seat.

In connection with "emergency gates", that is gates provided in front of the head gates, I would point out that where the depth of the intake is considerable these are usually made in sections. Where this is done a "follower" for engaging the lower sections is advisable and this may be made so that it will serve also in lifting the racks or screens which will likely also be made in sections.

Where the gate hoisting mechanism is of the rope hoist type, care should be taken that the location of the hoist and the shape of the gate checks permit the removal of the gate from the checks without dismantling the hoist. Also, lifting bolts should be provided so that the gate can be secured to the crane while it is supported by the hoists. This is especially required where the skin plate is on the upstream side, thus preventing attaching hooks or other connections to the horizontal girders.

In gates with movable roller trains, provision for adjustment of the roller train cable to compensate for the stretching of the same would be of advantage.

The author has not made mention of "drop gates", that is, gates which are lowered to open. In the design of these gates particular attention should be given to length of the roller trains and the spacing of the rollers. As the gate is lowered the bottom of the gate moves with twice the speed of the roller train and unless the roller train is longer than the gate itself the latter will project below it. If the gate is lowered until half open, the lowest quarter of its length would then be unsupported. Owing to the rush of water up behind the gate when the seal has moved off its seat, the pressure on the two sides of this portion of the gate is not balanced and a load is thrown on the overhanging portion of the gate with consequent severe stresses in the vertical members of the gate and on the lowest roller and roller path. Owing to the fact that in this type of gate the rollers are submerged while the gate is discharging, it is advisable to provide against debris collecting in the rollers.

Before closing I wish to say that I believe the engineering profession is greatly indebted to Mr. Newell for the valuable information and data given in this paper. In regard to the setting of the imbedded parts, my experience confirms the author's, that where possible it is advisable to leave openings and anchors in the concrete and set the gate checks and seals after the stripping of the forms rather than attaching the same to the latter.

Discussion by Ernest Loignon
Civil Engineer, Montreal, Que.

All gates with complicated machinery parts below water should be avoided as much as possible, unless properly protected from ice, floating debris, trees and logs. These gates are always dangerous to use near saw mills, pulp mills or where log driving operations are being carried on to any large scale. Water logged bark strips and tops of trees are bound to cause trouble, especially during freshets.

In the case of butterfly gates, the absolute stiffness or rigidity of both frame and shafts are essential to the satisfactory operation of these gates. Facilities for adjusting should be provided in case of uneven settling of concrete structure.

Wedges or notches for sliding gates are apt to get packed with sand, silt and barking refuses.

Placing bedded parts is always a difficult procedure on account of conditions under which this work has to be performed, such as forms in the way, contractors' plant, etc., and sometimes difficulties of access.

The pipe and bolt method is not satisfactory, as most of the time bolts have to be bent or cut out to allow of the placing of the steel member. If sufficiently large voids are left in the concrete structure the grouting is expensive and on account of contraction numerous holes in joints are always found, and the bonding to the part of the structure already poured is not very reliable. In some cases, caulking has been resorted to in order to prevent water passing through. Thorough cleaning of the spaces before grouting is absolutely necessary.

Complete rigid sections independent for support from the structural parts of the building in course of erection are the best solution when possible.
Chains should not be used *in any case.*

Discussion by W. S. Lee, M.E.I.C.

Vice-President and Chief Engineer,
Duke-Price Power Company, Limited.

The recommendations given by Mr. Newell in his paper on "Hydraulic Regulating Gates" for the design of the various types of gates and hoists for same, touch especially those features which will make simple field erection and result in satisfactory operation of the gate, and they are in line with our practice used at Isle Maligné and at the New Catawba station.

Relative to "headgates" it may be added that sliding headgates of large size filled with concrete were built by us and operated by both stem hoists and rope hoists. Owing to the heavy weight of the gate and the high frictional resistance of the gate due to water pressure large capacity hoists are, however, required compared with gates of the butterfly type.

As to the use of rope hoists on head and regulating gates, we are not quite in accord with Mr. Newell. Due to the action of the water and air the wire ropes rust out soon and in many cases the sheaves and drums are of too small a diameter causing undue stresses in the ropes.

Maritime General Professional Meeting

The first session of the Maritime Professional Meeting of 1925, at Halifax, was held at the Nova Scotia Technical College and was called to order by Vice-President F. A. Bowman, M.E.I.C., at 11.15 a.m., on Thursday, October 8th, Mr. Bowman taking the chair in the unavoidable absence of President Surveyer. About one hundred and twenty members and guests were in attendance. The chairman introduced to the meeting the Mayor of Halifax, and His Worship welcomed to the city the members of *The Engineering Institute.* Halifax was honoured in being the seat of the deliberations of such a learned body, and it was his personal pleasure to welcome to the historic city this distinguished party of visitors. He noted that the programme of the gathering included a portion of time which was to be devoted to golf, and he hoped that this important item would enable members to improve themselves.

The Mayor drew attention to the effects of the work of the engineer in the development of the Dominion of Canada, and felt sure that great benefits would accrue to the profession through the activities of associations like *The Engineering Institute.*

The chairman, having briefly thanked the Mayor for his kindness, called upon Mr. Gordon Kribs, M.E.I.C., for his paper on "The Calculation of Short Transmission Lines".

The Calculation of Short Transmission Lines

Mr. Kribs dealt first with fundamental definitions and electric units and traced out the analogies between hydraulic and electric, sketching briefly the vector method of representing current and voltage and the application of this method to problems involving power factor, inductance and capacity. The relations between voltage and current in single-phase, two-phase and three-phase generators were explained, together with the action of a condenser in causing the current to lead the voltage while the effect of inductance is to produce a lagging current. Mr. Kribs showed also that the frequency of the power fluctuations is double that of the voltage or current.

The meeting adjourned at 12.30 p.m. until 8 p.m.

Joint Luncheon with Commercial Club

At one p.m. the members assembled at the Green Lantern to attend a joint luncheon with the Commercial Club under the chairmanship of Major H. E. Gates. During and after lunch a programme of songs and choruses was rendered and brief speeches were made by R. J. Durley, M.E.I.C., general secretary of *The Institute,* H. W. McKiel, M.E.I.C., representing the Moncton Branch, Geoffrey Stead, M.E.I.C., representing the St. John Branch and W. G. Wilson, A.M.E.I.C., representing the Cape Breton Branch. They were followed by F. A. Bowman, M.E.I.C., who expressed the regret of the members of *The Institute* at the enforced absence of the president, Dr. Surveyer, who was to have addressed the gathering. The attendance at this very enjoyable lunch was about one hundred and fifty.

The executive of the Halifax Branch having made arrangements for excursions during the afternoon, parties left at 2.30 p.m., for the inspection of the Imperial Oil refinery at Imperoyal, the Acadia Sugar refinery, Dartmouth, the new grain elevator, Halifax, and for a trip round the harbour. Those who felt the need for exercise were taken to the Halifax Golf and Country Club.

At 8 p.m. Mr. Kribs continued his paper on "The Calculation of Short Transmission Lines". He discussed the methods of determining power in single, two-phase and three-phase systems, and proceeded to consider the effect of inductance and reactance in an elementary transmission line, using vector methods to determine the regulation in terms of the voltage, power factor and reactance factor. Tables were developed giving size of wire necessary for transmission lines under various conditions of length, load, and regulation, and an expression was obtained for the economical current density in their conductors. These Tables with an explanation of their use, are given in this issue of the *Journal*, page 457.

At the close of the paper C. H. Wright, M.E.I.C., congratulated Mr. Kribs on the very useful character of the information contained in his paper, and pointed out that it gives in convenient form data which will be found of great value by anyone connected with electric transmission work, and more particularly by engineers already familiar with civil or mechanical engineering work, but who have not had much experience in transmission line engineering.

On motion of Mr. Wright, seconded by F. P. Vaughan, M.E.I.C., a vote of thanks to Mr. Kribs for his excellent paper was unanimously passed.

Methods of Constructing Earth Roads

At 9 o'clock a series of moving picture films were given illustrating the methods of constructing earth roads by the use of heavy tractor-drawn graders, all stages of construction being clearly demonstrated both in level country and where the road passed between banks.

R. W. McColough, A.M.E.I.C., chief engineer of the Nova Scotia Provincial Highway Board, opened the discussion and said that the films showed very clearly the efficiency of this method of road grading. He pointed out that while there was some indication from the pictures that the material through which the grader was working was sandstone, in his opinion the material must have been of a fairly soft nature. While it is quite true that the grader will operate in hard rock which is stratified or broken up, or in ledge rock which is very soft, it will not operate in hard ledge material. The pictures illustrated the method of burying the sods in the shoulder of the road. In Mr. McColough's opinion this was not practical, and the practice in Nova Scotia was to clean off the sods completely and either waste same or haul it ahead to some deep fill.

Mr. McColough spoke at some length on the various kinds of graders used. The grader illustrated in the picture was of the leaning wheel type. The great majority of graders, however, were not of this type. The size of graders varied from the 1,000-pound pony grader for maintenance work, which is operated by one man and two horses, and costs about $150. to graders weighing approximately 10,000 pounds and requiring a 40- to 50-h.p., tractor to operate, and costing about $2,000. Graders weighing approximately 5,000 pounds can be easily handled by a 5-ton tractor, giving 25 h.p., at the draw bard. There are many designs of graders for maintenance on the market, and this is found to be the most efficient way of maintaining earth and gravel roads. The cutting edge of the grader is, perhaps, one of its most important parts, and these are made of high carbon steel. A large grader operated by a 40- to 50-h.p., tractor should move at least 1,000 cubic yards of material per day, and such an outfit will require to have a crew of ten or twelve men following it. The total cost would be in the vicinity of $86.00 per day, or approximately 8.6 cents per cubic yard, as compared with 25 cents per cubic yard for the same work if handled by day labour.

R. McManus, A.M.E.I.C., a road contractor, stated that he had used a grader of the type shown with considerable success in the construction of 9 miles of road this summer but he thought that Mr. McColough's figure of 8.6 cents per cubic yard was somewhat too low.

The Hon. Percy Black, Minister of Highways of Nova Scotia, found the films and discussion very interesting, and believed that the part played by the engineers in the construction of the road system of Nova Scotia had not been as generally appreciated by the public as it deserved. He very much valued the opportunity of being present at *The Institute* meeting.

H. W. L. Doane, M.E.I.C., said that in regard to water bound macadam roads on the outskirts of the city of Halifax, which used to have a life of ten years in the days of horse drawn traffic, great difficulty was now experienced in maintenance, particularly owing to the formation of pot holes. He had found the best remedy for this to be a floating coat of about 3 inches of moving stone, but this was objectionable to residents on account of the dust it created, and it was also expensive since it was thrown to the sides by the traffic and required continuous hand labour to return it from the edges of the road to the centre. He had found, however, that one small maintenance grader did this work at a fraction of the cost of hand labour.

Where a hard surface is maintained on macadam roads, it is treated with suitable tar or asphalt. This type of roadway is becoming very popular for residential streets, and during the past year Halifax has treated 156,500 square yards at an average cost, including a number of first applications which are necessarily heavy, of $0.085 per square yard.

Mr. McColough concurred with Mr. Doane regarding the advantage of a floating surface on the travelled way, and stated that the Nova Scotia Highway Board's present practice was to use gravel passing a 1¼-inch screen for this purpose. He also stated that the department's present practice in the construction of gravel roads was to have the gravel consolidated by traffic, all gravel used passing a 1½-inch circular opening screen. It was formerly the practice to use much heavier gravel and consolidate same with a steam roller, putting the gravel on in two courses. The present practice is to put all the gravel on at once and leave it in windrows on the sides of the road, drawing it in with the grader as it is consolidated. In reply to members who inquired as to the effect of this method of road construction on motor car tires, Mr. McColough stated that while the method was not entirely popular with the travelling public, the road was soon consolidated and ultimately gave a much better surface than was obtained by the method of using a steam roller.

A hearty vote of thanks was passed to Mr. McColough for his remarks.

Marketing of Cape Breton Coals

The chairman announced that M. W. Booth, A.M.E.I.C., who was to have read a paper on "The Marketing of Cape Breton Coals", had unfortunately been prevented from completing that paper, but that G. N. Hatfield, A.M.E.I.C., on short notice had kindly prepared one on the subject. Mr. Hatfield was then called upon for his paper.

Mr. Hatfield pointed out the difficulties connected with the marketing of Nova Scotia coal, these being largely due to the intermittent demand and the consequent necessity for piling coal in winter so as to keep the mines at work, and being due also to the fact that consumers accustomed to other coals having a lower proportion of volatile matter found some difficulty in obtaining satisfactory efficiency with the same design of furnace when the high volatile Nova Scotia coals were employed. In some cases difficulty had been experienced from the spontaneous combustion of piled coal, although this trouble had now been largely removed by improved methods of piling. He considered that in order to increase the sale of Nova Scotia coal it would be necessary to educate users in the particular methods of furnace construction and operation required by the various coals available from the Maritime Provinces, and that this could best be done by sending out competent men capable of advising consumers as to the coal best suited to each individual's requirements, and the methods of boiler setting or furnace construction required in each case. For example, he had been able to obtain much better efficiencies with Nova Scotia coal by changing boiler settings, increasing the height of the boiler above the grate, and by making sure that the grate area is sufficient to enable the necessary amount of coal to be burned without excessive rates of combustion per square foot, which result in high furnace temperatures, but give trouble from clinker.

He was of the opinion that in the Maritime Provinces great advantage would be found if experimental work were carried out similar to that which has been done by the Research Council of Alberta in the case of Alberta coals.* As a result of that council's work and publications, the market for Alberta coal has been greatly expanded and the public in Alberta and in other provinces has been successfully educated in the special methods needed, and the qualities of Alberta coals. Mr. Hatfield thought that in this matter the assistance of the Nova Scotia Technical College might be obtained, and that experimental work might with advantage be carried out there on the effect of various types of boiler setting on efficiency, and on the efficiency resulting from the use of various types of mechanical stokers. For this purpose the assistance of the provincial government would of course have to be secured, but he thought that in view of the important effect of any increase in the sale of coal on the revenues of the province, this should not be difficult.

G. D. Macdougall, M.E.I.C., thought that while it was very desirable to educate consumers within the province in the manner suggested by Mr. Hatfield, attention should also be paid to the large numbers of consumers outside of the province at points where Nova Scotia coal can be profitably sold. He referred more particularly to the St. Lawrence, and especially to pulp and paper plants. He considered that there is a real problem to be dealt with, particularly as the coal trade is one of the principal industries in Nova Scotia. He hoped that the idea suggested by Mr. Hatfield's paper would be actively followed up, so that some practical results could be obtained.

Mr. L. Killam agreed that reliable information as to the boiler settings and equipment best suited to different grades of coal would be of great commercial value. People will no longer buy purely on a price basis, but in most cases insist on purchasing the fuel which they believe will give them the best efficiency. He was sure that experimental work of the kind proposed would help in the home market and would also be beneficial in developing export trade.

A. R. Chambers, M.E.I.C., hoped that *The Engineering Institute* would take action with a view of bringing this question effectively to the attention of the government. On his motion, seconded by Professor F. R. Faulkner, M.E.I.C., a cordial vote of thanks was passed to Mr. Hatfield for his paper, and it was further unanimously resolved that the secretary should be requested to draw the attention of the Maritime Provinces branches of *The Institute* to this matter, urging the importance of a thorough study of the coals themselves, of the fuel requirements of the natural markets of eastern Canada, and of the best methods whereby the needs of these markets can be supplied by our Maritime coals. The branches should also be asked to consider the advisability of presenting resolutions on the subject to the several provincial governments in the Maritime Provinces.

*See *The Engineering Journal*, Oct. 1925, p. 420

At the conclusion of the meeting it was unanimously resolved that the secretary be requested to prepare and forward letters of thanks to those who had so kindly made provision for the entertainment of members during the meeting, particularly to E. G. M. Cape and Company in connection with the visit to the elevator; to Imperial Oil Ltd. in connection with the visit to their oil refineries; to the Acadia Sugar Refining Co. in connection with the visit to their refinery; to Commander Wood and the Senior Naval Officer, H.M. C. Dockyard, Halifax, for their kindness in connection with the cruise around the harbour; to the Halifax Commercial Club for their hospitality in connection with the luncheon; and to Dr. Sexton, principal of the Nova Scotia Technical College, for his kindness in arranging to place that building at the disposal of the meeting.

The chairman having impressed upon the members the necessity for punctuality in connection with the next day's automobile excursion to Windsor, the meeting adjourned at 11.30 p.m.

Visit to Windsor, N. S.

On Friday, October 7th, members assembled at the Nova Scotia Technical College at 9.30 a.m., and proceeded to Windsor in twenty-three automobiles preceded by a pilot car and followed by a service automobile equipped for all minor repairs. The weather was propitious and the fifty mile run was made in good time.

After an inspection of the Wentworth Gypsum Company's plant around which the party was conducted by the manager, Mr. Otis Wack, a delightful lunch was enjoyed, and the very appropriate decorations of the room and tables were particularly appreciated. Mr. F. W. Armstrong, president of the Windsor Board of Trade, welcomed the guests.

The new development of the Avon River Power Company on the Avon river was visited after lunch, and the works of the Eastern Lime Company were also inspected.

The Banquet

In the evening the closing banquet of the meeting was held at the Green Lantern, Prof. W. F. McKnight, A.M.E.I.C., chairman of the Halifax Branch, in the chair.

The toast list included one to the Maritime Provinces, proposed by J. L. Rannie, M.E.I.C., supervisor of triangulation, Geodetic Survey of Canada, Ottawa, and responded to by Capt. the Hon. J. F. Cahan, M.P.P., A.M.E.I.C., and Geoffrey Stead, M.E.I.C., district engineer, Department of Public Works, St. John, N.B.; one to the Guests, proposed by C. E. W. Dodwell, Hon.M.E.I.C., and responded to by Hon. J. F. Fraser, and Prof. H. W. McKiel, M.E.I.C., of Mount Allison University, one to *The Engineering Institute of Canada*, proposed by President MacKenzie, of Dalhousie University and responded to by F. A. Bowman, M.E.I.C., of Halifax, and R. J. Durley, M.E.I.C., secretary of *The Institute*, Montreal. K. H. Smith, M.E.I.C., of Halifax, R. T. MacIlreith, and H. C. Burchell, M.E.I.C., of Windsor also spoke.

The principal speaker of the evening was Lt.-Col. J. L. Ralston, K.C., D.S.O., who gave a timely and most valuable address dealing with the semi-judicial functions exercised by an engineer in interpreting a contract and in deciding points in dispute between the owner and the contractor for the work under construction.

He cited a number of cases both in English and Canadian Courts, in which the engineer had been held by the court to be the sole arbiter in such disputes, but pointed out that circumstances might occur under which the engineer's power would be disallowed, and the court would itself decide upon the issue. He emphasized the personal responsibility placed upon the engineer in such cases, and congratulated the profession on the extreme rarity of instances in which the engineer had been found unfit for the judicial duty imposed on him by the terms of the contract.

The address greatly impressed the members present, and on the motion of the Hon. J. F. Cahan, A.M.E.I.C., seconded by C. H. Wright, M.E.I.C., it was unanimously resolved that Col. Ralston be requested to honour *The Institute* by preparing his discourse for publication in *The Journal.* This Col. Ralston very kindly undertook to do.

The official proceedings of the Maritime Professional Meeting terminated with this very successful dinner. The total registration at the meeting was one hundred and forty-seven, including members from as far east as Newfoundland and as far west as Peterborough.

Registration

1 R. J. Durley, Montreal.
2 Gilbert G. Murdoch, St. John.
3 W. A. Winfield. Halifax.
4 W. B. MacKay, Halifax.
5 C. M. Crooks, Halifax.
6 J. L. Rannie, Ottawa.
7 H. N. Putnam, Halifax.
8 L. M. Allison, Halifax.
9 P. D. Mosher, Halifax.
10 E. Viens, Ottawa.
11 G. D. Macdougall, New Glasgow.
12 C. W. Archibald, Truro.
13 R. W. McColough, Halifax.
14 G. G. Hare, St. John.
15 A. Gray, St. John.
16 R. L. Waycott, Halifax.
17 M. H. McManus, Halifax.
18 N. F. Ballantyne, Ottawa.
19 Harry F. Bennett, Halifax.
20 R. M. McKinnon, Sydney.
21 H. W. McKiel, Sackville.
22 W. J. Johnston, St. John.
23 B. E. Bayne, Moncton.
24 L. H. Wheaton, Halifax.
25 J. F. Cahan, Halifax.
26 R. R. Murray, Amherst.
27 C. A. Fowler, Halifax.
28 W. F. McKnight, Halifax.
29 H. R. Theakston, Halifax.
30 H. W. L. Doane, Halifax.
31 G. T. Medforth, Amherst.
32 D. H. McDonald, Halifax.
33 Frank P. Vaughan, St. John.
34 D. L. Hutchinson, St. John.
35 A. Barlow, Glace Bay.
36 G. N. Hatfield, St. John.
37 C. H. Wright, Halifax.
38 F. R. Faulkner, Halifax.
39 R. L. Nixon, Halifax.
40 W. H. Chisholm, Halifax.
41 C. T. Nisbet, Sussex.
42 D. Walter Munn, Halifax.
43 J. H. Clark, Halifax.
44 G. L. Dickson, Moncton.
45 R. A. Black, Halifax.
46 C. W. McCarthy, Great Village.
47 R. G. Johnstone, Cornerbrook, Nfld.
48 S. J. Hayes, Peterborough.
49 W. A. Brunning, Halifax.
50 G. N. Dickenson, Halifax.
51 Geoffrey Stead, St. John.
52 G. A. Vandervort, St. John.
53 H. A. Hatfield, New Glasgow.
54 R. P. Donkin, Halifax.
55 G. D. Anderson, Halifax.
56 M. G. Taylor, Parrsboro.
57 G. W. Browne, Windsor.
58 A. R. Hayman, Truro.
59 W. S. Wilson, Sydney.
60 D. W. J. Brown, Sydney.
61 D. W. Robb, Amherst.
62 A. C. Harris, Halifax.
63 A. L. Atwood, Halifax.
64 G. W. Moore, Halifax.
65 H. L. Wright, St. Peters.
66 E. F. Power, Halifax.
67 G. R. Morrison, Canso.
68 G. D. MacKenzie, Malagash.
69 H. C. Stevenson, Sydney.
70 J. A. Halsford, St. John.
71 J. S. Hillis, Halifax.
72 Cyril L. Parks, Truro.
73 H. B. Pickings, Halifax.
74 J. L. Holman, St. John.
75 J. A. W. Waring, St. John.
76 A. M. Hewat, Halifax.
77 E. S. F. Piers, Halifax.
78 J. H. Kenny, Halifax.
79 A. G. Pedder, Dartmouth.
80 J. W. MacDonald, Imperoyal,
81 G. A. Pippy, Halifax.
82 E. A. Bayer, Sydney.
83 H. F. Ryan, Halifax.
84 W. G. Sexton, Halifax.
85 W. M. Bristol, Halifax.
86 John W. McKenzie, Sydney.
87 J. A. Davies, Halifax.
88 Fred. Q. Boutelier, Sydney.
89 Walter B. Kelley, Yarmouth.
90 G. M. Trueman, Bridgeton.
91 Gordon Kribs, St. John.
92 C. S. G. Rogers, Moncton.
93 John Claney, Mulgrave.
94 K. E. Whitman, Halifax.
95 Harold S. Johnston, Halifax.
96 F. A. Bowman, Halifax.
97 A. L. Brown, Halifax.
98 W. P. Copp, Halifax.
99 F. W. W. Doane, Halifax.
100 A. R. Chambers, New Glasgow.
101 Andrew MacGillivray, Halifax.
102 J. H. Reid, Halifax.
103 J. C. Thompson, Halifax.
104 D. J. MacDonald, Halifax.
105 J. F. Lumsden, Halifax.
106 J. Cameron, Halifax.
107 W. L. Fraser, Halifax.
108 W. P. Morrison, Halifax.
109 Wm. J. deWolfe, Halifax.
110 A. C. D. Blanchard, St. John.
111 G. F. Murphy, Halifax.
112 J. S. Armstrong, Fredericton.
113 C. E. W. Dodwell, Halifax.
114 A. W. Gregory, Halifax.
115 O. S. Cox, Halifax.
116 J. G. W. Campbell, Truro.
117 G. W. H. Perley, New Glasgow.
118 P. H. Moore, Chester.
119 K. L. Dawson, Halifax.
120 S. T. E. Fetterley, Halifax.
121 R. A. Benoit, Halifax.
122 C. M. Smyth, Sydney.
123 F. H. Sexton, Halifax.
124 H. F. Laurence, Halifax.
125 John S. Misener, Dartmouth.
126 George Dike, Halifax.
127 Thomas J. Locke, Halifax.
128 K. H. Smith, Halifax.
129 J. Lorn Allan, Dartmouth.
130 William Rodger, Dartmouth.
131 P. A. Freeman, Halifax.
132 P. W. Benoit, Halifax.
133 J. R. Henshaw, Halifax.
134 F. G. McPherson, Halifax.
135 C. A. MacNearney, Halifax.
136 W. J. Johnson, Montreal.
137 J. W. Perrigo, Montreal.
138 A. R. Crookshanks, St. John.
139 C. A. D. MacIntosh, Truro.
140 E. A. Baillie, Halifax.
141 R. M. Williams, Halifax.
142 J. A. MacGillivray, Toronto.
143 J. Stackhouse, Halifax.
144 Thos. J. Brown, Halifax.
145 J. E. Belliveau, Halifax.
146 G. S. Stairs, Windsor.
147 M. L. Boswell, Halifax.

Maritime Professional Meeting — Halifax, N.S., October 8th, and 9th, 1925.

1. C. G. S. Rogers
2. H. N. Putnam
3. G. G. Murdoch
4. W. F. McKnight
5. F. A. Bowman
6. R. J. Durley
7. K. L. Dawson
8. D. W. J. Brown
9. W. J. Johnston
10. J. L. Rannie
11. W. H. Noonan
12. F. P. Vaughan
13. G. G. Hare
14. D. L. Hutchinson
15. A. C. D. Blanchard
16. A. MacGillivray
17. G. N. Hatfield
18. G. T. Medforth
19. N. F. Ballantyne
20. E. Viens
21. G. Stead
22. W. G. Wilson
23. W. B. MacKay
24. H. F. Bennett
25. L. M. Allison
26. J. G. W. Campbell
27. J. L. Clark
28. Prof. W. P. Copp
29. C. T. Nisbet
30. G. A. Vandervort
31. P. D. Mosher
32. G. I. MacKenzie
33. Prof. J. H. Reid
34. Geo. A. Pippy
35. C. W. Archibald
36. Gordon Kribs
37. W. M. Bristol
38. A. L. Atwood
39. R. J. Johnstone
40. J. S. Hillis
41. F. Ryan
42. J. A. W. Waring
43. Prof. H. W. McKiel
44. Geo. Dickson
45. C. M. Crooks
46. J. L. Holman
47. J. F. Lumsden
48. D. W. Robb
49. O. S. Cox
50. C. H. Wright
51. W. B. Kelley
52. St. C. Hayes
53. G. W. H. Perley
54. J. Clancey
55. R. L. Waycott
56. D. H. McDonald
57. R. M. McKinnon
58. M. H. McMannus
59. A. C. Harris
60. W. A. Winfield
61. J. W. MacDonald
62. R. A. Benoit
63. H. S. Wright
64. G. W. Moore
65. W. H. Chisholm
66. Prof. K. E. Whitman
67. C. M. Smythe
68. Prof. R. P. Donkin
69. Prof. R. L. Nixon
70. A. G. Pedder
71.
72. Prof. F. R. Faulkner
73. A. Barlow
74. E. S. F. Piers
75. B. E. Bayne

Tables for the Calculation of Short Transmission Lines

A valuable paper on the above subject was presented at the recent Maritime Professional Meeting at Halifax, by Gordon Kribs, M.E.I.C., electrical engineer, New Brunswick Electric Power Commission. The paper gave a resume of the principles governing alternating current work and the methods of calculation for alternating current transmission lines.

Mr. Kribs discussed methods of determining the necessary sizes of conductors, the voltage regulation and line losses, and has drawn up a series of useful tables for simplifying the work which are reproduced below with the necessary explanations of the method of using them.

The tables cover standard voltages as follows:—110, 220, 440, 600, 2,300, 4,000, 6,600, and 13,200; all at 60 cycles with normal standard spacings.

They assume that the power factor of the load will average as follows: — Lighting loads, 95 per cent; combined lighting and power loads, 80 per cent; power loads, 65 per cent.

The figures in the tables are based on the well known relation

$$E_s = \sqrt{(E_r \cos\phi + IR)^2 + (E_r \sin\phi + IX)^2}$$

where, E_s = voltage at generator or sending end of line
E_r = voltage at receiving end of line
$\cos\phi$ = power factor of load
I = current
R = resistance
X = reactance

Tables I to IV are for the determination of the size of conductor, or the regulation, and Table V is for the purpose of checking the carrying capacity in the case of short lines at the higher voltages.

An explanation of their use follows:—

Single-Phase Circuits — In order to calculate the size of wire necessary for a single-phase circuit multiply the load in kilowatts by the distance to be transmitted in feet, (for 6,600 and 13,200 volts use miles), and divide by the voltage regulation in per cent desired. This will give the constant K, for this particular circuit:—

$$K = \frac{\text{distance in feet} \times \text{k.w. load}}{\text{per cent regulation}}$$

Now look up in the table corresponding to the given conditions the number most closely corresponding to the calculated constant and opposite this number find the size of wire necessary under the assumed conditions.

Example: It is required to transmit 25 k.w. at 600 volts, 60 cycles, 80 per cent p.f. a distance of 1,000 feet with an allowable voltage variation of 5 per cent. What is the proper size of wire to use?

$$K = \frac{1{,}000 \times 25}{5} = 5{,}000$$

Now in the table, under 80 per cent p.f. find the number most closely corresponding to 5,000. This is found to be 5,254. Opposite this number will be found No. 4 copper or No. 2 aluminum as the proper size to use.

Conversely, by rearranging the above formula,

$$\text{Per cent regulation} = \frac{\text{distance in feet} \times \text{k.w.}}{\text{K.}}$$

or in other words,

To find the voltage regulation in per cent of delivered voltage under a given set of conditions and for a given size wire, multiply the load in kilowatts by the distance in feet and divide by the constant found in the tables for that size wire under the given conditions.

For three wire single-phase circuits use the voltage between the two outside wires, finding the proper size for these wires. For the neutral it is considered good practice to use a wire one-half the cross-sectional area of the two outsides.

Two-Phase Circuits — Since two-phase circuits are merely a combination of two single-phase circuits, it is necessary to divide the quantity of power to be transmitted by 2 and calculate as above. This is equivalent to using the formula for three-phase circuits as given below. The tables are not to be used for 3-wire two-phase circuits.

Three-Phase Circuits — To apply the tables to the calculation of three-phase circuits we proceed exactly as in the case of a single-phase circuit, but owing to the fact that the drop in a three-phase circuit is the same as that in a single-phase circuit transmitting half the power, our formula becomes,—

$$K = \frac{\text{distance in feet} \times \text{k.w.}}{2 \times \text{per cent regulation}}$$

or conversely,

$$\text{Per cent regulation} = \frac{\text{distance in feet} \times \text{k.w.}}{2 \times K}$$

Example: — It is required to transmit 50 k.w. at 80 per cent p.f. a distance of 10 miles by means of a three-phase, 60-cycle, 4,000-volt line, with a voltage regulation of 10 per cent. What size is necessary?

$$K = \frac{5{,}280 \times 10 \times 50}{2 \times 10} = 132{,}000$$

corresponding to a copper wire between No. 6 and No. 7. Since in the smaller wires even sizes are always used, and for mechanical reasons, No. 6 would no doubt be used, and the voltage regulation using No. 6 would be

$$\text{Per cent regulation} = \frac{5{,}280 \times 10 \times 50}{2 \times 156{,}336} = 8.4 \text{ per cent}$$

On short lines at the higher voltages it sometimes happens that a wire having the proper area for a given voltage variation has not sufficient carrying capacity. To enable this to be checked readily, the number of amperes per kilowatt per phase at stated voltages and power factors are given in table V.

It should also be noted that for a given standard spacing the ratio of the reactance volts to the resistance volts increases very rapidly as the size of wire becomes larger. Hence in circuits employing heavy currents the reactance volts are the determining feature as regards voltage regulation and it is often more economical to split the circuit up into two or more similar circuits in parallel. It is seldom advisable to use a conductor larger than 4/0 in a.c. circuits, due to the above characteristic. The size of wire necessary under given conditions is usually determined by the permissible voltage variation. Sometimes, however, the permissible voltage variation gives a wire of such small size as to produce an excessive I^2R or power loss. This may be calculated for any system by multiplying the I^2R loss for one conductor by the number of conductors (not including the neutral for a balanced load in a three-wire single-phase or four-wire three-phase system). Dissimilar circuits in parallel are uneconomical since the currents do not divide in a proper ratio to produce a minimum power loss.

TABLE I — Constants for A.C. Circuits

Size wire		Carrying cap. amps.	110 volts — Constant K for 60 cycles			220 volts — Constant K for 60 cycles		
Copper	Alum. equiv.		65% P.F.	80% P.F.	95% P.F.	65% P.F.	80% P.F.	95% P.F.
500M	790M	590	492	605	719	1973	2423	2877
400M	630M	500	470	579	687	1882	2317	2751
300M	475M	400	448	551	655	1793	2207	2621
4/0	335M	312	402	495	588	1610	1981	2352
3/0	265M	262	376	463	550	1505	1853	2200
2/0	4/0	220	347	427	507	1387	1707	2026
0	3/0	185	313	386	458	1255	1544	1838
1	2/0	156	277	341	405	1110	1365	1722
2	0	131	241	297	352	965	1187	1410
3	1	110	204	251	298	816	1005	1193
4	2	92	171	210	250	683	840	998
5	3	77	140	172	205	563	692	821
6	4	65	115	141	168	458	565	670
7	5	58	92	113	135	368	454	538
8	6	46	74	91	108	295	362	430

Constants in k.w.-feet.

TABLE III — Constants for A.C. Circuits

Size wire		Carrying cap. amps.	2300 volts — Constant K for 60 cycles			4000 volts — Constant K for 60 cycles		
Copper	Alum. equiv.		65% P.F.	80% P.F.	95% P.F.	65% P.F.	80% P.F.	95% P.F.
500M	790M	590	196895	242330	287770	545300	671254	797122
400M	630M	500	188270	231715	275165	521507	641850	762207
300M	475M	400	179385	220785	262180	496896	611574	726238
4/0	335M	312	160980	198125	235275	445914	548806	651711
3/0	265M	262	150560	185300	220045	417051	513281	609524
2/0	4/0	220	138725	170740	202750	384268	472950	561617
0	3/0	185	125465	154420	183370	347538	427743	507934
1	2/0	156	110955	136565	162170	307345	378285	449210
2	0	131	96465	118730	140990	267200	328882	390542
3	1	110	81620	100450	119565	226087	278246	331195
4	2	92	68305	84070	99835	189200	232873	276542
5	3	77	56320	69160	82125	156000	191573	227486
6	4	65	45866	46450	67035	127048	156366	185686
7	5	58	36840	45341	53845	102046	125595	149150
8	6	46	29452	36248	43045	81582	100406	119234

Constants in k.w.-feet.

TABLE II — Constants for A.C. Circuits

Size wire		Carrying cap. amps.	440 volts — Constant K for 60 cycles			600 volts — Constant K for 60 cycles		
Copper	Alum. equiv.		65% P.F.	80% P.F.	95% P.F.	65% P.F.	80% P.F.	95% P.F.
500M	790M	590	7876	9693	11510	12306	15146	17985
400M	630M	500	7531	9268	11010	11767	14482	17198
300M	475M	400	7135	8830	10487	11211	13800	16386
4/0	335M	312	6440	7925	9433	10061	12383	14705
3/0	265M	262	6036	7428	8802	9410	11580	13753
2/0	4/0	220	5550	6830	8110	8670	10670	12672
0	3/0	185	5018	6176	7335	7841	9650	11460
1	2/0	156	4438	5462	6486	6935	8535	10158
2	0	131	3860	4750	5640	6030	7420	8812
3	1	110	3265	4018	4772	5101	6280	7455
4	2	92	2732	3362	3994	4270	5254	6240
5	3	77	2248	2766	3285	3512	4322	5132
6	4	65	1835	2258	2682	2866	3528	4190
7	5	58	1474	1813	2154	2302	2833	3365
8	6	46	1178	1450	1722	1840	2265	2690

Constants in k.w.-feet.

TABLE IV — Constants for A.C. Circuits

Size wire		Carrying cap. amps.	6600 volts — Constant K for 60 cycles			13200 volts — Constant K for 60 cycles		
Copper	Alum. equiv.		65% P.F.	80% P.F.	95% P.F.	65% P.F.	80% P.F.	95% P.F.
500M	790M	590	264.1	325.0	386.0	968.0	1191.4	1414.7
400M	630M	500	253.7	312.2	370.7	934.4	1150.1	1365.7
300M	475M	400	242.8	298.8	354.8	897.4	1104.5	1311.6
4/0	335M	312	219.1	269.7	320.3	818.3	1007.2	1195.9
3/0	265M	262	206.0	253.5	301.1	774.6	953.4	1132.1
2/0	4/0	220	190.9	235.0	279.0	722.1	888.7	1060.2
0	3/0	185	173.7	213.8	253.9	663.7	816.8	969.9
1	2/0	156	154.6	190.3	226.0	595.6	733.0	870.4
2	0	131	135.3	166.5	197.8	525.3	646.5	767.7
3	1	110	115.1	141.7	168.3	450.1	554.0	657.8
4	2	92	96.7	119.0	141.3	380.3	468.0	555.8
5	3	77	79.8	98.3	116.7	316.1	389.1	462.0
6	4	65	65.3	80.4	95.5	259.2	319.1	378.9
7	5	58	52.5	64.6	76.8	209.1	257.4	305.7
8	6	46	42.1	51.8	61.5	167.7	206.5	245.2

Constants in this table are in k.w.-miles.

TABLE V — Amperes per K.W. per Phase at Stated Voltage and Power Factor

Voltage	Single-phase			Three-phase		
	65% P.F.	80% P.F.	95% P.F.	65% P.F.	80% P.F.	95% P.F.
110	13.98	11.36	9.56	8.06	6.55	5.51
220	6.99	5.68	4.79	4.03	3.28	2.76
440	3.49	2.84	2.39	2.08	1.64	1.38
600	2.6	2.0	1.8	1.5	1.2	1.05
2300	.67	.54	.46	.39	.31	.27
4000	.38	.32	.25	.22	.18	.15
6600	.23	.19	.16	.13	.11	.092
13200	.12	.095	.08	.065	.055	.046

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Export of Hydro-Electric Power

Among the many vexed questions confronting Canada to-day, that of the export of hydro-electric power is one of the most important. On its wise decision depends the future development and prosperity of some of our most populous areas, and it is evident that a definite policy must be adhered to, if progress is not to be arrested through indecision and uncertainty.

Members of *The Institute* will therefore note with great interest a paper on "Some Economic Aspects of Hydro-Electric Development in Canada" which was presented at the recent Montreal Meeting of the American Society of Civil Engineers and dealt fully with the subject from the United States point of view. The paper gave rise to a somewhat animated discussion, in which opinions were expressed differing widely from those of the author of the paper.

Canadian national policy regarding this question of conservation has very properly as its object the utilization of our natural advantages, and the restrictive attitude which has so far been evident in debates in both Federal and Provincial Legislatures when additional power export to the United States has been discussed, no doubt represents the consensus of public opinion in Canada.

The author of the paper, on the other hand, naturally took the viewpoint of the American promoter of hydro-electric enterprises, and argued that the unrestricted export of Canadian water power to the United States would be beneficial to both countries. He believed that refusal to export Canadian power to the United States would neither interfere with industrial expansion in the United States nor promote it in Canada, and he pointed to the economic interdependence of the two countries — Canada buying nearly 70 per cent of her imports from the United States, and selling over 40 per cent of her exports to that country. He stated that less than ten per cent of Canadian water power has been developed, and suggested that these undeveloped powers should be rendered available for the adjacent States of the Union, perhaps the most active industrial region of the world.

Canada's coal and oil requirements are largely supplied from the United States, and in his opinion we are to be congratulated on these avenues for profitable commercial contact. Unfortunately, however, power export is at present allowed only on permit, revocable on one year's notice, and American manufacturers cannot afford to tie up to an uncertain power supply. The author suggested that the power now wasted be utilized, that this cannot be done in Canada for many years, and that it would therefore be good business for Canada to permit the development of such power for export to the United States on long term contracts. This would conserve coal in the United States, benefit Ontario and Quebec by developing large markets in the States adjoining them, and will, in his opinion, cause no difficulty to arise should the power eventually be required in Canada at the expiry of the long term contracts.

He urged further that if shortage of water power occurs in the North Eastern United States, the tendency would be to shift manufacturing to the water power districts of the South Eastern States or the Pacific Coast, and not to Canada.

Several prominent Canadian water power authorities discussed this paper, outlined the reasons for the present attitude of the interested Governments and the Canadian public, and, in opposition to the ideas expressed in the paper, stated their view of the situation in terms which may be summarized as follows:

The figures given in the paper as to the available undeveloped power in the provinces of Ontario and Quebec include large quantities of power on rivers flowing into Lake Superior, Hudson Bay, the Atlantic Ocean and the Gulf of St. Lawrence, none of which is within transmission range of the industrial district of Canada, including the cities of Toronto, Ottawa, Montreal and Quebec. The total available commercial power within this industrial district and within striking distance of the International Boundary is only sufficient to supply the combined needs of the two provinces for the next twenty-five years, by which time the public utility systems of Ontario and Quebec will be experiencing acute power shortage.

It is urged that under these circumstances, the immediate benefit to Canada from the suggested huge capital expenditure, even if a large amount of temporary employment on construction work is secured by Canadians, should not be allowed to outweigh the disadvantage of losing control of our power, and losing also the permanent employment supplied eventually by the development and application of the power within our own territory. The revenue derived from the sale of power exported is almost negligible compared with the wealth created by the application and utilization of the same power, and this should accrue to the country possessing the power.

It was shown that the policy of restricting power export has already led to the establishment in Canada of great electrochemical and metallurgical industries, as for example in the Saguenay district, and these have been built up north of the boundary and not (as the paper anticipates) in the Southeastern or Pacific States.

The Canadian speakers stated that experience has demonstrated the practical impossibility of assuming the return of power, even if exported under the yearly license system. Vested interests are built up, based on the utilization of such power, which cannot be ignored and which in practice are able to prevent the stoppage of supply.

It was pointed out that there was no disposition on the part of responsible Canadians to take a "dog in the manger" attitude in respect to additional power to meet the needs of the Metropolitan districts of the United States, but that on the contrary, Canadians were prepared to co-operate with Americans to secure a solution for their growing power problems from jointly owned International water power sites, of which there were several of very large capacity much closer to awaiting markets than the smaller inland water powers of the Dominion, which would all be needed within a generation for domestic purposes.

Readers of *The Journal* will recall the very full discussion on this subject which took place at a meeting of the Montreal Branch of *The Institute*, and which was reported in the April 1925 number of *The Journal.*

It is the duty of engineers, like other good citizens, to form their own opinions on public questions, and further, engineers should be prepared to aid in moulding public opinion on such a matter as this. The American Society of Civil Engineers has aided in clarifying the situation by arranging for such a timely and forceful presentation of the views of leaders on both sides of the power controversy.

Report of Paris International Conference on High Tension Lines

It is proposed, subject to there being a sufficient demand, to publish an English edition, (in two volumes of about 1,100 pages each) of the papers read at the International Conference on High Tension Lines held in Paris on the 16th to the 25th June, 1925. The volumes will also contain a report of the discussions.

If the demand reaches 400 copies, the price will be *four pounds* for the two volumes, but in the event of 800 copies being subscribed for, the price will be *two pounds ten shillings.*

In order that an early decision may be arrived at as to whether to publish an English edition, those wishing to subscribe for copies are requested to inform without delay: Monsieur Tribot Laspière,

Union des Syndicats de l'Electricité,
25, Boulevard Malesherbes, Paris.

of the number of copies they will require.

A French edition of the papers and discussions will also be published provided not less than 1,000 sets are subscribed for. The price will be 200 francs per set, but after the 1st November, 1925, the price will be increased to 250 francs. Orders for the French edition should also be sent to M. Tribot Laspière at the address given above.

Nominations for Officers' Ballot

Regulations

Not later than the seventh day of November, the secretary shall mail to each corporate member of *The Institute* the officers' ballot, as prepared by the nominating committee and the council.

Additional nominations for the officers' ballot signed by ten or more corporate members and accompanied by written acceptances of those nominated, if received by the secretary on or before the first day of December, shall be accepted by the council and shall be placed on the ballot. The words "Special Nomination" shall be printed conspicuously near such names, and the names of the members making such nominations shall be printed on some part of the ballot.

Notices shall be deemed to have been mailed to members as prescribed by the by-laws if such notices are printed in *The Journal* of *The Institute* and mailed by the dates prescribed in the by-laws.

Officers' Ballot

The following is a list of the nominees submitted by the Nominating Committee, and approved by Council at the regular meeting held on September fifteenth, nineteen twenty-five, one addition having been made by Council on account of non-acceptance of nomination.

PRESIDENT: George A. Walkem, M.E.I.C., Vancouver.

VICE-PRESIDENTS: *Zone b* — Peter Gillespie, M.E.I.C., Toronto; H. J. Lamb, M.E.I.C., Toronto; George F. Porter, M.E.I.C., Walkerville.

Zone c — A. R. Décary, M.E.I.C., Quebec; W. G. Mitchell, M.E.I.C., Kenogami.

Zone d — C. C. Kirby, M.E.I.C., St. John; Geo. D. Macdougall, M.E.I.C., New Glasgow; H. W. McKiel, M.E.I.C., Sackville.

COUNCILLORS: *Victoria Branch:* M. P. Blair, M.E.I.C., Victoria; F. C. Green, M.E.I.C., Victoria.

Vancouver Branch: P. H. Buchan, A.M.E.I.C., Vancouver; Jas. Muirhead, M.E.I.C., Vancouver.

Calgary Branch: P. Turner Bone, M.E.I.C., Calgary; R. S. Trowsdale, A.M.E.I.C., Calgary.

Edmonton Branch: A. W. Haddow, A.M.E.I.C., Edmonton; H. H. Tripp, A.M.E.I.C., Edmonton.

Lethbridge Branch: John Dow, M.E.I.C., Lethbridge; P. M. Sauder, M.E.I.C., Lethbridge.

Saskatchewan Branch: R. W. E. Loucks, A.M.E.I.C., Regina; H. R. MacKenzie, A.M.E.I.C., Regina.

Winnipeg Branch: A. McGillivray, A.M.E.I.C., Winnipeg; D. L. McLean, A.M.E.I.C., Winnipeg.

Lakehead Branch: G. H. Burbidge, M.E.I.C., Port Arthur; D. G. Calvert, A.M.E.I.C., Fort William.

Sault Ste. Marie Branch: L. R. Brown, A.M.E.I.C., Sault Ste. Marie; C. H. E. Rounthwaite, A.M.E.I.C., Sault Ste. Marie.

Border Cities Branch: A. J. M. Bowman, A.M.E.I.C., Windsor; J. E. Porter, A.M.E.I.C., Ford.

Niagara Peninsula Branch: S. R. Fro[illegible] A.M.E.I.C., Niagara Falls; T. S. Scott, M.E.I.C., Niagara Falls.

London Branch: H. A. Brazier, M.E.I.C., London; E. V. Buchanan, M.E.I.C., London.

Hamilton Branch: A. M. Jackson, A.M.E.I.C., Brantford; W. F. McLaren, M.E.I.C., Hamilton.

Continued on next page.

Officers' Ballot (*Continued*)

Toronto Branch: J. M. Oxley, M.E.I.C., Toronto; H. W. Tate, A.M.E.I.C., Toronto.

Kingston Branch: L. M. Arkley, M.E.I.C., Kingston; W. L. Malcolm, M.E.I.C., Kingston.

Peterborough Branch: R. L. Dobbin, M.E.I.C., Peterborough; D. L. McLaren, A.M.E.I.C., Peterborough.

Ottawa Branch: 1 year — O. S. Finnie, M.E.I.C., Ottawa, A. F. Macallum, M.E.I.C., Ottawa; 2 years — J. D. Craig, M.E.I.C., Ottawa, J. L. Rannie, M.E.I.C., Ottawa.

Montreal Branch: J. L. Busfield, M.E.I.C., Montreal; C. M. McKergow, M.E.I.C., Montreal; D. C. Tennant, M.E.I.C., Montreal; H. A. Terreault, A.M.E.I.C., Montreal.

Quebec Branch: A. Lariviere, A.M.E.I.C., Quebec; (proposed by Council) A. B. Normandin, A.M.E.I.C., Quebec.

Saguenay Branch: E. Lavoie, M.E.I.C., Chicoutimi Centre; G. F. Layne, A.M.E.I.C., Kenogami.

Moncton Branch: F. O. Condon, M.E.I.C., Moncton; J. D. McBeath, M.E.I.C., Moncton.

St. John Branch: G. N. Hatfield, A.M.E.I.C., St. John; A. G. Tapley, A.M.E.I.C., St. John.

Cape Breton Branch: S. C. Mifflen, A.M.E.I.C., Sydney; W. C. Risley, M.E.I.C., Sydney.

Halifax Branch: R. W. McColough, A.M.E.I.C., Halifax; C. H. Wright, M.E.I.C., Halifax.

OBITUARY

Brig.-Gen. H. N. Ruttan, Hon. M. E. I. C.

It is with sincere regret that we record the death of one of *The Institute's* charter members, Brig.-Gen. H. N. Ruttan, Hon. M.E.I.C., at his latere sidence in Winnipeg on October 13th.

Due to General Ruttan's high position in the engineering profession, he was known from coast to coast and the news of his death has been received with deep regret by his many friends in the profession as well as those in private life.

The late General Ruttan was born at Cobourg, Ont., on May 1st, 1848, and during his active engineering career he has held many important positions with the Grand Trunk, Intercolonial and Canadian Pacific Railways. In 1874 he was engaged on the first surveys for the Canadian Pacific Railways along the north shore of Lake Superior, and during the following two years, he had charge of the first survey party through the Yellowhead Pass. For a period of twenty-nine years, 1886-1915, he was city engineer for Winnipeg, Man. At the age of sixteen years General Ruttan joined the Cobourg Rifles. He was a veteran of the Fenian Raids and was through the Northwest Rebellion. In 1915 he was appointed O.C.M.D. No. 10, and retired in 1918 from active service.

General Ruttan was one of the signatories of the Charter of the Canadian Society of Civil Engineers, and was a councillor of the Society for twelve years, between the period of 1887-1906. In 1909 he was elected Vice-President of the Society and in the following year was elected President.

PERSONALS

Arthur G. Willson, A.M.E.I.C., who until recently was located in Calgary, Alta., is now bursar of the Provincial Mental Hospital at Ponoka, Alta.

Martin Wolff, A.M.E.I.C., of Montreal, has accepted a position on the St. Lawrence Deep Waterway project and is at present located at Cornwall, Ont.

P. E. Palmer, D.L.S., A.M.E.I.C., has returned to Ottawa after a successful season spent on topographical surveys in the vicinity of New Glasgow, Nova Scotia.

Geo. S. Sangdahl, A.M.E.I.C., of Horton Steel Works Limited, Montreal, is leaving for Cleveland, Ohio, where he will be in charge of the office of the Chicago Bridge and Iron Works.

K. R. Somerville, S.E.I.C., who graduated from Toronto University this year, is with the General Electric Company, having recently been transferred from Schenectady to the Erie works of the company.

G. P. Hatton, A.M.E.I.C., of the Topographical Surveys Branch, Department of the Interior, Calgary, Alta., has been transferred to the staff of the Geodetic Surveys of Canada, Department of the Interior, Ottawa, Ont.

G. B. Dodge, D.L.S., M.E.I.C., of the staff of the Topographical Survey, Department of Interior, has returned to Ottawa after several weeks spent in the Maritime Provinces in connection with the work of the Survey.

H. S. Wilson, S.E.I.C., who graduated from McGill University in 1924 and who during the past year was with the Geological Survey of Canada, is now with the department of geology, University of Wisconsin, Science Hall, Madison, Wis.

B. E. Barnhill, M.E.I.C., formerly chief field engineer with the Algoma Steel Corporation and the Algoma Central Railway of Sault Ste. Marie, Ont., has accepted a position in Florida with Messrs. Foley Bros., on railway construction work.

T. Douglas Pollock, S.E.I.C., graduated in civil engineering from McGill University in 1924, and has since that date been with the Bell Telephone Company of Canada, and is at present assistant to the divisional commercial supervisor, Montreal Division.

Edward Hughes, A.M.E.I.C., who for the past year has been with the Calumet and Hecla Consolidated Copper Company, has accepted a position with the Western Chemical Company, who are developing a sodium sulphate mine at Camp Verde, Arizona.

T. Lindsay Crossley, A.M.E.I.C., formerly editor of Canadian Chemistry and Metallurgy, is president of the Industrial Laboratories Limited, Toronto, Ont. Prior to undertaking editorial work, Mr. Crossley was in private practice as consulting chemical engineer in Toronto.

W. R. Conibear, Jr.E.I.C., is at present with the Riordon Pulp Corporation Limited as chief of party on the Quinze river survey, North Temiskaming, Que. Following his return from overseas in 1919, Mr. Conibear was for several years with the Hydro-Electric Power Commission of Ontario at Niagara Falls, Ont.

S. Eastman Root, Jr.E.I.C., who has for some time been with the St. Lawrence Paper Mills Limited, Three Rivers, Que., has joined the field engineering staff of the Riordon Pulp Corporation Limited, and is at present engaged on preliminary field work in connection with the proposed new mill at Gatineau Point, Quebec.

D. L. McLaren, A.M.E.I.C., who has been on the A. C. engineering staff at the Peterborough works of the General Electric Company, Limited, has been transferred to Toronto, where he has taken charge of the Generator Section of the Apparatus Sales Department, recently made vacant by the retirement of G. F. Madden.

P. G. Gauthier, Jr.E.I.C., has joined the engineering staff of the Aluminum Company of Canada and is located at Jonquiere, Que. Mr. Gauthier graduated from McGill University in civil engineering in 1921 and subsequently was demonstrator at the University. He was later with Messrs. Price Brothers and Company Limited at Jonquiere, Que.

G. B. Hull, A.M.E.I.C., formerly assistant engineer of the Lethbridge Northern Irrigation District, Lethbridge, Alta., is now chief engineer of the Sinaloa Land Company, Culiacan, Sinaloa, Mexico. Upon leaving the Lethbridge Northern Irrigation District Mr. Hull was appointed assistant engineer with the water department of the city of Los Angeles.

J. Bloomfield, S.E.I.C., formerly with Universal Engineering Corporation, Montreal, and Waterbury Tool Company, Waterbury, Conn., as assistant to chief engineer, with headquarters in Montreal, is now permanently located in Waterbury as test and experimental engineer with the latter company. Mr. Bloomfield graduated from McGill University in mechanical engineering in 1923.

Thurston M. Hamer, Jr.E.I.C., is western railroad engineer representative for the Air Reduction Sales Company with headquarters at Chicago, Ill. Mr. Hamer was for a short time connected with the Canadian Pacific Railways at Montreal and later with the Canadian National Railways, subsequently occupying the position of long distance engineer with the Bell Telephone Company of Canada.

T. L. Watt, A.M.E.I.C., is locating engineer with the Canadian National Railways on the O'Brien-Rouyn Line with headquarters at O'Brien, Que. Mr. Watt has had extensive railway engineering experience which dates back to 1906 when he first joined the Canadian Northern Railway on survey work in Quebec and Ontario. He was also with the Canadian Railway Troops overseas for two years. In addition to his railway work he has had a number of years experience on harbour construction at Port Weller, Ont.

C. E. Webb, A.M.E.I.C., has been promoted to the position of district chief engineer for the province of British Columbia and Yukon Territory, in the Dominion Water Power and Reclamation Service. Mr. Webb has for twelve years been in the employ of the Water Power and Reclamation Service in British Columbia. Previous to that he was with the Canadian Northern Railway on location and construction work in Ontario and British Columbia. He is a graduate in civil engineering of the University of Toronto of the class of 1910.

R. J. Anderson, A.M.E.I.C., has resigned from his position as assistant engineer in the bridge department of the Engineer of Standards office, Canadian National Railways, Montreal, and has been appointed engineer on the substructure of the International bridge between Buffalo and Fort Erie for the contractors, Messrs. Aiken and Inness. Mr. Anderson served his apprenticeship as mechanical engineer with the firm of Sir William Arrol and Company, bridge builders, Glasgow, Scotland, and was with that firm for ten years previous to coming to Canada in 1913. Since that date, with the exception of his overseas service, he has been in the bridge department of the Government Railways until resigning to accept his present position.

James Muirhead, M.E.I.C., Enters Private Practice

James Muirhead, M.E.I.C., who, for the past five years has been chief inspector of electrical energy for the province of British Columbia, has resigned his position to enter private practice as consulting electrical engineer with headquarters in the Birks Building, Vancouver, B.C.

Mr. Muirhead graduated from Glasgow University in the year 1902, where he received his degree of B.Sc., in civil and electrical engineering. Following his graduation he was engaged in engineering work in the Old Country; first with the Glasgow Corporation Tramways Department in charge of one of their substations, and for five years, from 1903-8, with Messrs. British Thomson-Houston Company, Limited, Rugby, England, on design of electrical machinery. The following year he was electrical designer and works manager for Krumos Limited, manufacturers of electrical specialties, Bath, England, and for the next two years was estimating engineer with Bruce Peebles and Company Limited, electrical manufacturers, Edinburgh, Scotland.

In 1912 Mr. Muirhead came to Canada and joined the engineering staff of the British Columbia Electric Railway Company, with the distribution and transmission line department. In 1914 he was appointed assistant electrical inspector with the British Columbia Government and occupied this position until promoted to chief electrical inspector in 1920.

Malleable Castings

An exemplification of how necessary ferrous metals are to mankind, in this age of iron and steel, is that of malleable castings.

Because of their varying physical properties, each of the respective classes of ferrous metal castings has its legitimate field, and malleable castings, because of their qualities of uniform structure, easy machining, great strength with light weight, shock resistance, and rust resistance, are used in the production of numerous lines.

Manufacturers of many important lines use this tough, strong, dependable material for vital parts of their product to prolong its life and for protection against dangerous breakdowns and expensive delays.

Among the numerous lines in the production of which malleable castings play an important part are motor cars and trucks, farm implements, railway equipment, farm tractors, waggons, farm fencing, concrete mixers, road machinery, lumbering tools, refrigerating equipment, pipe fittings, electrical fittings and builders' hardware.

Plan to Attend

The Annual General

and

General Professional Meeting

in

Toronto

January 27th, 28th and 29th, 1926

Concrete Deterioration in Alkali Soils

Review of the First Chemical Paper published by Dr. Thorvaldson and Assistants, in connection with the investigation initiated by the Engineering Institute Committee into the Disintegration of Concrete by Alkali waters.

By C. J. Mackenzie, M.E.I.C.,
Dean of Engineering, University of Saskatchewan, Saskatoon, Sask.,
Chairman of Committee on Concrete Deterioration in Alkali Soils.

For the past three years Dr. Thorvaldson, professor of chemistry at the University of Saskatchewan, has been directing a chemical research into the disintegration of cement in so-called alkali waters. This work has been done under the auspices of a research committee of *The Engineering Institute of Canada* with the financial support of the Research Council of Canada, the Canada Cement Company, the Canadian Pacific Railway, and the Prairie Provinces of Canada. A great deal of very valuable work has been done and many deductions important from the practical as well as the scientific standpoint may now be made.

Up to the present two papers have been published in the Journal of Industrial and Engineering Chemistry, two more are in course of publication and several others will be ready in the near future, but it is the first paper published in the May 1925 issue which will be referred to chiefly.

This paper is a condensed and concentrated statement of chemical facts and conclusions, which will be read profitably by experts in cement chemistry. It has been suggested, however, that a review of a general nature would help many engineers, who have not been following this work closely, to grasp the significance of the data presented.

Very briefly it may be stated that Dr. Thorvaldson's first paper suggests a general explanation of what happens when cement is acted upon by solutions of sodium and magnesium sulphate, which salts it is generally accepted are the constituents of so-called alkali waters chiefly responsible for the decay of concrete. This explanation, no less striking in its simplicity than in its novelty, is supported by unquestioned experimental data and accounts for many effects which have been observed for years by different engineers, but which were never explained. For instance, it has been observed and reported by many different engineers that when concrete is mixed with or cured in sulphate waters, setting of the cement is not hindered, and the strength during the first few weeks is not below the normal. While most engineers have reported only the conclusion that early strengths were not decreased by contact with sulphate waters, other engineers have noted that the original test data actually indicated a slight increase in the early strengths. Dr. Thorvaldson's explanation of sulphate action shows clearly that this early increase in strength is to be expected.

Another interesting conclusion from the experimental data in the paper is that if pure water only be permitted to percolate freely through a porous concrete, the cement will eventually become completely disintegrated, just as it would if immersed in a solution of sodium sulphate. A bit of corroborative evidence to support the above conclusion is to be found in Engineering News-Record of June 25th, 1925, page 1064. There Mr. William Gore notes that in a very porous concrete (cemented gravel) in the floor of a water filter at Toronto, "the cement was being slowly dissolved by the water".

A very important finding is that of the fundamental difference between the actions of sodium sulphate and magnesium sulphate on cement. Hitherto it has been quite generally accepted that the so-called alkali action could be regarded as the action of either sodium or magnesium sulphate or of a mixture of these. It is very significant to note that not only has Dr. Thorvaldson proved that the chemical actions of these two salts on cement are different, but he has found that certain cements, which are disintegrated in sodium sulphate, will apparently stand up in magnesium sulphate; he has also been able to produce a treated cement which has stood up in sodium sulphate solutions but will not do so in solutions of the magnesium salt. Up to the present time, however, no cement has been produced that will stand up in both under the most adverse conditions. This distinction between the actions of these two sulphate salts should be kept clearly in mind when drawing general conclusions from the results of particular exposure tests, especially as in many of the alkali waters, magnesium sulphate is the principal sulphate, just as it is in sea-water, while in other alkali waters there is a preponderance of sodium sulphate. It may be mentioned that, while we feel quite certain that the sodium and magnesium sulphates are the salts chiefly responsible for the disintegration of concrete, studies are also being made on the actions of other sulphates on cement.

A still further result of the work to date, which appeals to the practical engineer as of great importance, is that we are now able by chemical analysis of the disintegrated concrete to determine definitely whether the cause of failure has been (a) alkali action, (b) acid action, or (c) frost or weather action. The non-conclusive nature of a diagnosis based on a physical examination only has been the cause of much difference of opinion in the past and for years retarded actual work of an investigational nature, due to lack of unanimity in accepting the problem.

The significance of Dr. Thorvaldson's contribution to the subject of alkali disintegration of Portland cement cannot be appreciated without glancing first at the theories held previously. These theories will be presented only in a general way and for a more detailed account reference can be made to papers in *The Engineering Journal* of October 1920, August 1921 and September 1922. Portland cement consists essentially of the oxides of calcium (CaO), silica (SiO_2) and alumina Al_2O_3 united chemically into three compounds. The calcium and silica are united in two forms, i.e. tricalcium silicate and dicalcium silicate, while the calcium and alumina form tricalcium aluminate; of these three compounds the first is generally considered to be the principal constituent of ordinary Portland cement. As is well known, when water is added to cement the physical condition changes and a cementing material results. From a chemical standpoint what is known as hydrolysis or hydration occurs. Taking tricalcium silicate as an example the following equation may be considered to represent the reaction:

$3\,CaO.\,SiO_2 + H_2O \rightarrow 2\,Ca(OH)_2 + CaO.\,SiO_2.\,y\,H_2O$ in other words the result is a hydrated calcium silicate with a certain amount of free $Ca(OH)_2$. A similar action takes place with dicalcium silicate, while the tricalcium aluminate hydrates directly without the liberation of free lime $Ca(OH)_2$.

The theories of sulphate disintegration of concrete date back about a hundred years. At that time L. J. Vicat explained the disintegration of hydraulic cement in sea water as due to the action of sulphate of magnesia on the uncombined lime in the cement forming sulphate of lime, this substance being dissolved and carried away if the water "traverses the mortar or concrete rapidly", while if the water passes through very slowly crystals of gypsum are formed in the mass causing the expansion of the mortar characteristic of mortars decomposed by sea water. This explanation with certain modifications is still accepted for the disintegration of cement in sulphate waters in general.

Modern hydraulic cements, if properly made, do not contain free lime. However, during the process of normal hydration, free lime is liberated as explained above, and the past theories have assumed that the interaction of the sulphates in the water with the calcium hydroxide liberated during hydration forms gypsum crystals and that the force of expansion due to this crystallization shatters the cementing materials. A further development of this idea attributes the chief cause of disintegration to the formation of calcium sulpho-aluminate through reaction between the calcium sulphate and the hydrated tricalcium aluminate of the cement. This product, which crystallizes with 30 molecules of water and with a large increase in volume, is supposed to form cracks in the hardened mass which admit more of the sulphate water, the crystals then increase in size and "with irresistible power cause the mortar to burst more or less completely".

Thus the current theories as stated above claim that disintegration is primarily due to a direct chemical action between the sulphates and the different ingredients of set cement. Now the explanation of sulphate action on cement proposed by Dr. Thorvaldson does not suggest that the above mentioned reactions or similar ones do not occur, but it does say that these are secondary and that the primary action has to do with the hydration of the cement. It is shown that the presence of sulphates during the setting of cement assists and speeds up the necessary hydration of the cement, and that this would naturally give strengths higher than normal during the initial stages, such as have been observed in the field, but unfortunately the hydration or hydrolysis does not stop at the point of optimum strength for the cement, as it ordinarily does in pure water, but it is carried on and on until so much of the calcium has been removed by hydrolysis that sufficient strength to withstand the physical action of crystallization is gone.

The reason that hydration stops under normal conditions is that as hydration proceeds with the liberation of $Ca(OH)_2$, the immediate film of liquid around each particle of cement reaches saturation and finally what is known as chemical equilibrium obtains, no further hydration occurring. Now if for any reason this saturated film is removed equilibrium will be upset and hydration will proceed beyond the point of optimum strength. If this view is correct then constant passing of pure water through a porous concrete would keep this saturated film of $Ca(OH)_2$ from forming and should upset the equilibrium and permit hydration to proceed until complete failure of the cement occurs. Experiments in the laboratory have proven this to be the case, and the example previously referred to which has been cited by Mr. Gore, adds evidence. It will be noted that the disintegration of porous concrete in dams and other hydraulic structures, where water is forced through concrete at a comparatively high rate, may thus be viewed in a new light.

Engineers will be interested in learning that two different hydraulic structures of large magnitude, inspected about three years ago by Dr. Thorvaldson showed marked signs of water seepage. The concrete appeared to be of good quality and the water that was being forced through was not alkali but fresh river water. One of these structures had suffered serious disintegration, which could not be satisfactorily explained at that time, the second structure showed then no serious action. Samples taken at that time showed large accumulations of $Ca(OH)_2$ on the outside surface of both structures. It is plainly evident now in the light of the above explanations, just why disintegration should be expected in such cases, and it has been recently learned unofficially that the second structure which was apparently sound three years ago is now occasioning serious alarm.

When set concrete is exposed to sulphate solutions (or alkali waters), the same general action takes place that occurs when pure water is forced through concrete, only the liberation of lime is speeded up by the presence of the sulphate and then the equilibrium is upset by the saturated film of $Ca(OH)_2$ solution combining with the sulphate solution, with the consequent result that hydration of the cement proceeds further and if enough sulphate is present complete failure will result.

During this process crystals of gypsum separate out in the concrete, and the calcium sulphate reacting with the hydrated calcium aluminate forms calcium sulpho-aluminate. The disruptive force of crystallization may be a factor in the final crumbling especially where alternate wetting and drying takes place. Dr. Thorvaldson's results indicate also that in the advanced stages of sodium sulphate disintegration, if the concentration of the sulphate is high and drainage is poor, reactions will occur directly between the sodium sulphate and the hydrated aluminates and silicates. Thus it may be true that final disintegration in such cases is the result of direct attacks on some of the fundamental primary constituents of the set cement. However the important point to realize is that Dr. Thorvaldson has shown quite conclusively that in the early stages at least, the primary action of sulphate solutions on concrete consists in speeding up the hydration (with a consequent strength increase in the early stages) and by not permitting the hydration to stop at the point of optimum strength, creating the conditions leading to final destruction of the cement. Another valuable bit of evidence (not included in the first paper) to support this theory lies in the success of a remedy tried. A substance was added to cement which had for its function the maintaining of equilibrium at the optimum point. Treated bars of porous sand mortar (1–7½ mix) have been standing up in a 2% Na_2SO_4 solution for nearly two years now, whereas untreated bars under the same exposure conditions are completely destroyed in ten to fifteen days.

The difference between the reactions of sodium and magnesium sulphate on cement has been ascertained both by chemical and petrographic methods and is of great importance, for if a general remedy is to be found it must be possible to maintain the proper equilibrium under two different chemical environments. The different character of the disintegrated cement due to the different sulphates explains also the difference that has been noted so often in various concrete structures, some of the decay being soft and putty-like, into which a pick could be driven, while in other structures the concrete has appeared to scale off and crumble with the production of granular decomposition products.

This first paper of Dr. Thorvaldson's then gives the results of preliminary studies on Portland cement. It is a defining of the problem and forms the framework into which the succeeding papers will be incorporated. But it is also of great practical and scientific significance in itself.

In the laboratory the pure constituents of both Portland and the "high alumina" or "French" cements have been prepared and both chemical and petrographic studies have been made on the effect of different sulphate solutions on these compounds. Three papers on these studies have already been prepared and others will be published within the next year, including a further study on the influence of various factors such as curing, alkalinity, carbonation and addition of various likely materials, on the resistance of mortars to sulphate disintegration.

EMPLOYMENT BUREAU

Situations Wanted

Mechanical Engineer

McGill graduate in mechanical engineering, with six years experience in designing, checking and estimating, desires position with firm manufacturing power plant equipment, locomotives, or marine engines and boilers. Thirty-one years of age, married, in excellent health. At present employed. Available on two weeks notice. Apply box No. 198-W

Construction Engineer

Engineer, M.E.I.C., with extensive experience in construction work, bridges, water works, sewer works and heavy concrete work, and also mining survey work, desires position preferably in the Western part of Canada. Apply box No. 199-W.

Civil Engineer

Canadian civil engineer, university graduate, M.E.I.C., at present employed on large power plant construction in Michigan, desires to return to Canada. Experience covers reinforced concrete design, plant maintenance, and concrete and general construction. Would consider any class of work, not necessarily engineering, where technical training and experience may win advancement. Personal interview sought where any such opportunity offers. Box 200-W.

Situations Vacant

Structural Steel Designer

Wanted by structural steel contractors in middle west, structural steel designer, preferably university graduate who has had several years experience with structural steel fabricating contractors, Some practical designing experience essential. Apply giving full particulars to box No. 148-V.

Death of Thomas Franklin Manville

Thomas Franklin Manville, chairman of the Board of Directors of Johns-Manville, Incorporated, died on October 19th, 1925, in New York City. For the past twenty-five years he has been the directing head of Johns-Manville, Incorporated, producers and manufacturers of asbestos, during which time he has built up an outstanding organization fully capable of carrying on his plans and policies to even greater achievements. His brother, H. E. Manville, who succeeded to the presidency of Johns-Manville, Incorporated, in 1924, was closely identified with him during this entire period and will continue to direct the policies of the organization.

ANNOUNCEMENT OF MEETINGS

Information may be secured from the secretaries of the various Branches, whose addresses will be found under "Officers of Branches" on page 438 of *The Journal.*

WINNIPEG BRANCH:—

Secretary-Treasurer, James Quail, A.M.E.I.C.

Oct. 15th. Address on "Some Problems in Railway Transportation" by H. J. Symington, K. C.
Nov. 5th. Address on "Long Distance and High Voltage Transmission" by E. P. Fetherstonhaugh, M.E.I.C.
Nov. 19th. Prize Papers-Engineering Students, University of Manitoba.
Dec. 5th. Prize Papers-Engineering Students, University of Manitoba.
Dec. 17th. Address on "Patents and Inventions" by G. S. Roxburgh, A.M.E.I.C.

MONTREAL BRANCH:—

Secretary-Treasurer, C. K. McLeod, A.M.E.I.C.

Nov. 5th. Address on "Rate Making, Public Carriers, by Dr. S. J. McLean. Chairman, J. M. R. Fairbairn, D.Sc., M.E.I.C.
Nov. 12th. Address on "Road Ballasting on Eastern Lines, C.P.R., by A. C. Mackenzie, M.E.I.C. Chairman, A. R. Ketterson, A.M.E.I.C.
Nov. 19th. Address on "Some Recent Stress Analysis of the Photo-elastic Method, by Prof. Heyman. Chairman, F. P. Shearwood, M.E.I.C.
Nov. 26th. Address on "Aviation and Modern Engineering Practice" by Wing-Commander, E. W. Stedman, O.B.E., M.E.I.C. Chairman, Wm. Walker, A.M.E.I.C.
Dec. 3rd. Student Papers. Chairman F. E. Winter, S.E.I.C.
Dec. 10th. Address on "Transmission Towers", by Major C. M. Goodrich, M.E.I.C. Chairman, G. A. Wallace, Jr.E.I.C.
Dec. 17th. Annual Meeting of Montreal Branch. Refreshments. Chairman, J. L. Busfield, M.E.I.C.

LETHBRIDGE BRANCH:—

Secretary-Treasurer, N. H. Bradley, A.M.E.I.C.

Nov. 7th. Address on "Electric Power for the Province" by R. A. Brown.
Nov. 21st. C. R. Wing, Supt., Sugar Company. Visit to factory in afternoon, weather permitting.
Dec. 5th. Illustrated address by C. G. Childe, A.M.E.I.C., Resident Engineer, Rocky Mountains Park, Banff, Alta.
Dec. 15th. Address by P. M. Sauder, M.E.I.C., Project Manager, Lethbridge Northern Irrigation District.
Jan. 9th. Illustrated address on "Technical Education in the Province of Alberta" by A. G. Carpenter.
Jan. 23rd. Illustrated address on "Architecture" by H. M. Whiddington.
Feb. 6th. Address on "Some Phases of the Art of Communication", by A. M. Mitchell, of the Alberta Government Telephones.
Feb. 20th. Address by E. Stansfield, M.E.I.C., of the Research Council of Alberta.

OTTAWA BRANCH:—

Secretary-Treasurer, F. C. C. Lynch, A.M.E.I.C.

Nov. 13th. Complimentary Luncheon to C. A. Magrath, M.E.I.C., Chairman, Hydro-Electric Power Commission of Ontario.
Nov. 19th. Illustrated Lecture on "Highway Bridges", by C. J. Desbaillets, M.E.I.C., Chief Engineer, Montreal Water Board.
Nov. 26th. Luncheon. Address on "Recent Developments on Oil-Electric Transportation", by C. E. Brooks, Operation Department, Canadian National Railways, Montreal.
Dec. 10th. Luncheon. Address on "Popular Ownership of Public Utilities", by Fraser S. Keith, M.E.I.C., Manager, Development Department, Shawinigan Water and Power Company, Montreal.
Dec. 15th. Luncheon. Address on "The Adjustment of the Motor Vehicle to the Requirements of the Common Carrier Transportation Field", by R. A. C. Henry, M.E.I.C., Bureau of Economics, Canadian National Railways. Montreal.
Jan. 14th. Annual Meeting of the Local Branch.
Jan. 21st. Annual Ball, Chateau Laurier.
Feb. 11th. Address "The Founders of Modern Science", by Dr. L. E. Parizeau of Montreal.

ELECTIONS AND TRANSFERS

At the meeting of Council held on October 27th, 1925, the following elections and transfers were effected:

Members

BENOIT, Paul Soumande, Lieut.-Col., R.C.E., (Grad. R.M.C.), dist. engr. officer, Military District No. 6, Halifax, N.S.

GRIFFIN, Augustus, B.S. (Univ. of Calif.), supt., operation and mtce., eastern section irrigation system, C.P.R., Brooks, Alta.

MACKENZIE, Alexander Roderick, manager, Vernon Irrigation District, Vernon, B.C.

RICKEY, James Walter, C.E. (Renss. Poly. Inst.), chief hydraulic engr., Aluminum Company of America, Pittsburg, Pa.

Associate Members

ARMSTRONG, William Dun, plant supt., Canada Cement Co., Exshaw, Alta.

BRUNNING, William Henry, Capt., R.C.E. works officer, Military District No. 6, Halifax, N.S.

DUNBAR, James Bevan Plenderleath, (Grad. R.M.C.), dist. engr. officer, Military District No. 13, Calgary, Alta.

FRASER, Andrew Stackwell, B.Sc. (McGill Univ.), asst. supt., Cardinal plant, Canada Starch Company, Montreal, Que.

HAMMERSLEY, Albert William, engr. in charge of constrn. of filtration plant, Ford City, Ont.

HOLM, Mourits Jensen, C.E. (Univ. of Copenhagen), Atlas Construction Company, Montreal, Que.

IRWIN, Robert Hamilton, Major, B.Sc. (McGill Univ.), dist. engr., officer, Military District No. 4, Montreal, Que.

JORON, Rodolphe Emile, B.A.Sc. (Laval Univ.), private practice, civil engr. and land surveyor, Chicoutimi, Que.

McCRAE, Donald Gordon, canal supt., C.P.R., Lethbridge, Alta.

SHANKS, Graham Lawson, B.Sc. Agric. (Univ. of Man.), professor agricultural engrg., Manitoba Agricultural College, University of Manitoba, Winnipeg, Man.

Juniors

BURNS, Robert Henry, engrg. dftsman., Lake Superior Paper Co. Ltd., Sault Ste. Marie, Ont.

FERGUSON, James Gordon, B.Sc. (Queen's Univ.), telephone engr., Northern Electric Co. Ltd., Montreal, Que.

KINGAN, Gordon Herron, B.Sc. (McGill Univ.), junior constrn. engr., Riordon Pulp Corporation, Temiskaming, Que.

MARCHAND, Eugène François, gen. mgr. and elect'l. engr., Laurentian Hydro Electric Ltd., Montreal, Que.

YOUNG, Hugh Andrew, B.Sc. (Univ. of Man.), Royal Canadian Corps of Signals, Ottawa, Ont.

Transferred from the class of Associate Member to that of Member

CHADWICK, Kenneth Murray, engr. of constrn. Victoria Gas Company, Victoria, B.C.

EARL, Ernest Alfred, dist. engr. in charge of a district of constrn., Gold Coast Govt. Rlys., Bekwai, Gold Coast Colony, West Africa.

HEARN, Richard Lankaster, B.A.Sc. (Univ. of Tor.), asst. chief engr., Washington Water Power Co., Spokane, Washington, D.C.

MANSON, Alexander Brock, B.A.Sc. (Univ. of Tor.), city engr., Stratford, Ont.

PEDEN, Alexander, chief dftsman., Dominion Bridge Company, Montreal, Que.

WALKER, Andrew, in charge of design, Fred Thomson & Co. Ltd., Montreal, Que.

WARDLE, James Morey, B.Sc. (Queen's Univ.), chief engr., Canadian National Parks Branch, Dept. of the Interior, Ottawa, Ont.

WESTON, Samuel Raymond, B.Sc. (Univ. of N.B.), chief engr., N.B. Electric Power Commission, St. John, N.B.

Transferred from the class of Junior to that of Associate Member

ALBERGA, Albert Miller, B.Sc. (McGill Univ.), senior engrg. clerk, Canadian National Parks Branch, Dept. of the Interior, Ottawa, Ont.

BURNS, Eedson Louis Millard, (Grad. R.M.C.), asst. professor of military engineering, Royal Military College, Kingston, Ont.

GOODWIN, Wilder Clifford, designer, checker and estimator, Truscon Steel Co., Boston, Mass.

HARKOM, John Frederick, B.Sc. (McGill Univ.), in charge of Divn. of Wood Preservation, Forest Products Laboratories of Canada, Montreal, Que.

HINTON, Robert E., B.Sc. (Queen's Univ.), asst. designing engr., induction motor engrg. dept., Can. Gen. Elec. Co., Peterborough, Ont.

JOYAL, Jules, B.A.Sc., C.E. (Univ. of Montreal), logging divn., Price Bros. & Co. Ltd., Chicoutimi, Que.

LAWRENCE, William Sewell, Major, (Grad. R.M.C.), dist. engr. officer, Military District No. 11, Victoria, B.C.

MACKENZIE, John Allan, (Grad. R.M.C.), transitman, mtce. of way dept., Brownville Division, C.P.R., Brownville Jct., Me.

MILLER, Harry Edward, asst. engr., Dept. Public Works, Charlottetown, P.E.I.

PASSY, Philip deLacy Deare, Major, R.C.E., (Grad. R.M.C.), Survey Division, Dept. National Defence, Ottawa, Ont.

RUSSELL, Allan Hugh, asst. city engr., Sault Ste. Marie, Ont.

THOMPSON, Harold Morfin, chief engr., Sawyer-Massey Co., Hamilton, Ont.

Transferred from the class of Student to that of Associate Member

BREITHAUPT, Carl L., B.A.Sc. (Univ. of Tor.), chemical engr., Breithaupt Leather Co., Kitchener, Ont.

JOHNSTON, Harry Wyatt, B.Sc. (McGill Univ.), chief engr., Canadian Prest Air Ltd., Montreal, Que.

KEARNS, James A., B.Sc. (McGill Univ.), consulting engineer, Montreal, Que.

LABELLE, Gaston, C.E. (Polytech. School), technical service, City of Montreal, Que.

LEGATE, John Harold, B.Sc. (Univ. of Tor.), supt., plant No. 5, Canada Cement Co. Ltd., Belleville, Ont.

MALLOCH, Allan Clyde, B.Sc. (Queen's Univ.), mech'l. dftsman., C.P.R., Montreal, Que.

PURCELL, John Metcalfe, B.Sc. (McGill Univ.), Steere Engineering Co., Detroit, Mich.

VESSOT, Charles Ulysses, B.Sc., M.Sc. (McGill Univ.), lecturer in mechanics of machines and shop processes, McGill University, Montreal, Que.

WILSON, James Clarence, B.A.Sc. (Univ. of Tor.), engrg. staff, Laurentide Co. Ltd., Casey, Que.

Transferred from the class of Student to that of Junior

BRADSHAW, Frederick Wykeham, B.Sc. (McGill Univ.), asst. to engr. in charge of installation of equipment, Price Bros.' Riverbend Mill, Riverbend, Que.

CLIFFORD, James Lawrence, dist. supt., Peterborough Hydro-Electric Railways, Peterborough, Ont.

COULTER, Hugh John, B.A.Sc. (Univ. of Tor.), cadet engr., Detroit City Gas Co., 1259 Ouellete Avenue, Windsor, Ont.

DENTITH, Francis William Hubert, B.Sc. (McGill Univ.), junior chemist, Brandram-Henderson Ltd., Montreal, Que.

FARNSWORTH, Arthur Leslie, B.Sc. (McGill Univ.), dfting. and designing, Lake Superior Paper Co. Ltd., Sault Ste. Marie, Ont.

FETTER, Roy Eugene, B.A. (Univ. of Alta.), 923–9th Street South, Lethbridge, Alta.

STROYAN, Philip Bateman, B.A.Sc. (Univ. of B.C.), dftsman., Sydney E. Junkins Co. Ltd., Vancouver, B.C.

The following students were admitted:

BAIN, Archie Marcus, 142 Rosebury Street, Winnipeg, Man.

BECK, Robert George, 202 Milton Street, Montreal, Que.

BELLEW, Leo Thomas Frederick, 298 St. Joseph Boulevard West, Montreal, Que.

BLACKMORE, Cyril Leslie, 770 University Street, Montreal, Que.

COLEMAN, Charles Lester, 297 Peel Street, Montreal, Que.

CREPEAU, Louis, B.A. (Laval Univ.), 28 Sherbrooke Street W., Montreal, Que.

DEWAR, Kenneth McIntyre, 715 Grosvenor Avenue, Westmount,, Que.

FANJOY, William Thomas, B.Sc. (Univ. of Alta.), 214 Park Street, Peterborough, Ont.

FRASER, Willard Bruce, 666 Querbes Avenue, Outremont, Que.

GAUVIN, Hervé A., B.Sc. (Univ. of Sask.), 782 St. Urbain Street, Montreal, Que.

GRANT, Alexander James, 810 University Street, Montreal, Que.

HAMILTON, Robert William, 113 Brock Avenue, S., Montreal West, Que.

HUTCHINS, Forbes Meredith, 64 Ontario Avenue, Montreal, Que.

JAMES, William Albert, 1620 De La Roche Street, Montreal, Que.

KALINCHUK, William, 522 Furby Street, Winnipeg, Man.

KEENE, Thomas Ross, 164 Marlowe Avenue, Montreal, Que.

KILLAM, Donald Alexander, 793 Shuter Street, Montreal, Que.

KINGSTON, George Harold, 67 McTavish Street, Montreal, Que.

KLEIN, George Gustave, B.Sc. (Univ. of N.B.), 334 Reid Street, Peterborough, Ont.

MOORE, William Herbert, 138 Selby Street, Westmount, Que.

MUTTER, James Lindsay, 223 Stinson Street, Hamilton, Ont.

NATHANSON, Max, 1568 Hutchison Street, Montreal, Que.

PATTERSON, William L., 303 Querbes Avenue, Outremont, Que.

PEELE, John Percy Frederick, B.A.Sc. (Univ. of B.C.), 207 Reid treet, Peterborough, Ont.

SAVARD, Lucien, 407 Mount Royal Avenue, East, Montreal, Que.

SCANLAN, Joseph Jeremiah Rene, 688 Charlevoix Street, Montreal, Que.

SIMON, Robert C., 1425 Bourbonniere Street, Montreal, Que.

STEWART, John Rufus, 297 Peel Street, Montreal, Que.

STEWART, Leslie Baxter, B.Sc., (St. Francis Xavier), 100 Durocher Street, Montreal, Que.

WHATMOUGH, Frederick Russell, B.A.Sc. (Univ. of Tor.), 516 Charlotte Street, Peterborough, Ont.

Recent Additions to the Library

Transactions, Proceedings, Etc.

Presented by the Societies:

Standards of the Hydraulic Society, 1925.
Proceedings and Year Book of the National Fire Protection Association, 1925.
Annual Report of the Association of Ontario Land Surveyors, 1925.
List of Members of the Mining Institute of Scotland, 1924-25.
Transactions of the American Society of Mechanical Engineers, 1925.
Transactions of the American Society of Civil Engineers, 1925.
Transactions of the North East Coast Institution of Engineers and Shipbuilders, 1924-25.
Proceedings of the Institution of Mechanical Engineers, January to April 1925.
Transactions of the Institution of Mining and Metallurgy, 1923-24
Proceedings of the Society for the Promotion of Engineering Education, 1924.

Reports

Presented by the Board of Trustees of the Carnegie Library of Pittsburgh.
Annual Report, 1924.

Presented by the John Crerar Library.
Annual Report, 1924.

Presented by the Hydro-electric Power Commission of Ontario.
Annual Report, 1924.

Presented by the Trustees of the Public Library of Boston.
Annual Report, 1924-25.

Presented by the International Confederation of Intellectual Workers.
L'Oeuvre de la Confédération Internationale des Travailleurs Intellectuels — Congrès de 1925.

Presented by the Harbour Commission of Montreal.
Annual Report, 1925.

Presented by the Ontario Department of Mines:
Annual Report, 1923, Parts, 1 and 4.
Annual Report, 1924, Parts, 5 and 6.

Presented by the Mexican Ministry of Agriculture.
Boletin oficial de la secretaria de agricultura y fomento, 1924.

Presented by the Industrial Research Department, University of Alberta.
Annual Report of the Scientific and Industrial Research Counci of Alberta, 1924.

Presented by the Department of Education of Ontario.
Report, 1924.

Presented by the Aeronautical Research Committee:
Technical Report, 1923-24.

Technical Books

Presented by Chapman and Hall:
Motor Ships, by A. C. Hardy.

Presented by the Authors:
Practical Road Building, by E. A. James, M.E.I.C.
The Old and New Bridges over the River Don at Inverurie, 1791 and 1924, by H. S. Tawse, A.M.E.I.C.

BOOK REVIEWS

Combustion in the Power Plant

By Thomas A. Marsh, M.E.

Review by Professor L. M. Arkley, M.E.I.C., Professor Mechanical Engineering, Queen's University, Kingston, Ont.

The first sixty-four pages of this book are devoted to a description of the coals which may be obtained from the different States of the Union, together with typical analyses of the same. This information indicates the economical source of coals for different sections of the country, and points to the proper furnace and stoker to be used with different grades of coal. The following ten pages are devoted to the coals of Canada and the rest of the world, and the author solves Canada's coal problem by saying that our importation of about 18,000,000 tons of steam coal per year, which, due to high freight rates costs from $8.00 to $11.00 per ton, is quite unnecessary, if we give the proper study to furnace design and stoking methods.

The facts of the case are of course, that a great deal of the steam coal used in Canada can be obtained from the U.S.A., laid down at a price of from $5.00 to $6.00 per ton and it is the long haul and high freight rates that prevent the use of Canadian coal from the east and west.

Chapter II is a short chapter on combustion.

The chapter on stokers, shows the logical development of the older types to the modern underfeed stoker and chain grates used for high overloads, and touchs on the live subject of stoker vs pulverized coal plants. The remainder of the book deals with furnaces and their construction, draft and boiler operation and ash disposal in the conventional manner of books on these subjects, but chapter XIV on trouble investigations gives a schematic analysis which should be of great value to operating engineers. The book is written with the minimum of technical terms, can be easily read and should prove a valuable book for any one who has a steam power plant problem on his hands.

This volume contains 249 pages with 63 illustrations and is published by the New York Combustion Publishing Corporation, 43 Broad Street, New York City.

Practical Road Building

By E. A. James, M.E.I.C.

This work is intended as a manual for the practical road builder.

After introductory chapters on road economics and road organization and location the book deals succinctly with foundations, drainage and culverts, and with the various types of road which are being developed in Canada to meet local conditions of climate and traffic.

The author's experience in road and highway construction in Canada has enabled him to point out the disadvantages of various wasteful and ineffective methods, and detailed directions on practical road building methods add to the value of the work.

A useful glossary of words used in discussing roads and pavements is given, and the book can be recommended as containing a great deal of useful information.

The book contains 227 pages and is published by the author,—Toronto, Ont.

Concrete Products—Their Manufacture and Use

By W. R. Harris.

Review by H. S. Van Scoyoc, M.E.I.C., Consulting Engineer, Service and Promotional Departments, Canada Cement Company, Limited, Montreal, Que.

Concrete Products — Their Manufacture and Use is really a compedium of facts relative to the concrete products industry. To the man or company considering the possibilities of this manufacturing field the information in this book will be of great value. To the thinking man already engaged in this class of work it will likewise be of great interest as it deals in a very thorough manner not only with problems of manufacture but also with methods of distribution.

The engineers and architects who wish to know more about the product they are specifying, than its price, will find this publication an excellent book of reference. The chapters relating to proportioning, mixing, and curing concrete, describe methods which could well be followed in the most pretentious of engineering works. The inclusion of standard and tentative specifications for building units and the various classes of drain pipe and sewer and pressure pipe should appeal both to the architect and engineer.

This second edition is quite an improvement over the first, but if there is a criticism that the reviewer would offer it is that the various chapters might be arranged in a more logical manner particularly those relating to manufacture.

The author secured much of his early experience with concrete products in Canada and is widely known particularly among the engineers of western Canada.

This book is published by International Trade Press, Inc., Monadnock Block, Chicago.

Report on the Meeting of the Advisory Committees of the International Electrotechnical Commission of the Hague

In order to understand the real significance of the meetings of the above Advisory Committees, the origin and growth of the International Electrotechnical Commission must be recalled.

This Commission was originated at the instigation of the British Government in 1904, in order to obtain international uniformity in legal electrical units. The business of the Commission was to obtain scientific definitions of the electrical units agreeable to all the participating countries. The organization consisted of National Committees, formed by technical societies of each country, with the Commission headquarters in London.

With the increase in the uses of electricity, further duties were assigned to the Commission which lead to the formation of Advisory Committee to deal with the various branches of the work. The most recent meeting of the Advisory Committees was held at the Hague in April last when most gratifying progress was achieved.

The committees sitting were those on:

Symbols and Nomenclature,
Rating of Electrical Machinery,
Prime Movers,
Traction Motors,
Transformer Oils,
Standard Pressures,
Rules and Regulations for Overhead Transmission Lines.

A very successful innovation at this conference was the presentation at the commencement of the session of papers by experts selected by the Council on the subject under consideration. This system indisputably assisted in re-focussing the attention to members on the basic lines of their work and showed where discussions had had a tendency to drift from a strict course.

During the course of the meetings, the manner of attacking contentious points changed. Whereas at first there was a marked tendency for each delegate to argue the correctness of his own country's proposals, after one strong delegation had agreed to withdraw a point which they had been pressing strongly in order to obtain unanimous agreement, a spirit of compromise developed in an effort to find points of agreement. The development of this spirit was utilized by the chairmen of the several committees to obtain agreement upon many points concerning which discussion had apparently arrived at a deadlock.

The Committee on Rating made great progress towards completing the specification for large machines.

The Committee on Prime Movers hopes shortly to produce specifications which could be used commercially throughout the world in inviting tenders.

The Committee on Transformer Oils considered a vast amount of evidence regarding the various tests of the sludging properties of transformer oils and has mapped out a comprehensive programme for the investigation of the relative merits of various systems employed.

It may not perhaps be out of place to explain the reasons for the formation of the Committees of Action and their promulgation of recommendations under the six months rule. Originally it was necessary, after an Advisory Committee had made recommendations, for these to receive endorsation at a plenary meeting of the Council of the Commission before publication. With the growth in the number of Advisory Committees, recommendations were frequently subjected to long delay in publication owing to the infrequency of plenary sessions.

To obviate this delay a Committee of Action was established which could meet more frequently; and when any Advisory Committee made recommendations, if approved by the Committee of Action, they could circulate such recommendations to all National Committees, and upon unanimous consent, or failing receipt of any objections within six months, the Committee of Action could publish such unanimously accepted recommendations as having the authority of the I.E.C. If any objections were lodged, the recommendation had to go before a plenary meeting for consideration.

Maps Recently Issued

The Topographical Survey, Department of the Interior, has recently issued two sheets forming part of the sectional map of Canada. One, the Maple Creek sheet (No. 67), extends from township 9 to township 16, and from range 16 west to 3rd meridian, to the Saskatchewan-Alberta boundary; the other, the Rush Lake sheet (No. 118), fills the gap between the Swift Current sheet on the south and the Elbow sheet on the north and lies just west of the Regina sheet. Both these maps are on the scale of three miles to the inch and contain latest information regarding topographical features. Of particular interest is the classification of roads into four divisions, namely, trunk roads, secondary thoroughfares, local roads well travelled, and local roads slightly travelled.

Central Levelling Bureau

Levelling data is undoubtedly the most essential and the most widely used of all topographical information required in the development of a country. It is important, therefore, that Canada, which is, comparatively speaking, in the early stages of development, should have this branch of the technical service on a well ordered and solid basis.

With this in mind, and in pursuance of the general policy of promoting efficiency and economy by consolidating offices performing services of a similar nature, the Department of the Interior has merged, into a Central Levelling Bureau, under the Geodetic Survey of Canada, the separate control levelling staffs which in the past have been operating under different technical branches of the service. In future all publications of control levels will be issued by this Bureau.

In addition to extending control levelling to provide every part of the Dominion with an adequate system of primary lines, the newly established levelling bureau will maintain an office for the collection of levelling data of all classes. This data will be assembled, adjusted to the control net and tabulated in readily accessible form for public use.

By this re-organization all the unconnected segments of levelling throughout the Dominion will eventually be joined together in one great system based on mean sea level datum; duplication of effort obviated, and many confusing anomalies sifted out.

With the object of rendering the greatest possible service, the Geodetic Survey of Canada will be prepared, upon request, to supply engineers and surveyors, either public or private, with all available information pertaining to altitudes in any specified area of Canada.

Welding on Boilers

In view of the ever-widening applications of fusion welding throughout industry and the probability that repairs to boilers made in this way will be proposed from time to time, it is well that those responsible for the results should bear several points in mind. For simplicity, these are briefly: 1. Most boilers are insured. 2. Many boiler insurance policies are so worded that if repairs are made without the authority of the company carrying the insurance, the policy becomes void. 3. There may be Federal, Provincial and Municipal regulations governing this work, as well as those issued by the insurance companies. 4. Only competent welders, used to boiler work, should be allowed to do the welding.

Therefore, the following precautions should be observed by the owner or his representative: — 1. Examine the part of the boiler to be welded in company with the insurance company inspector, and get his approval before doing any welding. 2. Be present at the test after welding with the inspector. 3. If possible, get the inspector to sign a statement that the work has been properly done and that it has passed the test successfully. 4. If the boiler is not insured, and comes under Federal, Provincial or Municipal supervision, carry out the above programme in company with the proper authority.

If the boiler is neither insured nor under supervision of some constituted authority, ample precautions should be taken by the welder and the owner to protect themselves against possible future trouble. They should make a sketch of the location and size of the repair, with a clear statement of what was found wrong and how the repair was made. They should always make a hydrostatic hammer test of the finished job, using a pressure of 1½ times the working boiler pressure, in the presence of witnesses, and get their signature to a statement of the facts. These papers should be carefully filed away. In such a case, no welding should be done which is not permitted by law or by good practice.

In all cases, the welder should make friends of the insurance and other inspectors by refusing to do work unless authorized by them, by being conservative in what work he recommends, and by doing nothing except a first-class job.

Notes prepared by S. W. Miller, past-president of the American Welding Society.

University of Manitoba Graduates meet in Chicago

The University of Manitoba Chicago Club held its monthly dinner last Saturday, October 3rd, at the La Salle hotel. There were present Messrs. A. C. Broatch, E. M. Brydon, L. S. Couch, C. Glynn, V. Gould, J. A. Hern, Geo. F. Long, S.E.I.C., J. A. P. Marion, Jr.E.I.C., R. W. Mauer, S.E.I.C., J. G. Mawhinney, Jr.E.I.C., C. G. Muller, Fred. Muir, G. L. Russell, J. J. Samson, J. Sigurjonson, E. Staples, J. C. Trueman, Jr.E.I.C., R. A. Young, S.E.I.C., D. C. Wilson and J. H. Wilson, S.E.I.C.

The executive for the coming year is as follows: Honorary president, L. S. Johnstone; president, Fred. Muir; Secretary, Joseph A. P. Maroñi, Jr.E.I.C.; treasurer, A. C. Broatch. Social Committee, R. W. Mauer, S.E.I.C., V. Gould, J. Sigurjonson. It was decided that the next dinner would be held in the "Loop" followed by a theatre night.

BRANCH NEWS

Border Cities Branch

F. Jas. Bridges, A.M.E.I.C., Secretary.

Midsummer Meeting

A midsummer meeting of the Border Cities Branch was held when they had the pleasure of entertaining about twenty members of the London Branch on August 15th. The London members motored from London and were met at the Prince Edward hotel, Windsor, by about twenty members of the local branch.

The party then motored out to the plant of the Ford Motor Company of Canada, at Ford, where they were met by several members of the engineering staff who are also members of *The Institute*. The party was conducted through the new machine shop and assembly building and all the different steps in the construction and assembly of a Ford were explained. From there the party was taken to the power building and shown through the plant from top to bottom.

The filtration plant of the Border Cities was the next place of inspection. Here the party climbed from bottom to top and J. Clark Keith, A.M.E.I.C., chief engineer of the Border Cities Utilities Commission, who had charge of the party, was kept busy answering questions.

The day was finished by returning to the Prince Edward hotel where all had dinner. The gathering broke up early and many of the visitors were seen hastily making their way down to the ferries to cross the river and take in the sights across the boundary, in the city of Detroit.

Triumphs in Bridge Building

One of the largest and most enthusiastic meetings of the Border Cities Branch was held on the evening of Friday October 9th, in the Prince Edward hotel, Windsor. It was the opening meeting for the fall and the guest of the evening was Prof. C. R. Young, M.E.I.C., instructor of structural engineering at the University of Toronto.

After the members had partaken of a splendid dinner, the chairman, J. Clark Keith, A.M.E.I.C., introduced Prof. Young. The subject the speaker chose was, "Triumphs in Bridge Building". Lantern slide pictures were shown of the most primitive bridges built on the north-western frontiers of India and also by the Indians of British Columbia as well as bridges built of bamboo. These structures, although crude in the extreme and often made of scrap materials, showed all the characteristics of design of our most modern structures.

The gradual improvement in lines and lengthening of spans was shown as the materials employed changed from timber to stone, cast iron, steel and reinforced concrete. An old typical stone arch is that of a bridge on the road in Galilee to Jerusalem built before the beginning of the Christian era. Other famous stone bridges were some in Italy, Roman arches in Spain and the famous old London bridge. This latter structure was built by priests who were called "Brothers of The Bridge", and they had buildings erected on it to help pay the upkeep.

The materials used by the engineers passed gradually from stone to ferrous materials, cast iron at first being used, then chain suspension bridges. Famous engineers now began to make their appearance, such as Thos. Telford, Brunel, Roebling. Here were shown slides of Brunel's proposed bridge at Clifton, England, Roebling's suspension bridge at Niagara where wire cables were first used. This bridge, of 821-foot span, was built in 1855 and lasted for 43 years.

The gradual advancement in design, span and lines was noted as pictures were shown of the Brooklyn bridges, Williamsburg, and the New York-Manhattan bridge. Designs of tubular constructed bridges were then shown as designed by Robt. Stevens, the Chester Holyhead, Conway, Britania and Victoria, Montreal. The outcome of the tubular bridge is the plate girder design, some of which are the Lethbridge, a long viaduct at Burma and the 462 feet high bridge at Tyrrol.

Different designs of truss bridges were shown, such as Brunel's Salt arch 455-foot span. Among the pictures of typical bridges shown were the C.P.R. bridge at Lachine; the railway bridges across the Niagara River; the Clifton suspension; Victoria Falls, in South Africa; Hells Gate; Sidney and Forth bridges.

The material used then passed to the non-ferrous materials as reinforced concrete. Of those shown the most notable were the Walnut Lane 233-foot arch, Rocky River 280-foot span at Cleveland, the Grafton bridge in New Zealand, and the 234-foot arch at Peterborough and the memorial arch at Minneapolis.

At the conclusion of the address slides were shown of engineers famous in bridge building and various notable bridges, throughout the world.

Calgary Branch

G. P. F. Boese, A.M.E.I.C., Secretary-Treasurer.
W. St. J. Miller, A.M.E.I.C., Branch News-Editor.

The following extract from a paper read at the nineteenth annual meeting of the Western Canada Irrigation Association held at Kelowna, B.C., in July, may prove of general interest to readers of *The Journal.* Although this paper was not presented at a branch meeting of *The Institute*, the fact that it was delivered by one of our members and is a subject of considerable interest to engineers, would warrant its appearance in these columns.

Irrigation Flumes

The paper delivered by P. J. Jennings, M.E.I.C., was of interest particularly to those who derive a living from the products of the land and who at one time or another have experienced trouble and annoyance with the use of flumes. Trouble invariably does occur and any information on the subject of flumes is bound to be of use.

Mr. Jennings gave the results of his observations as a government inspecting engineer. Following his enumeration of the various types of metal and wooden flumes and pipes, he outlined certain attempts that have been made from time to time to avoid corrosion by the application of tar to which is added ten per cent Portland cement to counteract the acidity of the tar. Also the use of zinc sheets as well as a coating of cement mortar on wooden structures over expanded metal. He referred to joint leakage in some detail and pointed out how the factor of quality of material, chemical composition of the water, slope, and amount of silt passing play an important part in the life of any flume. Wood piling, he added, must be deeply set in the ground to avoid lifting action due to frosts, and in zinc flumes without expansion joints, a section here and there must be removed in the fall. Expansion joints are necessary in all other types of metal flumes and are generally a common source of leakage. He mentioned that electrolytic action is possibly more noticeable in galvanized steel flumes than in those constructed of pure iron galvanized sheets, especially when alkali is present in the water. He quoted the statement of one manufacturer that if proper protective treatment is applied every two or three years the life of the flume may be estimated at from 25 to 30 years. Another point of importance brought out by the speaker was that the section of the metal flume at the end structure should be as near as possible the true shape that the flume would assume when loaded and not a true semicircular section. In other words it should take the form of a hydrostatic catenary, the concrete outlet being built to accommodate this shape.

In conclusion he advocated creosoting the timber for all sub-structures in contact with the ground, or where, and whenever possible the use of concrete pedestals, also the periodic painting of all metal flumes with either coal-gas tar with Portland cement or one of the high grade manufactured bitumistic paints, especially at the joints to guard against rusting and the effects of chemical action.

Application of Water on the Land

Another paper of particular interest was that delivered by W. H. Snelson, A.M.E.I.C., on the best means to employ in the application of water on the land. This is a subject that is seldom properly understood by the average farmer and consequently Mr. Snelson's advice should prove of great benefit to irrigationists. It is anticipated that his paper in full will be published by our contemporary "The Irrigation Review".

An Apology

Owing to a misapprehension the name of Dr. Savage was given wrongly in the last issue. Since quite early times he has been known as Hiram N., and not Norman H. We apologize profusely for the misnomer, and are at a loss to know how it was we allowed our imagination to run so wild.

Moncton Branch

M. J. Murphy, A.M.E.I.C., Secretary-Treasurer.

A special supper-meeting was held at the Barker House, on September 30th, to welcome R. J. Durley, M.E.I.C., general secretary of *The Institute*, on the occasion of his first official visit to the branch.

C. S. G. Rogers, A.M.E.I.C., chairman of the branch, presided. Mr. Durley gave an instructive address on *Institute* affairs, referring particularly to the work of branches in western Canada. He gave a detailed account of the professional meeting held at Banff in July last, and his story of life under canvas proved extremely interesting. In fact, Mr. Durley's entertaining and witty remarks carried the writer back to student days at McGill, when even thermodynamics was made to appear a bright and airy dream. That is, until exams. rolled round with their cold and cruel awakening.

Reference was made to the endeavours of Council to solve the problem of remuneration, and also to the matter of supplying technical information to members of *The Institute*.

A lively discussion arose over the make up of *The Journal*. A number present were of the opinion that more space should be devoted to the personal activities of members, together with a brief description of the work in which they were engaged. It was contended that long technical articles, dealing only with a special branch of engineering, were of interest only to the few engaged in that particular work. The suggestion was made that papers read before the branches should be published in the form of transactions and sold to members desiring them.

A. Lorne McKendrick rendered several very enjoyable vocal selections, and the Juvenile Harmony Kings orchestra was present and furnished music during the course of the supper.

Montreal Branch

C. K. McLeod, A.M.E.I.C., Secretary-Treasurer.
Stanley A. Neilson, A.M.E.I.C., Branch News Editor.

Evolution

The winter season of the Montreal Branch was opened on October 1st, when Dr. L. E. Pariseau, head of the X-ray department of the Hôtel-Dieu, and one of the finest lecturers who has ever spoken before the branch, took as his subject "Evolution". This is the third time that Dr. Pariseau has been on the programme, and, as usual, he filled the hall.

Dr. Pariseau began his discourse by pointing out that evolution was no new idea. The early philosophers, Ananimander, 600 B.C., and Aristotle, amongst others, advanced the view that all things had their origin in water and in other elements. Aristotle went a step farther than most and saw the law of changes and their causes. But these thinkers, for the most part, were but guessing, albeit cleverly, at the explanation of things.

The fathers of the Church, St. Augustine and St. Gregory, also made their guesses at evolution. But it was fossils and their explanation that focused attention on the subject.

With the Renaissance came a slightly better understanding and it was that universal genius, Leonardo Da Vinci, who showed the clearest comprehension of the underlying principles. At this stage the fundamentalists stepped in and began to muddle matters. This period was followed by a stage when perfunctory explanations of things were received with little thought. Then it was that Bishop Ussher was able to gain a following with a statement that the world began on the 26th, of October, 4004 B.C., at 9 o'clock in the morning. At the end of the 18th century a serious beginning of study into the question of species and their plasticity was made by Buffon, the naturalist.

Lamarck and St. Hilaire, the real fathers, perhaps, of evolution put forward theories of the species, but their ideas were nebulus, functioning rather as an explanation of changes in species. All these men and many other clever thinkers were, however, not given credit and matters were at a standstill for a time.

When Darwin published his book "The Origin of Species", he put evolution on a fairly scientific basis and abundant proof of the varying of species was put forward.

Summing up the proofs of evolution, Dr. Pariseau referred to the evidence of the rocks, where was found perhaps the most impressive evidence of all — the sequence in the chronological order of the various strata, and the varying kinds of fossil life found in them. Then there was the geographical distribution of flora and fauna, and classification and embryology.

Speaking of embryology, the speaker stated that at certain stages in the development of the human embryo it was practically impossible to distinguish it from that of the pig, monkey or fish. Even the human embryo at times in its development had rudimentary gills, a tail, and was covered with a thick growth of hair, and formed what was almost a recapitulation of the whole of animal life.

Dr. Pariseau concluded his address with a plea that scientific subjects be given scientific study, pointing out that nothing disgusted him more than to see fundamentalists taking mistakes that scientists made and using them 75 years after, brandishing them as follies of to-day.

Some discussion followed after which a vote of thanks was proposed by Prof. C. M. McKergow, M.E.I.C., and tendered to the speaker by the chairman, J. L. Busfield, M.E.I.C.

Hydraulic Regulating Gates

Fred. Newell, M.E.I.C., mechanical engineer, the Dominion Bridge Company, took the above as the subject of the paper which he read before the Montreal Branch on October 8th. The meeting was attended by a very large number of members, and there was considerable discussion following the paper. Mr. Newell's paper is published in full in this issue of *The Journal*.

J. A. McCrory, M.E.I.C., occupied the chair.

American Society of Civil Engineers, Fall Meeting

Hydro-electric development was the principal subject of discussion at the Fall Meeting of the American Society of Civil Engineers held on October 14th to 16th, 1925, in Montreal. Other subjects of interest to city planners, to sanitary and to structural engineers were also discussed. Leading civil engineers from various parts of the United States and Canada attended the meeting.

Not the least of the interest to the visitors was the opportunity afforded for visiting the attractive city of Montreal, viewing its extensive harbour development and inspecting the large power plants on the St. Maurice river.

The technical session of Wednesday, October 14th, was devoted entirely to the consideration of the question of hydro-electric development in Canada, with main papers delivered by acknowledged experts in this subject. O. O. Lefebvre, M.E.I.C., chief engineer of the Quebec Streams Commission, and a member of the Canadian Section, Joint Board of Engineers, St. Lawrence Waterways Project, discussed the work of the Quebec Streams Commission; Frederick A. Gaby, M.E.I.C., chief engineer of the Hydro-Electric Power Commission of Ontario, spoke on developments by the Hydro-Electric Power Commission of Ontario; the third main address was by Ira W. McConnell, vice-president of Dwight P. Robinson and Company, New York, whose subject was "Some Economic Aspects of Hydro-Electric Development in Canada". During the afternoon, this whole general topic was thrown open to public discussion, led by prominent Canadian and American engineers, including H. G. Acres, M.E.I.C., N. R. Gibson, M.E.I.C., William S. Lee, M.E.I.C., D. W. Mead, Julian C. Smith, M.E.I.C., and Arthur Surveyer, M.E.I.C.

The morning of Thursday, October 15th, had been set aside for the meetings of the various technical divisions of the Society. The Sanitary Engineering Division, following a paper on "The Water Supply of Montreal", by F. E. Field, M.E.I.C., division engineer of the Montreal Water Board, conducted a symposium on grit chamber practice, in which F. A. Dallyn, M.E.I.C., director of sanitary engineering division, Board of Health of Ontario, described Canadian procedure, George B. Gascoigne, consulting sanitary engineer of Cleveland, spoke of American practice, and Karl Imhoff, noted as the chief engineer of the Ruhr-Verband, Essen, Germany, outlined German practice.

The City Planning Division in laying out its programme co-operated with the Town Planning Institute of Canada which joined with it for this session. James Ewing, M.E.I.C., consulting engineer of Montreal, vice-president of the Town Planning Institute of Canada, spoke on "The Engineer and the Town Plan", and Gerard H. Matthes, consulting engineer of New York City, had as his topic "Aerial Photography Maps for City Planning".

The third division to meet on Thursday morning was the Structural Division which considered three topics: "Producing a Concrete of Uniform Quality on the Job" by R. B. Young, M.E.I.C., of the Hydro-Electric Power Commission of Ontario; "Concrete Proportioning and Testing on Exchequer Dam (California)" by L. H. Tuthill; and "Water Ratio Specification for Concrete" by F. R. McMillan and Stanton Walker of the Structural Materials Research Laboratory, Lewis Institute, Chicago, Ill.

The natural attractions of Montreal and the international flavor of the meeting provided the occasion for several delightful social events. Between the sessions of the Wednesday programme, a luncheon was held at which the Honourable Joseph L. Perron, minister of roads, Montreal, gave an address on "The Roads of the Province of Quebec". That same evening, a Smoker given by members of the Montreal Branch of *The Engineering Institute of Canada* to visiting members and their engineer guests. This meeting, aside from its entertaining features, gave opportunity for social contact between American and Canadian engineers.

Following the meetings of the technical divisions, the whole of Thursday afternoon was devoted to a luncheon and inspection trip around Montreal harbour. The luncheon was served through the courtesy of the Cunard Line and the White Star Dominion Line on board two large ocean liners, the "Aurania" and the "Megantic". Following the luncheon, the party was shown around the harbour, visiting many points of engineering interest, including the cold storage warehouse, one of the newest and most up-to-date of the facilities of the modern harbour of Montreal.

The formal social event of the meeting was a dinner-dance on Thursday evening in the Grand Ballroom of the Mount Royal hotel.

The last day of the meeting, Friday, October 16th, was devoted to an all-day excursion, by special train from Montreal, to visit power developments on the St. Maurice river, with luncheon enroute furnished by courtesy of the Shawinigan Water and Power Company, Limited.

This excursion was popular with the visiting engineers, providing, as it did, not only intensely interesting inspection of noted engineering works but also the opportunity for visiting friends.

The local committee on arrangements consisted of: — Frederick W. Cowie, M.E.I.C., chairman, C. B. Brown, M.E.I.C., J. L. Busfield, M.E.I.C., R. J. Durley, M.E.I.C., J. M. R. Fairbairn, M.E.I.C., C. H. Keefer, M.E.I.C., R. S. Lea, M.E.I.C., H. M. MacKay, M.E.I.C., C. N. Monsarrat, M.E.I.C., Julian C. Smith, M.E.I.C., Arthur Surveyer, M.E.I.C., and K. B. Thornton, M.E.I.C.

Ottawa Branch

F. C. C. Lynch, A.M.E.I.C., Secretary-Treasurer.

The Royal Canadian Air Force and its development along the lines of civil aviation was the theme of an interesting address given before the Ottawa Branch at a luncheon on October 6th, by Capt. J. Stanley Scott, M.C., A.F.C., A.D.C., director of the Force.

Capt. Scott drew attention to what the Canadian Air Service had already accomplished in the salmon fisheries, in the prevention of smuggling, in forest fire protection and in surveying.

All the flying officers on the Pacific coast are sworn in as fishery inspectors and patrol the fishing grounds for the suppression of illegal fishing, netting, etc.; wireless communication is maintained from the air craft to the stations. Ships suspected of bringing in narcotics and other contraband material are kept under observation to detect any attempt to dispose of illegal cargoes. Forest fires, when seen, are reported by wireless to the fire rangers. The work of aerial photographs for mapping and records has reached a very high stage of usefulness and accuracy.

The address was illustrated by lantern slides showing the various aviation fields of the Dominion and the different uses to which aeroplanes have been put since the war.

A. F. Macallum, M.E.I.C., chairman of the local branch, presided.

Peterborough Branch

Paul Manning, A.M.E.I.C., Secretary.
W. E. Ross, A.M.E.I.C., Branch News Editor.

The regular meeting of the season was held on the evening of September 22nd, in the Chamber of Commerce, with A. L. Killaly, A.M.E.I.C., the chairman of the branch, in the chair, and with a goodly number of members and friends in attendance.

Economic Results of the Use of Electric Power

C. M. Ripley, E.E., of the Publicity Department of the General Electric Company, Schenectady, N.Y., gave an illustrated address on "Some Economic Results of the Use of Electric Power" in which, with the aid of lantern slides including photographs, charts, and diagrams he drew comparisons between the installed horsepower of electrically driven machinery and the production per capita in several basic industries in Great Britain and in the United States.

The speaker especially stressed the fact that in the application of modern machinery and methods in the handling of materials, in land transportation, and in the domestic field, the North American continent is far ahead of Europe, where, he stated, the outstanding impression gained by the visitor is that human beings do the work of machines.

Mr. Ripley, during a recent visit to Europe, travelled extensively on the regular aeroplane routes, and by request, after the conclusion of his scheduled address, showed a series of very interesting slides covering the established aeroplane services of Europe, and gave a further short talk on this subject. He said, in part, that although our European neighbours are so far behind us in the use of up to date machinery and methods in many branches of industry, they are far advanced in the development of passenger and mail transportation by air. Some remarkable aeroplane photographs of the Alps were included in this group of slides, also views of various continental cities and photographs of the latest types of machines used by the various European and British air lines.

Moving pictures were shown depicting the manufacture of a modern electric locomotive at the Erie works of the General Electric Company, and of the operation of the locomotive on the Chicago Milwaukee and St. Paul Railroad; and a further film illustrating the manufacture of a small electric motor.

At the conclusion of the meeting the chairman expressed the thanks of the branch to Mr. Ripley for his very interesting and instructive discourse.

Central Ontario Power Sytem

The second regular meeting was held on Thursday, October 8th, when C. F. Publow, assistant station engineer of the Hydro-Electric Power Commission for this district, gave a paper entitled "The Central Ontario Power System".

Mr. Publow gave a short history of the system from 1916, when it was taken over by the commission, to the present time, describing briefly the chief features of each of the stations, and showing by the aid of diagrams the complete transmission system, which consists of a series of loops connecting the nine stations, which operate in parallel, and which includes about 400 miles of 44,000-volt lines, 14 miles of 11,000-volt lines, and 36 miles of 6,600-volt lines.

The speaker described the general protective systems in use, and devoted some time to the question of regulation, illustrating how the governors at all stations are set relative to the Healy Falls station so that the latter is a reference point for the whole system.

Of special interest was a section of the paper devoted to the automatic stations at dams 8 and 9 on the Trent river. These stations which have but recently been completed, are somewhat unusual, in that they both contain three generators the control of which is entirely automatic. These stations are controlled by the supervisory system. The operator at Ranney Falls station, approximately four miles distant, having complete control of the starting, stopping and load regulation of each machine. At the control station indications are furnished of the gate opening of each of the automatically controlled machines and the water level in the forebay of each station. The total output and the total reactive kva of each station are also indicated at the control station.

A rather unusual feature of these automatically controlled stations is the fact that no low voltage bus is installed; each machine feeding directly through its individual transformer to the high voltage bus. The governors on all of the machines in both of these stations are equipped with an electrically operated valve of special design for use with the automatic control system.

The paper was fully illustrated with photographs and diagrams, and was greatly appreciated by those in attendance. R. L. Dobbin, M.E.I.C., was the chairman of the meeting and tendered the thanks of the branch to Mr. Publow for his very interesting paper.

Sault Ste Marie Branch

A. H. Russell, Jr.E.I.C., Secretary-Treasurer.

The regular monthly meeting was held at the Y.W.C.A. on September 25th, following a dinner of the members and guests. Wm. Seymour, M.E.I.C., chairman, called the meeting to order and disposed of the general business and then, under the guidance of Mr. Vandusen, local manager, and Mr. Tushingham, wire chief, the members were taken through the local Bell Telephone building at 8.20 p.m.

The first department visited was the power room in the basement, which contains one 4-h.p., generator, capacity of 100 amp., two mercury arc rectifiers used in charging large storage batteries, located in adjoining room. A power panel for the control of batteries and machines is also located in power room, as well as the ringing machines, used in signaling operations.

The storeroom was then inspected and as in all large companies the slogan "A place for everything and everything in its place" was well carried out.

On the next floor is the ladies rest room with its comfortable chairs and couches. Adjoining the rest room is the kitchen equipped with an electric stove for the use of the night operators. The top floor, where the large cables of 400 pair enter the building from a manhole in the roadway, was then visited.

The most modern equipment is installed in the wire chief's office, allowing the tester to determine the nature and location of the trouble on the lines or apparatus. The tone test is used for locating trouble in the cables. The toll lines are all numbered and can be tested very accurately by the use of the wheat-stone bridge method.

The office is connected to Sudbury by telegraph as well as long distance lines, and on the "phantom" circuit a telegraphic message may be sent while the circuit is also being used for telephonic conversation. While the members were present Mr. Tushingham put a call through to Sudbury, a distance of approximately 200 miles, in about five seconds.

The rear of the switchboard was examined and proved a complicated system to the layman. The actual operation of the switchboard was also very interesting to the members. The board has 20 positions with 16 in use and from 21,000 to 29,000 calls are attended to daily. The capacity of the switchboard is 5,600 phones, and there are about 3,600 connected at present. Each call comes in at seven different places on the switchboard thus making delays in getting connections few and far between. Each operator has seventeen pairs of cords and these are often all in use at one time, which demonstrated the necessity of having calls come in at the different points in order to get efficient service.

Mr. Tushingham pointed out the interesting fact that the telephone pole at west end of the steel plant was the farthest westerly pole of the Bell Telephone system in Canada.

Our criticisms of the telephone service will end with our visit, as our eyes were opened to the efficient way in which everything in the exchange was handled. A hearty vote of thanks was tendered to the Bell Telephone officials for their kindness and courtesy during our inspection trip through the local plant.

St. John Branch

W. J. Johnston, A.M.E.I.C., Secretary-Treasurer.

Visit of General Secretary

On September 25th, 1925, the Saint John Branch was honoured by a visit from R. J. Durley, M.E.I.C., general secretary of *The Institute*. Mr. Durley spent the day in calling generally on the members of *The Institute* and again met a number at dinner at the Admiral Beatty,—Saint John's new hotel. After dinner the members were addressed by Mr. Durley who spoke on *Institute* affairs. The Western Professional Meeting held at Banff in June last was described, also the visit of the secretary to the branches of *The Institute* in western and central Canada. By the close attention given Mr. Durley, who spoke for over an hour it was shown that members of *The Institute* are interested generally in what other branches of *The Institute* are doing. En route to Saint John, Mr. Durley visited a number of branch members at Fredericton.

Branch Members attend Halifax Meeting

Fifteen members of the Saint John Branch recently returned from Halifax after attending the Maritime Professional Meeting. The members are all pleased with their trip and of the very complete arrangements made by the several committees of the Halifax Branch for this meeting. An unusual feature of the programme was a motor trip of about 120 miles, affording the visitors an opportunity to see various points of interest and also of comparing the several types of construction on Nova Scotia highways.

Concrete Construction

On October 15th, a branch meeting was addressed by E. Viens, M.E.I.C., director of laboratory for testing materials of the Department of Public Works, Ottawa, speaking on the subject of concrete construction and methods to follow in obtaining good concrete.

Dealing with the subject of cement the speaker mentioned the chemical composition of the Portland cement in common use and also of the aluminium and titanium cements, and of the chemical re-action in each case when they are used in making concrete.

Grading the aggregate in proper proportions of sand and gravel or crushed stone was shown to be one of the most important points in making concrete. The speaker showed by actual tests how an increase of from 40 per cent to 70 per cent in strength had been obtained by regrading the materials in different proportions or adding a third material to fill the voids in the aggregate, but using the same amount of cement in each case, and that this had been obtained at little or no increase in cost.

The proper quantity of water to be added was explained and the danger of the common practise of adding too much water that the concrete may be placed more easily in the forms. The proper amount of water to use may be checked by the Abrams slump test. The bulking effect of the sand due to moisture was shown to be one of the features commonly disregarded, but that concrete of greater strength and less cost may be produced by making proper allowance for it. A new machine called the inundator was described by which the proper proportions of sand, gravel, cement and water, as determined from previous laboratory tests, might be controlled and kept constant.

About thirty lantern slides were shown, one set consisting of the results of laboratory tests, and the other set showing views of concrete construction in different parts of the country. G. G. Murdoch, M.E.I.C., acted as chairman and extended a vote of thanks to Mr. Viens on motion of Geoffrey Stead, M.E.I.C., and A. G. Tapley, A.M.E.I.C.

Joint Meeting with Minnesota Engineers

For two days on Thursday and Friday, August 20th, and 21st, there was held at Winnipeg what was termed a "Get-Together" Convention, attended by architects and engineers from the states of Minnesota, Dakota, Iowa and the province of Manitoba. The Minnesota Surveyors' and Engineers' Society has in the past held similar meetings at various points and as early as last May plans were laid to make this year's meeting an international one, joining with the engineers and architects in the province of Manitoba.

The arrangements for the entertainment of the visitors were in the hands of several professional associations and other organizations in Winnipeg, including the Winnipeg Branch of *The Engineering Institute of Canada.* The headquarters of the meeting was at the Marlborough Hotel, and the registration included 137 from Minnesota and approximately 100 from Manitoba.

The first day of the meeting was spent in automobile tours in the neighbourhood of Winnipeg, affording an opportunity for the visitors to become acquainted with the local engineers. The afternoon of the first day was devoted to the technical programme, including the presentation of a number of papers on subjects of engineering interest. In the evening a dinner dance was held, over which C. H. Attwood, A.M.E.I.C., chairman of the Winnipeg Branch of *The Institute*, presided and during which short addresses were made by His Worship, Mayor R. H. Webb, D. L. McLean, A.M.E.I.C., Deputy Minister of Public Works, and President W. T. Ryan of the Minnesota Federation. The following day was spent in visiting the Winnipeg Hydro-Electric Plant as the guests of the City of Winnipeg Hydro.

German Engineering Society issue Interesting Volume

A special number of the well known Zeitschrift des Vereines Deutscher Ingenieure (Journal of the Society of German Engineers) has been issued on the occasion of the Society's 1925 General Meeting, and contains a series of noteworthy articles, for the most part taken from papers presented at that time or at assemblies of the various Branches of the Society. One of the most interesting items describes the origin and development of the great German Technical Museum in Munich, which was commenced in 1906 and finally opened in 1925. Its collections are not only of historic value, but also serve as an inspiring record of the development of all branches of German industry.

The number also contains a report on industrial research in the United States, and articles on the functions of machinery in increasing the efficiency of German agriculture; on the hemp industry; on the use of Diesel engines for locomotive work; on American practice in steam boiler construction, and on Technical Education.

Nearly four hundred pages of advertising matter, much of it very striking, give a vivid impression of the activity with which German engineering industry is endeavouring to extend and consolidate its influence.

A Course in Industrial Metallography

Under the auspices of the Department of Metallurgy at McGill University an extension course in metallography will be given as usual by Harold J. Roast, and Charles F. Pascoe.

The course consists of fifteen periods, held Monday nights at the Chemistry building, McGill University, commencing on Monday, November 2nd, at 7.30 p.m. The fee for the course is $20.00.

Application should be made to J. W. Jeakins, secretary, Extension Department.

In past years the course has been composed of Mechanics, Engineers, and Chemists, and those desiring a winter hobby or whose business brings them in contact with metals and who desire to have more knowledge of their composition. *No previous knowledge is assumed* and the course is essentially practical from first to last.

Ferrous and non-ferrous metals are dealt with, training being given in preparing them for examination under the microscope and finally photographing the various structures developed.

A Course in "Metallurgical Analysis"

This course consists of fifteen periods and will be held Wednesday evenings at the Chemistry building, McGill University, at 7.30 p.m., commencing Wednesday evening November 4th. Fee $20.00.

Instruction will be given in the installation of a works laboratory, sampling of various works products, and the usual routine of a works chemists, including the analysis of brasses, bronzes, white metals, steel and iron and the ordinary ores and slags. Only fast and commercially accurate practical methods are taught.

Application should be made to J. W. Jeakins, secretary, Extension Department, or to the lecturer Harold J. Roast, McGill University.

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Engineering Index

This Index is prepared by the American Society of Mechanical Engineers.

In this department will be published from month to month the titles of current engineering papers with the authors and source and a brief extract of the more important. It is designed to give the members of The Institute a survey of all important articles relating to every branch of engineering profession.

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A

ACCIDENTS

Industrial. Industrial Accidents and Hygiene. Monthly Labor Rev., vol. 21, no. 2, Aug. 1925, pp. 152-159. Accident Experience of metals and woodworking sections of National Safety Council; coal mine fatalities in United States in 1924; metal-mine accidents in United States in 1923; coal-mine accidents in Colorado, 1924; mine and mill accidents in Idaho.

AERODYNAMICS

Experiments. Recent Experiments at the Göttingen Aerodynamic Institute, J. Ackeret. Nat. Advisory Committee for Aeronautics—Tech. Memorandums, no. 323, July 1925, 22 pp., 18 figs. on supp. plates. Systematic experiments with Joukowski wing profiles; experiments on airplane model with built-in motor and functioning propeller; rotating cylinder (Magnus effect). Translated from Zeit. für Flugtechnik u. Motorluftschiffahrt, Feb. 14, 1925.

AIR COMPRESSORS

Explosions. Air Compressor Explosions, Chas. H. Bushnell. Power, vol. 62, no. 9, Sept. 1, 1925, p. 319, 4 figs. Considerations which lead to following conclusions: Use low flash-point lubricating oil; do not use more oil than necessary; exclude all combustible dust; keep valves in good condition; removes such deposits as cannot be prevented.

The Prevention of Explosions in Air Receivers, Wm. F. Parish and Wm. B. S. Whaley. Instn. Petroleum Technologists—Jl., vol. 11, no. 50, June 1925, pp. 305-310. Suggestions are offered which, it is hoped will make clear the reasons for many air-compressor explosions, origin of which were thought to be mysterious; solution of problem of explosions in air receivers.

AIR CONDITIONING

Odors. Odors. Am. Soc. Civ. Engrs.—Proc., vol. 51 no. 6, Aug. 1925, pp. 1166-1197. Discussions of following papers: Laws Relating to Obnoxious Odors, I. I. Goldsmith; Methods for Determining Origin, Prevalence, and Effect of Obnoxious Odors and Evaluation of an Odor Nuisance, S. DeM. Gage; Elimination of Odors from Garbage Disposal Works, S. A. Greeley; Control of Odors from Sewage Treatment Plants, J. F. Skinner; The Detection and Elimination of Odors from Oil Refineries, R. S. Weston.

AIRPLANE ENGINES

Radiators. Further Experiments on Honeycomb Radiators, R. G. Harris and L. E. Caygill. Aeronautical Research Committee, Reports & Memoranda, No. 952, Nov. 1924, 20 pp., 21 figs. on supp. plates.

Variation of Power With Height. The Variation of Engine Power With Height, H. M. Garner and W. G. Jennings. Aeronautical Research Committee, Reports & Memoranda, No. 961, Sept. 1924, 3 pp., 6 figs. on supp. plates.

Variation of Engine Power With Height, H. L. Stevens. Aeronautical Research Committee, Reports & Memoranda, No. 960, Aug. 1924, 8 pp., 11 figs. on supp. plates.

AIRPLANE PROPELLERS

Characteristics. Airscrews and Gears. Aeroplane, vol. 28, nos. 15 and 21, Apr. 15 and May 27, 1925, pp. 358, 360 and 522, 524, 6 figs. Discusses airscrew characteristics and efficiency from practical point of view; variable-pitch airscrews.

Independence of Elements of Blade. Experiments to Verify the Independence of the Elements of an Airscrew Blade, C. N. H. Lock, H. Bateman and H. C. H. Aeronautical Research Committee, Reports & Memoranda, No. 953, Nov. 1924, 4 pp., 4 figs. on supp. plates.

AIRPLANES

Airfoils. Lift and Drag of Two Aerofoils Measured Over 360° Range of Incidence, C. N. H. Lock and H. C. H. Townend. Aeronautical Research Committee, Reports & Memoranda, No. 958, Nov. 1924, 5 pp., 4 figs. on supp. plates.

Body Design. Discontinuous Flow Around the Edge of a Bluff Obstacle, L. W. Bryant and D. H. Williams. Aeronautical Research Committee, Reports & Memoranda, No. 962, Jan. 1925, 4 pp., 9 figs. on supp. plates.

Gliders. Relation of "Lilienthal Effect" to Dynamic Soaring Flight, R. Fick. Nat. Advisory Committee for Aeronautics—Tech. Memorandums, no. 324, July 1925, 14 pp., 7 figs. on supp. plates.

Light. The English Light Plane Meeting. Aviation, vol. 19, no. 19, Sept. 7, 1925, pp. 282-284, 4 figs. Royal Aero Club meeting at Lympne fails to bring out many new light-plane designs; engine performance greatly improved.

The Light Airplane, I. H. Driggs. Nat. Advisory Committee for Aeronautics—Tech. Memorandums, no. 326, Aug. 1925, 34 pp., 13 figs. on supp. plates.

Test Data Reduced to Standard Conditions. The Reduction of Airplane Flight Test Data to Standard Atmosphere Conditions, W. S. Diehl and E. P. Lesley. Nat. Advisory Committee for Aeronautics—Report, no. 216, 1925, 18 pp., 8 figs.

Wings. Computation of Cantilever Airplane Wings, I. Thalau. Nat. Advisory Committee for Aeronautics—Tech. Memorandums, no. 325, July 1925, 21 pp., 15 figs. on supp. plates.

ALLOYS

Aluminum. *See Aluminum Alloys.*

Brolunick. The New Alloy "Brolunick" [Note sur un nouvel alliage (Le Brolunick)]. Fonderie Moderne, vol. 19, Aug. 1925, p. 163. A bronze-aluminum-nickel alloy, made by a process which insures complete deoxidation and homogeneity; has a low melting point; combines characteristics of steel and advantages of aluminum bronzes.

Copper. *See Copper Alloys.*

Iron. *See Iron Alloys.*

Lead. *See Lead Alloys.*

Volume Change during Solidification. On the Measurement of the Change of Volume in Alloys during Solidification, H. Endô. Japanese Jl. Physics, vol. 3, nos. 7-10, 1924, p. 16 (Abstracts). Results of measurements on change of volume in six useful alloys during solidification; results obtained for change of volume during melting or solidification, as well as mean coefficient of cubical expansion from room temperature to its melting state are given in tabular form.

ALUMINUM ALLOYS

Airplane-Engine. Aluminium Alloys for Aeroplane Engines, F. C. Lea. Roy. Aeronautical Soc.—Jl., vol. 29, no. 176, Aug. 1925, pp. 338-400, 68 figs.

Aluminum-Copper-Zinc. On the Constitution of Alloys of Aluminum, Copper, and Zinc, D. Hanson and M. L. V. Gayler. Inst. Metals—advance paper no. 10, for mtg. Sept. 1-4, 1925, 45 pp., 59 figs. Objects or research were to confirm or disprove existence of invariant points as found by Jares, and to determine constitutional changes which take place below solidus in alloys containing up to 25 per cent copper.

Castings. Testing for Perosity in Aluminum Castings, Rob. J. Anderson. Metal Industry (Lond.), vol. 27, no. 7, Aug. 14, 1925, pp. 145-146, 1 fig. Various methods for testing for perosity in aluminum-alloy castings. Abridgment from article in monthly review section of Am. Metal Market.

Corrosion. Passification and Scale Resistance in Relation to the Corrosion of Aluminium Alloys, L. H. Callendar. Inst. Metals—advance paper, no. 4, for mtg. Sept. 1-4, 1925, 25 pp., 14 figs.

Properties. The Properties of Some Aluminium Alloys, H. Hyman. Inst. Metals—advance paper, no. 12, for mtg. Sept. 1-4, 1925, 21 pp., 8 figs.

AMMONIA CONDENSERS

Shell-and-Tube Type. Shell and Tube Type Ammonia Condensers, Design and Methods of Construction, L. H. Burkhart. Refrig. Eng., vol. 12, no. 1, July 1925, pp. 1-4 and (discussion) 4 and 8-9, 4 figs. First consideration in design is capacity of condenser; most economical size of tubes has been found to be 2 in. in diam.; layout of tube; determination of thickness of shell and tube sheets; electrically welded joints and their comparison with other types of joints.

ARCHES

Calculation. Calculation of Arches Subjected to Oblique Pressure (Calcul des arcs soumis à des forces obliques), Rogoff. Génie Civil, vol. 87, no. 8, Aug. 22, 1925, pp. 156-158, 6 figs. Developments for approximate calculation for reinforced-concrete or metal frames; double-hinged, parabolic and circular arches.

ARMATURES

Rewinding D. C. Rewinding Direct-Current Armatures, F. Huskinson. Power, vol. 62, no. 9, Sept. 1, 1925, pp. 321-324, 8 figs. Explains different operations in rewinding armature, from stripping off old winding and taking winding data to making armature ready for service again.

Winding. Direct Current Armature Windings for Multi-Polar Generators and Motors—Frogleg Windings, W. H. Powell and G. M. Albrecht. Iron & Steel Engr., vol. 2, no. 9, Sept. 1925, pp. 345-354, 13 figs. Reviews development of art in winding of drum-type d.c. armatures, and describes recent improvements made in balancing of circuits whereby commutation has been improved, capacity increased for given speed or speed increased for given capacity, etc.; tests made under abnormal conditions to show effect of balanced windings when magnetic circuits have been unbalanced.

ASBESTOS

Asbestos-Bakelite Composition. A New Acid-Resisting Constructional Material. Chem. Trade Jl., vol. 77, no. 1995, Aug. 14, 1925, pp. 183. New asbestos-bakelite composition being put upon market under name of Haveg by Saurescbutz G. m. b. H., of Berlin, Germany; on account of its favourable mechanical, thermal, and chemical properties, is recommended for construction of large pieces of chemical plant.

AUTOMOBILE ENGINES

Carburetors. *See Carburetors.*

AUTOMOBILE FUELS

Gasoline. *See Gasoline.*

AUTOMOBILES

Brakes. Development of Difficulties and the Design of Hydraulic-Brake Units, H. E. Maynard. Soc. Automotive Engrs.—Jl., vol. 17, no. 3, Sept. 1925, pp. 231-235, 6 figs. Describes general construction of system but dwells more particularly upon development of major elements and difficulties overcome in search for entirely satisfactory materials; development of flexible leads; how piston cup was developed; search for suitable liquid; neutralized castor oil and alcohol adopted.

AVIATION

Forest Fire Patrol. Aerial Fire Patrol on the National Forests, P. G. Redington. Aviation vol. 19, no. 9, Aug. 31, 1925, pp. 248-249. Experience of first season; results of three years' work.

Radio Navigation. The Drift of an Aircraft Guided Towards its Destination by Directional Receiving of Radio Signals Transmitted from the Ground, E. P. Warner. Nat. Advisory Committee for Aeronautics—Tech. Notes, no. 220, June 1925, 5 pp., 2 figs. on supp. plate. To determine loss of efficiency resulting from curvature of path, calculations have been made for two particular cases by method of step-by-step integration.

B

BEAMS

Reinforced-Concrete. Graphical Method of Determining the Spacing of Bent-up Bars and Stirrups in Reinforced Concrete Beams, T. H. P. Veal. Concrete & Constr. Eng., vol. 20, no. 8, Aug. 1925, pp 422-425, 3 figs. Outlines method which may be used in determining spacing of bent-up bars and stirrups in reinforced-concrete beams of type commonly met with in design of floor systems.

BEARINGS, BALL

Ball Quality and Bearing Life. Relationship of Ball Quality to Bearing Life, H. G. Freeland. Am. Soc. Steel Treating—Trans., vol. 8, no. 3, Sept. 1925, pp. 309-323, 1 fig. Describes important fundamentals governing design, manufacture, application and care of bearing; points out necessity of using high-grade steel for manufacture of balls and ball races, and outlines methods used in inspecting steel and finished product; steels that contain certain defects are not suitable for bearings and these factors are discussed.

BEARINGS, ROLLER

Timken. Changes in Timken Bearings Improve Design and Production, H. Chase. Automotive Industries, vol. 53, no. 11, Sept. 10, 1925, pp. 420-421, 5 figs. Longer life and ability to run more quietly at high speed are among advantages claimed for new processes; nickel-molybdenum steel substituted for chromium steel; noise measured by radio.

BLAST-FURNACE GAS

Utilization. The Development of Steam Power from Blast Furnace Gas, Gordon Fox. Gas Engr., vol. 41, nos. 590 and 591, June and July, 1925, pp. 129-130 and 156-157. Gives typical data relating to use of gas from 600-ton blast furnace.

BLAST FURNACES

Charging. Recent Mechanical Chargers for Blast Furnaces, J. M. Ringquist. Indus. Mgmt. (Lond.), vol. 12, no. 8, Aug. 1925, pp. 398-402, 3 figs. Describes installation of bucket system of charging in South Wales. (Abstract.) Paper read before Cleveland Inst. Engrs.

BOILER EXPLOSIONS

Marine Boilers. Cause of the "Mackinac" Explosion at Newport, R.I. Power, vol. 62, no. 8, Aug. 25, 1925, pp. 307-308, 2 figs. Examination of boiler shows that explosion was caused by rupture of circulating-drum sheet. See also reference in same journal, no. 9, Sept. 1, 1925, pp. 348-349, 1 fig.

BOILER FEEDWATER

Concentration. Concentration in Boilers, G. D. Bradshaw. Engrs.' Soc. West. Pa.—Proc., vol. 41, no. 4, May 1925, pp. 105-118 and (discussion) 119-132, 4 figs. In summing up situation with respect to boiler concentration, outstanding fact is that balance is always established between impurities entering boiler with feedwater, and sum of impurities leaving with blow-off and leaving in steam; it is last two items which determine degree of boiler concentration; in order to reduce heat losses as much as possible blow down should be kept low; when concentrations have been measured, check upon them should be obtained by working up "dirt balance".

BOILER FURNACES

Air Preheaters. Extending the Heat Cycle in Boiler Rooms by the Use of Preheated Air for Combustion Purposes, Jos. G. Worker. Iron & Steel Engr., vol. 2, no. 9, Sept. 1925, pp. 391-398, 14 figs. Points out elements that require consideration in design of modern preheater stoker plant.

Design and Practice. Modern Boiler House Furnace and Stoker Practice. Eng. & Boiler House Rev., vol. 39, no. 1, July 1925, pp. 3-8, 6 figs. Deals with principal developments in furnace and stoker practice.

Hog-Fuel Firing. Logging—Newsprint Manufacture—Hog Fuel. Mech. Eng., vol. 47, no. 9, Sept. 1925, pp. 773-775. Discussion of papers on these subjects presented at Portland Regional Mtg., Portland, Ore.

BOILER OPERATION

Performance Chart. Boiler Performance Chart, G. H. Sheasely. Power, vol. 62, no. 12, Sept. 22, 1925, pp. 446-447, 1 fig. Presents chart which is arrangement of values given in Marks and Davis' steam tables in such manner as it is believed will cover maximum range of operating conditions within minimum of chart space.

BOILERS

High-Pressure. Adaptation of Water-Tube Boilers to High Pressures (Adaptation des générateurs aquitubulaires aux pressions élevées), M. Emanaux. Revue Industrielle, vol. 55, no. 2192, July 1925, pp. 305-307. Author shows that in case of new water-tube boiler designed for higher pressure, it is possible, without appreciably modifying conditions of circulation to reduce diameter of water and increase steam production per square meter per hour; superheater eliminates necessity for perfect separation of steam in steam drum itself.

Oil-Fuel Burning, Combustion Losses in. Combustion Losses in the Burning of Fuel Oil Under Boilers, G. G. McVicker. Nat. Engr., vol 29, no 9, Sept. 1925, pp. 409-411. An analysis of the different losses occurring in combustion of fuel oil under power boilers.

Weymouth, Mass., Station. The 1,200-Lb. Boiler and Turbine at Weymouth. Power, vol. 62, no 11, Sept. 15, 1925, pp. 394-398, 9 figs. Details of boiler and turbine and explanation of methods of operation.

BOLTS

Special Dimension Requirements. Special Bolt Dimension Requirements, A. L. Greene. Iron Age, vol. 116, no. 9, Aug. 27, 1925, pp. 532-533, 1 fig. Suggestions to purchasers to be specific if delays or errors are to be avoided; illustrates 5 types of bolts, showing dimensions necessary in ordering.

BORING MACHINES

Locomotive Driving-Wheel Centers. Boring and Facing Machine for Driving Wheel Centres. Machy. (Lond.), vol. 26 no. 674, Aug. 27, 1925, pp. 686-688, 3 figs. Machine built by G. & A. Harvey, Glasgow, and installed in locomotive shops of Lond., Midland & Scottish Ry. Co., Horwich.

BRAKES

Design. Locomotive Brake Design, D. Angus and C. R. Barefoot. Can. Ry. Club—Official Proc., no. 24, no. 4, Apr. 1925, pp. 54-61. Two articles on brake design.

BRASS

Electric Melting. Melting Brass and Bronze Electrically. West. Machy. World, vol 16, no. 8, Aug. 1925, pp. 333-335, 3 figs. Advantages of electric melting; methods of application; material used in charging brass furnaces.

Iron Impurity in Cast. Iron Impurity in Cast Red Brass. Foundry Trade Jl., vol. 32, no. 470, Aug. 20, 1925, p. 166. It has been ascertained from results of tests that magnetic property of cast brass is not reliable index of iron content of cast metal.

BRASS FOUNDRIES

Lighting-Fixture Castings. Making Castings for Lighting Fixtures, H. R. Simonds. Foundry, vol. 53, no. 17, Sept. 1, 1925, pp. 679-683, 12 figs. Large Connecticut manufacturer operating small brass foundry at loss, enlarged foundry, installed modern equipment and methods, and is operating department at substantial profit.

BRIDGE CONSTRUCTION

Allegheny River, Pa. The Bridge-Raising Program on the Allegheny River in Allegheny, V. R. Covell. Engrs.' Soc. West Pa.—Proc., vol. 41, no. 3, Apr. 1925, pp. 81-97 and (discussion) 98-104. Notes on navigable streams; existing bridges deemed obstructions to navigation; contest over alteration order; approval bodies; design of bridges; bridges in detail.

BRIDGE DESIGN

Early American. American Metal Bridges Fifty Years Ago, C. Gayler. Eng. News-Rec., vol 95, no. 10, Sept. 3, 1925, pp. 385-386, 3 figs. Turning point in designing practice; influences for improvement elimination of cast-iron members

BRIDGES, CONCRETE

Repairing. Repairing a Failed Concrete Arch at Asheville, J. B. Hutchings, Jr. Eng. News-Rec., vol. 95, No. 11, Sept. 10, 1925, pp. 430-431, 5 figs. End arch of bridge of six 75-ft. spans sheared at spring line; restored by tangential jacking after blocking up.

Trough-Shaped. Trough-Shaped Concrete Bridge Resists Flotation, C. A. Bock. Eng. News-Rec., vol 95, no. 11, Sept. 10, 1925, pp. 416-419, 7 figs. Deck tied to flexible concrete piers adds weight and eliminates necessity of providing rollers in Pueblo Bridge.

BRIDGES, RAILWAY

Reconstruction, Arkansas. Reconstruction of White River Bridge, De Valls Bluff, Ark. for C.R.I. & P. Ry., A. S. Armstrong. West. Soc. of Engrs.—Jl., vol. 30, no. 8, Aug. 1925, pp. 352-359, 5 figs Details of reconstruction work involving many difficulties.

Waterproofing. The Waterproofing of Railroad Bridges, G. A. Haggander. West. Soc. of Engrs.—Jl., vol. 30, no 6, June 1925, pp. 260-274, 16 figs. Importance of careful attention to waterproofing of railroad and other overhead structures to prevent expensive repairs due to leakage. Gives specifications for work found most satisfactory to date.

BRIDGES, SUSPENSION

Wind Pressure. Action of Wind on Floor of a Suspension Bridge (Action du vent sur un tablier de pont suspendu), E. Pigeaud. Génie Civil, vol 87, no 4, July 25, 1925, pp. 84-85, 1 fig. Describes a method for calculating approximately action of wind on bridge floor and suspension cables.

BROACHING MACHINES

Interchangeable, for Keyways. Interchangeable Broaches for Keyways. Machy. (Lond.), vol. 26, no. 671, Aug. 6, 1925, pp. 592-595, 2 figs., 3 tables. Method of designing cutters that will permit broaching of one size keyway in bores of different size with one cutter.

BRUSHES

Carbon. Relation Between Abrasiveness and Hardness of Carbon Brushes, W. C. Kalb. Power, vol. 62, no. 8, Aug. 25, 1925, pp. 293-294. Author shows that of two grades of brushes containing same amount of abrasive material, soft grade will be more abrasive that hard one; shows also that these two characteristics occupy two different fields in quality of brushes with very little overlapping and it is essential that purchaser of brushes understand this distinction.

BUSES

Trolley. A New Electric Trolley Omnibus. Engineer, vol. 140, no. 3634, Aug. 21, 1925, pp. 196-198, 6 figs. Advantages of railless trolley, and speed, power and acceleration obtained during actual tests with demonstration vehicle, details of which are given.

The Latest Trackless Trolley Car. Motor Transport (Lond.), vol. 41, no. 1068, Aug. 17, 1925, pp. 205-206, 2 figs. Notes on latest production of Richard Garrett and Sons, Ltd., London, Eng.

The Latest Railless Chassis. Motor Transport (Lond.), vol. 41, no. 1065, July 27, 1925. pp 119-12, 6 figs. Particulars of new design of chassis with brakes on all four wheels and a new type of back axle that enables a low floor level of 2 ft. 4 in. to be obtained.

C

CABLES, ELECTRIC

Underground. Calculation of the Electrical Problems of Transmission by Underground Cables, D. M Simons. Elec. Jl., vol 22, no. 6, June 1925, pp. 366-384, 3 figs Assembly of data so as to assist in calculating any of ordinary electrical problems in underground transmission; includes formulas which are considered best adapted to practical calculation of problems met in cable engineering, of which majority are not presented for first time. Full bibliography is included in appendix.

CANALS

Permissible Velocities. Permissible Canal Velocities, S. Fortier and F. C. Scobey. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 7, Sept. 1925, pp. 397-413. Use of relative high velocities reduces cost of canal per unit length; limit of velocities permissible is somewhat less than velocities that will erode canal bed; determination of permissible velocities is not possible from data on transporting velocities or mere non-silting velocities; presence or absence of colloidal matter is of prime importance.

CAR LIGHTING

Costs. St. Paul Makes Study of Car Lighting Costs. Ry. Elec. Engr., vol. 16, no 8, Aug. 1925, pp. 233-237. Merits of 11 different plans are compared; new development and annual costs are determined.

CARBURETORS

Rayfield Model K. Carburetor Combines Advantages of Air Valves and Plain Tube Types. Automotive Industries, vol. 53, no. 11, Sept. 10, 1925, pp. 409-410, 2 figs. Simplicity of construction and low cost are features of new Rayfield design introduced by Beneke Mfg. Co. as Model K.

CARS, PASSENGER

Power-Saving. Energy Saving Reduces Maintenance Costs in St. Louis, A. M. Brinkman. Elec. Ry. Jl., vol. 66, no 3, July 18, 1925, pp 87-90, 2 figs. Electric equipment maintenance and brakeshoe replacement on United Rys Co. of St Louis show decided reduction following installation of economy meters; analysis of cost curves shows amount creditable to meters.

CAST IRON

Machinability. Hardness Governs Machinability, Jas. Ward. Foundry, vol 53, no 17, Sept 1, 1925, pp 684-687, 12 figs Difficulty in machining cast iron offers co-operative problem for machine-shop superintendent and foundryman; discusses general phases of machinability of cast iron, and effect of factors occurring in machining operations.

Metallurgy of. Principles of Metallurgy of Ferrous Metals for Mechanical Engineers, L Cammen. Mech Eng , vol 47, no. 9, Sept 1925, pp 735-742, 7 figs. Deals with cast iron. Various kinds of cast irons; annealed gray cast iron; alloying elements in cast irons; cast iron as affected by high temperatures. Bibliography.

CASTING

Economical Design. Economical Casting Design, F. C. Edwards. Metal Industry (Lond.), vol. 27, no. 8, Aug. 21, 1925, pp. 169-171, 5 figs. Points out imperative need for designing casting on lines that facilitate molding, obviate contraction stress, and which involve minimum of fettling; importance of section on molding clearance; relation of shape to contraction; economic design eliminates deep joint or core; how elimination of small radius gave appreciable economy.

CATALYSIS

Industrial Application. Application of Catalysis in the Chemical Industries (Les applications de la catalyse dans les industries chimiques), P. Pascal. Technique Moderne, vol. 17, no. 15, Aug. 1, 1925, pp. 449-456, 5 figs. Discusses catalytic reactions in oxidation, hydrogenation, synthetic methyl alcohol, hardening of fats, hydrogenation of aromatic hydrocarbons, berginization and cracking.

CENTRAL STATIONS

Auxiliaries and Auxiliary Drives. Auxiliaries and Auxiliary Drives for Steam Electric Generating Stations, A. L. Penniman, Jr., F. W. Quarles. Iron & Steel Engr., vol. 2, no. 9, Sept. 1925, pp. 377-384, 6 figs. Study of problems of station auxiliaries and auxiliary drives as influenced by design of steam-electric stations, based largely on experiences obtained in operating fairly large central station.

Boston, Mass Mechanical Design of Weymouth Power Station, E. W. Norris. Mech. Engr., vol 47, no. 9, Sept 1925, pp. 719-723, 13 figs. Choice of steam pressure and temperature; boilers; feedwater circuit; flow-control system; auxiliary equipment.

Heat Balance Power Station Heat Balance. Power, vol. 62, no. 11, Sept. 15, 1925, pp. 426-427. Prime Movers Committee of N. E. L. A. reports continued developments; motor drive of auxiliaries still in favour; bleeder heating in from 2 to 4 steps the standard practice; new type of bleeder heater developed; rapid introduction of full-voltage starting for a.c. motors.

Hydro-Steam Plants. The Parallel Operation of Hydro and Steam Plants, F. A. Allner. Mech. Eng., vol. 47. no. 9, Sept. 1925, pp. 727-731, 7 figs. Operating and economic features that should receive careful attention; hydro-steam parallel operation may produce favourable operating combination as these two sources of power can supplement each other to mutual advantage.

Steam, Developments in. Development in Steam Power Plants and Their Effect on Thermal Efficiency, E. Berg. Inst. Elec Engrs. of Japan—Jl., no. 442, May 1925, pp. 456-464, 1 fig. Steam engines versus steam turbines; table giving theoretical water rates per kilowatt hour; recent developments; thermal efficiency; turbine design; material; improvements in thermal efficiency of turbine; plant thermal efficiency; marine practice. (In English.)

CIRCUIT BREAKERS

High-Voltage. High-Voltage Circuit Breaker Tests, P. Sporn and H. P. St. Clair. Electrician, vol. 95, no. 2468, Sept. 4, 1925, pp. 262-264, 9 figs. Tests made at 132 kv. show that capacities of 725,000 kva. can be interrupted successfully; details of connections and results observed.

Oil Purification. Purifying Circuit Breaker Oil, L. H. Clark. Elec. World, vol. 86, no. 12, Sept. 19, 1925, pp. 562-565, 3 figs. Combined centrifugal and chemical treatment purifies carbonized oil produced in oil breakers; new process used and typical installations and results presented; estimate of costs of installations.

Oil Type. New Super Tension Switchgear. Electrician, vol. 95, no. 2466, Aug. 21, 1925, pp. 208-209, 2 figs. High-rupturing-capacity outdoor oil circuit breaker for 88,000-volt service; general features of design.

Selection and Maintenance of Oil Circuit Breakers, M. J. Wohlgemuth and E. K. Read. Iron & Steel Engr., vol. 2, no 9, Sept. 1925, pp. 398-405, 16 figs. Attempts to show how it is possible to calculate what requirements of necessary switching equipment will be to handle service that is demanded, and also care necessary to keep this equipment in good operating condition.

CITY PLANNING

Excess Condemnation. Excess Condemnation in City Planning—A Symposium. Am. Soc. Civ. Engrs.—Proc , vol. 51, no 7, Sept. 1925, pp 1416-1452, 18 figs Contains following contributions: Present Status of Excess Condemnation in the United States, F. B Williams; Use of Excess Condemnation in Opening, Widening, and Extension of Streets, A L. Vedder; Need and Scope of Excess Condemnation, Chas W. Leavitt; Excess Convemnation in Massachusetts, F H Fay.

Hexagon Cell System Arterial Highways and Hexagonal Planning, N. Cauchon. Can Engr., vol. 49, no 4, July 28, 1925, pp. 170-172, 2 figs. Describes new system of town planning known as "hexagon cell" or residential honey comb system. From article in Town Planning, Jl. of Town Planning Inst. of Can.

CLAY

Grit Determination in. Determination of Grit in Clays, G. M. Darby. Chem. & Met. Eng., vol. 32, no. 14, Aug. 1925, pp. 688-690, 2 figs. Comparison of centrifugal, flotation, elutriation and screening methods for classifying fine suspensions.

COAL

Carbonization. Smokeless Fuel; The Present Position and Future Possibilities, C. H. Lander and M. Fishenden. Chem. & Industry, vol. 44, no. 50, July 24, 1925, pp. 375T-382T. Points out that there unquestionably exists urgent need for eliminating loss of by-products involved in domestic use of raw coal, and for replacing latter by some form of smokeless fuel; most suitable process of carbonization to meet this need must depend largely upon local conditions, and future developments; but solution of problem may well prove to lie, not in any single method of carbonization, but in several, each operating in circumstances most favourable to its particular requirements.

United States. Empirical Relations for Coals in the United States, F. C. Evans. Cornell Univ., College of Eng., Bul. Eng. Exper. Sta., no. 3, Jan. 15, 1925, 28 pp., 29 figs. Geology of coal in United States; determination of heating value of combustible from proportion of volatile matter in combustible; determination of per cent total carbon in combustible from volatile matter in combustible; determination of hydrogen in combustible from per cent volatile matter in combustible; estimating proportion of total carbon and hydrogen in combustible of cretaceous and tertiary coals.

COAL HANDLING

Piers. New Coal Terminal of the Virginian Railway, C. Gray. Ry. Elec. Engr., vol. 16, no. 8, Aug. 1925, pp. 244-246, 3 figs. Huge pier, electrically equipped, is capable of handling enormous tonnage in record time.

COLLOIDS

Structural Engineering, Significance for. Colloidal Phenomena and Their Significance to the Structural Engineer, O Oesterblom. Instn. Engrs. (India) — Jl , vol. 5, Apr. 1925 pp. 52-60 and (discussion) 124-133 (including bibliography). From viewpoint of structural engineering, two phenomena are at present specially significant and important, viz: Setting of certain gels into fixed bodies of definitely established shapes and sizes; change of water contents of these fixed gels and in connection therewith changes of volume and temperature.

COLUMNS

Reinforced-Concrete. Criticism of the Joint Committee Concrete Column Formulas, J. Feld. Eng. News-Rec., vol. 95, no. 12, Sept. 17, 1925, pp. 477-478, 2 figs. Comparisons between them and some other theories and codes show they restrict design.

COMBUSTION

Gaseous. Gaseous Combustion at High Pressures, Wm. A. Bone and D. T. A. Townend. Roy. Soc.—Proc., vol. 108, no. A747, July 1, 1925, pp. 393-418, 7 figs. Explosion of hydrogen-air and carbon monoxide-air mixture at varying initial pressures up to 175 atmos.

CONCRETE

Alumina Cement. Close Water Control Important in Alumina Cement Concrete, P. H. Bates. Eng. News-Rec., vol. 95, no. 12, Sept. 17, 1925, pp. 462-463. Tests show that concrete made from high-early-strength cement can readily be affected by excess mixing water.

Field Control. Practical Field Control of Concrete, T. P. Watson. Eng. and Contracting (Gen. Contracting), vol. 64, no. 2, Aug. 19, 1925, pp. 419-425, 7 figs. Methods employed by Pennsylvania R.R. in scientific design of concrete for Beck's Run bridge in Pittsburgh, Pa.; this project involved placing of 5000 cu. yd. of mass concrete and 10,000 cu. yd. of reinforced concrete. From paper read before Am. Concrete inst.

Quick-Hardening. Making Quick-Hardening Concrete of Standard Portland Cement. Rock Products, vol. 28, no. 16, Aug. 8, 1925, pp. 52-53. Method adopted by Indiana State Highway Commission for making repairs that can be open to traffic in two days.

Specifications. Report of the Joint Committee on Standard Specifications for Concrete and Reinforced Concrete. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 7, Sept. 1925, pp. 1485-1537, 7 figs. Discussion of Report published in Oct. 1924 issue of Proceedings. For reference to report, see Eng. Index 1924, p. 180.

CONCRETE CONSTRUCTION

Precast Flooring and Paving Units. Pre-Cast Concrete Flooring and Paving Units. Can. Engr., vol. 49, no. 6, Aug. 11, 1925, pp. 211-212, 3 figs. Convenient and durable substitute for wood; time saved and traffic disruptions minimized in reconstruction work; Jordan, Ont., bridge floor replaced ready for traffic in three days; many applications: advantages claimed.

CONDENSERS, STEAM

Performance, Checking. Checking the Performance of Surface Condensers and Cleaning for Maximum Efficiency, Chas. E. Colborn. Power, vol. 62, no. 11, Sept. 15, 1925, pp. 405-407, 2 figs. Systematic checking of performance; data on results obtained from cleaning of condensers by various means.

CONDUITS

Penstocks. Unusual Penstock Arrangement at White River Plant. Eng. News-Rec., vol. 95, no. 11, Sept. 10, 1925, pp. 422, 3 figs. Economical scheme for supplying new unit from two existing pipe lines involves "fish-mouth" connections.

Underground, Montreal. The Municipal Underground Conduit System of Montreal, G. E. Templeman. Eng. Jl., vol. 8, no. 9, Sept. 1925, pp. 367-376, 18 figs. Organization, preliminary investigation, and details of installation features; provision of duct space; duct sections; layout of runs and manholes; operation, maintenance and costs.

CONTRACTING

Unsound Position of. What Is the Matter with Contracting? J. Barney. Eng. News-Rec., vol. 95, no. 12, Sept. 17, 1925, pp. 456-459. Author seeks to depict unsound situation that exists in contracting business. Discusses ignorance of costs, poor estimating, no distinction of class, inadequate engineering, hazards in plans and specifications, poor judgment of wage and price markets, disposition to gamble, need of co-operation and organization.

COPPER ALLOYS

Copper-Zinc. The *B* Transformations in Copper-Zinc Alloys, J. L. Haughton and W. T. Griffiths. Inst. Metals—advance paper, no. 11, for mtg. Sept. 1-4, 1925, 9 pp., 8 figs Study of change of electrical resistance with change of temperature it is shown that resistance rises with temperature, rate of change of resistance increasing steadily as temperature rises until 470 deg. cent. is reached, when very marked and sudden decrease in temperature coefficient of resistance is observed.

Copper-Tin. The Alpha-Phase Boundary in the Copper-Tin System, D. Stockdale. Inst. Metals— advance paper, no. 16, for mtg. Sept. 1-4, 1925, 9 pp., 13 figs. Results of investigation lead to conclusion that solidus is smooth curve, slope of which is least when tin content is highest; change occurs in certain of alloys of 590 deg. cent.; this is due to polymorphic transformation in *B* phase.

ZINC-COPPER. On the Constitution of Zinc-Copper Alloys Containing 45 to 65 Per Cent of Copper. M. L. V. Gayler. Inst. Metals—advance paper, no. 8, for mtg. 1-4, 1925, 10 pp., 10 figs. In course of investigation of critical point of brass, author made investigation of constitution of alloys containing 47-65 per cent of copper; great care was taken to ensure that alloys examined were in equilibrium at definite temperatures.

CORES

CORE-MAKING MACHINE. A Power-driven Core-making Machine. Foundry Trade Jl., vol. 32, no. 470, Aug. 20, 1925, p. 155, 1 fig. Machine designed and put upon market by Geo. Green & Co., Keighley, Yorks, Eng.; in addition to possessing range from 3-8 in. to 7 in. in cylindrical cores, it is also capable of making special shapes, such as squares, hexagons, ovals and flats, while in every case cores are vented automatically throughout their length.

CORROSION

BUILDINGS AND APPARATUS, PREVENTION OF. Avoiding the Effects of Corrosion on Buildings and Apparatus, W. S. Calcott. Chem. & Met. Eng., vol. 32, no. 14, Aug. 1925, pp. 684-687. Summary of present materials and methods used where corrosive chemicals must be handled.

ELECTRICAL EQUIPMENT FOR. Electrical Equipment for Cranes. Elec. Times, vol. 68, no. 1759, July 2, 1925, pp. 4-5. Discusses motors, brake solenoids, main switches, fuses, limit switches, cables and conduits, collectors and bare wires.

LEVEL LUFFING. Crane and Grab Installation for Handling Clay and Cement. Indus. Mgmt. (Lond.), vol. 12, no. 8, Aug. 1925, pp. 395-397, 3 figs. Describes installation in which three level luffing cranes are successfully employed for dual purpose of grabbing clay from Thames barges and loading cement to seagoing vessels.

CUTTING METALS

BRASS. High-Speed Cutting of Brass and other Soft Metals in Standard Machine Tools, O. D. Burlingame. Mech. Eng., vol. 47, no. 9, Sept. 1925, pp. 705-712, 14 figs. Types of machines to use; tools and tooling methods to employ; cutting dry or with coolant; kind of metals to use; examples of work done in screw machine. See (abstract) in Machy. (N. Y.), vol. 32, no. 1, Sept. 1925, pp. 17-18, 2 figs.

D

DAMS

ARCHED. Construction of Arched Barrage Dams in Switzerland (La construction des barrages-voutes en Suisse), H. E. Gruner. Génie Civil, vol. 87, no. 9, Aug. 29, 1925, pp. 181-186, 16 figs. Layout and construction details of dams at Broc over the Iogne (head 105 m.), and at Amsteg over the Reuss (head 270 m.); dimensions, stablity calculations, expansion joints, observations as to temperature and deformation.

FORMED BY LANDSLIDE. 180-Ft. Dam Formed by Landslide in Gros Ventre Canyon, F. B. Emerson. Eng. News-Rec., vol. 95, no. 12, Sept. 17, 1925, pp. 467-468, 2 figs. Mass of loss rock and earth blocks channel of river; water now running through dam.

MULTIPLE-ARCH. Multiple-Arch Dam at Gem Lake on Rush Creek, California. F. O. Dolson and W. L. Huber. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 7, Sept. 1925, pp. 1310-1332, 11 figs. and (discussion), pp. 1453-1455.) Writers believe deterioration from frost action will occur in any thin concrete structure subjected to water pressure and extreme cold unless concrete can be made 100-per cent waterproof or watertight; results of frost action and repairs necessary to safeguard structure.

SPILLWAYS. Side Channel Spillways: Hydraulic Theory, Economic Factors, and Experimental Determination of Losses, J. Hinds. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 7, Sept. 1925, pp. 1350-1396, 30 figs. Discusses question of prosper location of spillway on ground, and suggests systematic method of determining most economic design; results of experiments at Arrowrock Spillway, and of laboratory experiments at Bellvue, Colo; conclusions are reached that Bernoulli's theorem is not conveniently applicable, and that law of conservation of linear momentum is directly applicable without experimental coefficient, subject only to small correction for swell in volume due to entrained air and unequal distribution of velocities.

DIE CASTING

PISTON MOLDS. Die Casting Piston Molds, G. E. Tennis. West. Machy. World, vol. 16, no. 8, Aug. 1925, pp. 327-328, 2 figs. Principal advantages of process of die mold casting which is rapidly becoming important factor in economical manufacture of interchangeable parts.

DIES

DIE COLLAPSIBLE. Collapsible Dies for Bending Tin Box Ltd, C. J. Williams. Machy. (Lond.), vol. 26, no. 671, Aug. 6, 1925, p. 586-587, 2 figs. Tool was built on substantial sub-press lines for use on inclined press to perform double bend on sheet-tin box lid; shows work and operations carried out.

DIESEL ENGINES

OIL FOR, SELECTION OF. Diesel Oil and Its Selection, P. Aikens. Power House, vol. 18, no. 15, Aug. 5, 1925, pp. 43 and 60. Outlines factors in selecting fuel oil for Diesel operation.

PRACTICE. Practical Diesel Engineering, L. R. Ford. Mar. Eng. & Shipg. Age, vol. 30, nos. 1, 2, 3, 4, 5, 6, 7, 8 and 9, Jan., Feb., Mar., Apr., May, June, July, Aug. and Sept., 1925, pp. 48-51, 110-114, 172-176, 226-230, 287-292, 351-355, 408-412, 466-470, 509-515, 51 figs. Jan.: Derangements in lubricating and air systems; starting difficulties and operating troubles in general. Feb.: Setting cylinder head valves; troubles with valves and how they may be overcome. Mar.: Ignition failures due to insufficient fuel, low compression, late injection, failure of air supply or cold cylinders; engine knocks. Apr.: How to make bearing adjustments for crankpin, crosshead and main bearings; bearing bolts. May: Lubrication; low and high-pressure systems; static and centrifugal filters. June: Air compressors and their operation; spray-air compressors; operating troubles; auxiliary and scavenging compressors. July: Indicator card as aid in Diesel engine operation; taking cards and their interpretation. Aug.: Use of boiler oil as Diesel-engine fuel; operating troubles and methods of overcoming them. Sept.: Obtaining license as motorship engineer; rules of U. S. Steamboat Inspection Service; questions and answers.

DISKS

ROTATING, STRESSES IN. Stresses in Rotating Discs of Hyperbolic Profile, B. Hodkinson. Engineering, vol. 120, no. 3112, Aug. 21, 1925, pp. 215-217, 6 figs. Curves herein given show stresses produced throughout disk by loading at center; using these in conjunction with Knight's curves, complete and mathematically accurate solution is arrived at.

DRILLING

DEEP-HOLE. Deep-hole Prospecting at the Chief Consolidated Mines, Chas. A. Dobbel. Am. Inst. Min. & Met. Engrs.—Trans., no. 1485-A, Sept. 1925, 13 pp., 6 figs. Properties are situated in Tintic mining district of Utah; methods of sampling; uses of deep-hole hammer drill; costs of deep-hole drilling; factors affecting progress; fishing tools for broken or lost steel; cost comparison with diamond drilling; records of data on hammer-drill prospect holes.

SQUARE AND HEXAGON HOLES, TOOLS FOR. Tools and Equipment for Drilling Square and Hexagon Holes. Engineering, vol. 120, no. 3112, Aug. 21, 1925, pp. 242-244, 22 figs. Describes investigation of subject at Keighley Technical School and jigs and tools designed and made in engineering workshop of institution.

DROP FORGING

DEVELOPMENTS. Developments in Drop Forging Production. Forging—Stamping—Heat Treating, vol. 11, no. 8, Aug. 1925, pp. 281-282. Discusses five-point range in carbon and general effect of several alloying elements; care required in heat treating; inspecting shipments.

DRYING

VACUUM. Theory of Vacuum Drying (Théorie des procédés de séchage sous vide), A. Martin. Chimie & Industrie, vol. 13, no. 6, June 1925, pp. 883-889, 3 figs. Theoretical discussion of principles underlying vacuum drying. in course of which equations are derived which give weight of steam necessary and time required for drying of material and which enable thermal efficiency of process to be calculated.

DUST

ATMOSPHERIC. Air Pollution from the Engineer's Standpoint, J. B. C. Kershaw. Engineer, vol. 140, no. 3633, Aug. 14, 1925, pp. 168-169, 2 figs. Review of 10th report of Advisory Committee on Air Pollution published by Meteorological Office, covering observations made and experimental work carried out by Committee during year ending Mar. 31, 1924; London and Glasgow results; other towns; new form of dust counter.

DYNAMOMETERS

DIRECT-CURRENT. Direct-Current Dynamometers, S. Hancock. Elec., Jl., vol. 22, no. 8, Aug. 1925, pp. 385-389, 7 figs. Describes methods of using d.c. motors or generators as dynamometers; first method is principally applicable where speed and voltage are always comparatively high; second method is somewhat more accurate, particularly when machine used as dynamometer is operated at greatly reduced speeds and voltages.

E

EDUCATION, ENGINEERING

VOCATIONAL GUIDANCE. The Educational and Vocational Guidance of Engineering Students and Graduates, H. P. Hammond. Jl. Eng. Education, vol. 15, no. 10, June 1925, pp. 735-750. Consideration of guidance of students and vocational guidance of graduates.

EJECTORS

STEAM. A Steam Ejector for Pumping Low Pressure Steam, M. C. Ernsberger. Sibley Jl. of Eng., vol. 39, no. 6, June 1925, pp. 357-358, 2 figs. Solution of problem on performance of steam-ejector compressor for handling low-pressure steam.

ELECTRIC ARC

SHORT-LENGTH TUNGSTEN. Short-Length Tungsten Arc Characteristics, S. H. Anderson and G. G. Kretchmar. Physical Rev., vol. 26, no. 1, July 1925, pp. 33-43, 7 figs. Methods of investigating characteristics of arcs between tungsten electrodes was a dynamical one; results, giving equations for arc characteristic and for minimal length characteristic.

ELECTRIC DISTRIBUTION SYSTEMS

ALTERNATING CURRENT. Evolution of Alternating-Current Secondary Networks, H. Richter. Elec. Jl., vol. 22, no. 7, July 1925, pp. 320-336, 20 figs. Reviews developments and discusses various present-day systems for load distribution; different types of networks.

AUTOMATIC NETWORK UNITS. Recent Developments in Automatic Network Units, G. G. Grissinger. Elec. Jl., vol. 22, no. 7, July 1925, pp. 336-338, 4 figs. Interlaced or interconnected secondary network system and protective device to prevent feedback of energy from network into faulty feeders.

ECONOMICS OF. Engineering and Economic Features of Distribution Systems Supplying Increasing Load Densities, L. M. Applegate and W. Brenton. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 9, Sept. 1925, pp. 937-942, 12 figs. Outlines general procedure in studying distribution system of Portland Electric Power Co., utilizing standard methods and locally derived costs.

4000-VOLT. The 4000-Volt Distribution System of the Duquesne Light Company, S. Rosenbach. Elec. Jl., vol. 22, no. 6, June 1925, pp. 289-294, 10 figs. Each 4000-volt lighting circuit consists of 3-phase, 4-wire feeder and 2300 volts between each phase and neutral, supplying system of single-phase or 3-phase mains; feeder extends from bus to its 4000-volt feeding point at circuit load center; changeover of entire system to 4000 volts is being made by substation districts.

LOS ANGELES, CAL. Electrical Distribution for a City of Unusual Growth, C. A. Heinze. Elec. Jl., vol. 22, no. 6, June 1925, pp. 261-268, 5 figs. Distribution system of Los Angeles consists of 34 distributing stations and 91 high-voltage industrial substations all receiving their energy over system of 33,000-volt lines.

ELECTRIC FURNACES

HEAT-TREATING. Electric Heat Treating Furnace Applications, E. A. Hurme. Iron & Steel Engr., vol. 2, no. 9, Sept. 1925, pp. 357-368, 14 figs. Notes on soaking pits, reheating furnaces, finishing processes, annealing sheets, bright annealing, foundries, annealing iron castings and steel castings, heat treating, heat-treating tools and dies in electric furnace, hardening, tempering, toughening, case carburizing, malleableizing, heat treating non-ferrous metals, equipment for heat treatment, etc.

HIGH-TEMPERATURE. Electric Furnace with High-Frequency Induction for Very High Temperatures (Fours électriques à induction à haute fréquence pour températures très élevées), G. Ribaud. Académie de Sciences—Comptes Rendus, vol. 180, no. 23, June 8, 1925, pp. 1733-1735. Furnace consists of cylindrical piece of porous carbon forming extension of graphite tube and surrounded by lampblack; porous cylinder is closed by plug of porous carbon and glass top; current of inert gas is passed through; if cylindrical piece and plug are more than 8 cm. long it is possible to open furnace by hand while interior is at 3000 deg.; temperatures obtained are decidedly higher than with furnaces previously described if electrical and volume conditions are made comparable.

MELTING. Electric Melting Furnaces, J. A. Seede. Iron & Steel Engr., vol. 2, no. 9, Sept. 1925, pp. 368-374, 13 figs. In addition to increase of capacity, changes have taken place in transformers, reactance, electrode control, motors, furnace construction and practice, and induction furnaces.

NON-FERROUS METALS MELTING. Induction Heating by Low-Frequency Currents, G. E. Taylor. Elec. Rev., vol. 97, nos. 2491 and 2492, Aug. 21 and 28, 1925, pp. 285-287 and 327-329, 12 figs. Use of induction furnace for melting non-ferrous metals.

RESISTANCE. New Type of Electrical Resistance Furnace. Brass World, vol. 21, no. 8, Aug. 1925, p. 285. Describes design developed by de Roihoil and Cachet; mode of heating is applicable to all types of furnaces employed in industrial operations, by judicious arrangement of component parts; refractories employed in building crucibles are zirconia products; due to their small coefficient of expansion, sudden changes in temperature are not to be feared. Translated abstract from Jl. de Four Electrique.

TEMPERING. Drawing by Convection, J. W. Harsch. Am. Soc. Steel Treating—Trans., vol. 8, no. 3, Sept. 1925, pp. 340-349, 5 figs. Describes electric heating furnace used for tempering hardened steel parts; furnace embodies several novel features, particularly fan system, which provides means of obtaining uniform temperature conditions throughout furnace.

ELECTRIC GENERATORS

GROUNDING OF NEUTRAL. Grounding the Neutral, E. D. Sibley. Iron & Steel Engr., vol. 2, no. 8, Aug. 1925, pp. 331-334, 6 figs. Describes experiences with grounding neutral of generator at West Reading Power Station; interference on dispatching circuit of Pennsylvania R.R., and introduction of filters to improve situation.

WIND-DRIVEN. Windmills and Their Use in Generating Electricity (Les moulins à vent et leur utilisation pour la production de l'électricité), V. Neveux. Electricien, vol. 56, no. 1379, Sept. 1, 1925, pp. 385-389, 1 fig. Details of windmills, dynamos, make and break devices, storage batteries, switchboards, etc.

ELECTRIC LOCOMOTIVES

AXLE DRIVE. Recent Devices for Axle Drive of Electric Locomotives (Dispositifs récents de commande des essieux dans les locomotives électriques). Industrie Electrique, vol. 34, no. 793, July 10, 1925, pp. 296-303, 18 figs. Details of methods employed for transmitting power from motors to axles by Midi and other French companies; various types.

DETROIT & IRONTON RY. D. T. & I. Electric Locomotive Completed. Ry. Age, vol. 79, no. 9, Aug. 29, 1925, pp. 389-392, 5 figs. Deals with unusual features of mechanical construction, such as equalization, transformer and motor-generator mounting, control apparatus, cab and brakes.

ELECTRIC MEASURING INSTRUMENTS

A. C. TEST INSTRUMENTS. Accuracy of Alternating-Current Test Instruments, S. C. Hoare. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 9, Sept. 1925, pp. 969-973, 11 figs. Deals mainly with accuracy of instruments used under maintained conditions of load; well-designed voltmeters, ammeters, and wattmeters show very small errors due to self-heating and changes in ambient temperatures.

ELECTRIC MOTORS

CONTROL. Recent Developments in Electric Motor Control, C. F. Scott. Electragist, vol. 24, no. 10, Aug. 1925, pp. 19-21, 3 figs. Discussion of use of temperature relays and magnetic switches or contactors for building equipment overload, underload, start and stop control.

ELECTRIC MOTORS, A. C.

SLOTS. The Design of Induction Motor Slots, I. C. Wharfe. Electrician, vol. 95, no. 2467, Aug. 28, 1925, pp. 236-237, 3 figs. Open vs. closed slots; choice of type and application of magnetic slot strips.

SUPER-SYNCHRONOUS. The Super-Synchronous Motor, H. C. Uhl. Iron & Steel Engr., vol. 2, no. 8, Aug. 1925, pp. 336-338, 4 figs. Details of design and operation, and summary of advantages.

ELECTRIC TRANSMISSION LINES

PROTECTION. Protective Relays for Central Station Systems, O. J. Bliss. West. Soc. of Engrs.—Jl., vol. 30, no. 5, May 1925, pp. 229-234. Types and characteristics of different systems and their possibilities; performance records.

STORED MECHANICAL ENERGY IN. Stored Mechanical Energy in Transmission Systems, J. P. Jollyman. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 9, Sept. 1925, pp. 948-950, 2 figs. Considers performance of stored mechanical energy in transmission system during changes in load, in input and in transmission capacity.

TRANSMISSION STABILITY. Transmission Stability, C. L. Fortescue. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 9, Sept. 1925, pp. 951-961, 9 figs. Analytical discussion of factors entering into problem. Includes appendix containing review of static stability.

ELECTRICITY

COSTS. Factors Entering into the Cost of Electrical Energy, L. S. Ready. Jl. of Electricity, vol. 55, no. 2, July 15, 1925, pp. 52-57, 7 figs. Traces costs from time of development of power to delivery to consumer; reasons for difference in rates to small and large users.

ELECTRICITY SUPPLY

CUSTOMERS' RECORD SYSTEM. Improved Customers' Record System, M. Barton. Elec. World, vol. 86, no. 11, Sept. 12, 1925, pp. 514-517, 9 figs. Routing and control system facilitate rapid service installation; high moving ratio of customers during peak seasons now gives little trouble to Hartford Central-Station Company.

ELECTRONS

STUDY FOR ELECTRICAL ENGINEERS. The Study of Ions and Electrons for Electrical Engineers, H. J. Ryan. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 9, Sept. 1925, pp. 964-967. Points out that it should be helpful to electrical engineers to acquire knowledge of more important factors in behavior of ions and electrons. Bibliography.

ELEVATORS

CHANGING FROM D.C. TO A.C. Changing Electric Power Source for Elevator Equipment, J. A. Jackson. Power, vol. 62, no. 8, Aug. 25, 1925, pp. 281-283, 3 figs. Where power supply to electric elevators is changed from direct to alternating current, there are six courses available to meet new conditions; each of these is discussed in detail along with some of limitations of a.c. drives for elevators.

CONTROLLERS. Three-Speed Traction Elevator Direct-Current Controller, Chas. A. Armstrong. Power, vol. 62, no. 12, Sept. 22, 1925, pp. 438-441, 4 figs. Explains in detail circuits and operation of 3-speed controller for use on traction elevators.

T-RAILS, PLANING. Planing Elevator T-Rails. Am. Mach., vol. 63, no. 12, Sept. 17, 1925, pp. 473-475, 5 figs. Eight rails machined per setting; from eight to forty tools in operation at once; multi-speed, a.c., reversing motor and motor-operated controlling equipment.

EMPLOYEES' REPRESENTATION

ECONOMIC COUNCILS. The German and French Economic Councils, R. Picard. Int. Labour Rev., vol. 11, no. 6, June 1925, pp. 803-829. Account of tendencies of thought and fact which led to creation of German Federal Economic Council in 1920 and French National Economic Council in 1925; describes machinery of the two institutions and results already obtained from working of former.

EVAPORATORS

SUGAR-FACTORY, REGULATION OF. Regulation in the Evaporation of Sugar. Chem. & Industry, vol. 44, no. 32, Aug. 7, 1925, pp. 794-795, 3 figs. Describes two schemes for evaporator regulation.

EXPLOSIVES

RATE OF EXPLOSION, MEASUREMENT OF. Spark Photography as a Means of Measuring Rate of Explosion, John E. Smith. Physical Rev., vol. 25, no. 6, June 1925, pp. 870-876, 4 figs. Results of study of solid explosives; explosive was placed in long cartridge having excess charges in small equally spaced side openings which were set off in succession as explosive reached them so that each became center of spherical sound wave; instantaneous photograph of shadows of these sound waves was obtained by means of spark which occurred automatically when explosion reached certain opening and closed electric circuit; from radii of spherical waves and distance between couplings rate of explosion was determined.

F

FACTORIES

PRINTING-PRESS. The Modern Manufacturing Plant, J. F. Fallon. Mgmt. & Admin., vol. 10, no. 3, Sept. 1925, pp. 119-124, 4 figs. Describes largest automatic-printing-press factory in world, built by American Type Founders' Co.

FERTILIZERS

DEVELOPMENTS. The Development of Fertilizer Practice, R. O. E. Davis. Am. Electrochem. Soc.—advance paper, no. 5, for mtg. Sept. 24-26, 1925, pp. 49-56. Of particular interest are investigations on potash-bearing silicates; in fixation of atmospheric nitrogen part played by electrochemistry is important one; phosphoric acid from phosphate rock; concentrated fertilizers possible by combination of chemical; trend toward concentrated products; future of industry.

FILTERS

LOSS-OF-HEAD GAGES. Electrically-Operated Gages Devised for Filters, H. N. Jenks. Eng. News-Rec., vol. 95, no. 9, Aug. 27, 1925, pp. 346-348, 4 figs. Loss-of-head gages and valve-opening indicators consist of voltmeters actuated by current varied through reactance coils.

FLAMES

MOVEMENT IN CLOSED VESSELS. The Movement of Flame in Closed Vessels, O. C. de C. Ellis and R. V. Wheeler. Fuel, vol. 4, no. 8, Aug. 1925, pp. 356-361, 17 figs. Results of experiments carried out in connection with work done for Safety in Mines Research Board.

FLOORS

CONSTRUCTION AND UPKEEP. Floors: Their Construction and Up-Keep, K. D. Hamilton. Factory, vol. 35, no. 3, Sept. 1925, pp. 390-394, 440, 442, 444, 446, 448, 450, 452 and 454, 17 figs. Methods for avoiding heavy expenses that come when floors are improperly laid and maintained.

FACTORY. Plant Maintenance—Gearing Up for Low-Cost Production, K. D. Hamilton. Factory, vol. 35, no. 2, Aug. 1925, pp. 201-206, 318, 320, 322 and 324, 20 figs. Deals with problems of floor load; vibration; water conditions; manufacturing processes in which uses of acids, alkalies and oils form important function; trucking conditions, etc., all of which have important influence on selection of factory floor; comparison of wood and concrete; advantages of other types.

FLOW OF FLUIDS

MEASURING NOZZLE. The Flow Measuring Nozzle, A. J. Nicholas. Power, vol. 62, no. 10, Sept. 8, 1925, pp. 365-366, 4 figs. Rigid thermodynamic analysis shows two forms of flow through nozzle or compressible fluids, each form having its own formula; one is defined from other by certain pressure-ratio condition.

VISCOUS FLUIDS. On the Motion of Circular Cylinders in a Viscous Fluids, R. A. Frazer. Roy. Soc. Lond.—Philosophical Trans., vol. 225, no. A 628, June 26, 1925, pp. 93-130, 7 figs. Investigation is restricted to two-dimensional problems in which fluid is supposed bounded by circular cylinders.

FLOW OF GASES

FLOW METER FOR. A Convenient Friction Flow-Meter for Small Rates of Flow of Gas, J. H. Yoe. Chem. & Industry, vol. 44, no. 33, Aug. 14, 1925, p. 432T, 1 fig. New design in Bureau of Mines type of glass capillary flow meter.

FORGING

DURALUMIN. Some Notes on Duralumin Forging, H. A. Whiteley. Forging—Stamping—Heat Treating, vol. 11, no. 8, Aug. 1925, pp. 260-263, 5 figs. Discusses working of duralumin in very comprehensive manner; forging duralumin introduces many difficulties not experienced with steel. Reprinted from Jl. (Brit.) Assn. Drop Forgers & Stampers.

FOUNDRIES

SYSTEMATIZING PRODUCTION. Systematizing Foundry Production, G. L. Lacher. Iron Age, vol. 116, no. 9, Aug. 27, 1925, pp. 527-529, 2 figs. Operations planned for varied line of products and large repair business at foundry of Bucyrus Co., South Milwaukee, Wis.; premium wage scheme of corollary development; check-up by superintendents and formen.

FREIGHT HANDLING

DANGEROUS ARTICLES. Handling Dangerous Articles Safely, H. B. Eyde. Pac. Ry. Club—Proc., vol. 9, no. 2, May 1925, pp. 15, 17, 19, 21, 23 and 25-26. Notes on transportation of explosives, inflammable liquids, compressed gases, corrosive liquids, etc., hazards and precautions.

FUELS

SMOKELESS. Solid Smokeless Fuels, Their Properties and Uses, E. C. Evans. Chem. & Industry, vol. 44, no. 31, July 31, 1925, pp. 383T-391T. Deals with anthracite and dry steam coal; gas and blast-furnace coke; and low-temperature cokes.

See also Coal; Oil Fuel.

FURNACES, HEATING

OXYGEN ENRICHMENT OF COMBUSTION AIR. Some Aspects of Oxygen Enrichment of Combustion Air in Heating-Furnace Practice, W. C. Buell, Jr. Engrs.' Soc. West. Pa.—Proc., vol. 41, no. 4, May 1925, pp. 133-143 and (discussion) 144-155, 3 figs. Study of theoretical, economic and operating factors that will be encountered when free oxygen is added to air and fuel used in developing heat in industrial furnaces.

FURNACES, INDUSTRIAL

COAL-FIRED. New Design of Coal-Fired Furnace. Iron & Coal Trades Rev., vol. 111, no. 2994, July 17, 1925, pp. 87-89, 4 figs. Particulars of coal-fired furnace designed by Bell & Harrod, of Sheffield Works of Brown, Bayley's Steel Wks., Ltd., which in efficiency is equal to gas- or pulverized-fuel-fired furnaces.

G

GASOLINE

Energy Losses in Automobile Engines. Present Automobiles Use Only About 5% of Energy in Gasoline. Automotive Industries, vol. 53, no. 9, Aug. 27, 1925, pp. 334-335, 1 fig. Review of book by T. A. Body, entitled Gasoline, in which author claims 95 per cent either is thrown away entirely or lost in friction.

GEARS

Cast. Cast Gearing. Metal Industry (Lond.), vol. 27, no. 8, Aug. 21, 1925, pp. 171-172. Author considers that far from cast gearing falling right out of use, there has been some revival of its employment in recent years, and that there is decided field in general engineering work for renewed development of cast gear; advocates greater study of cast gearing by young patternmakers.

Gaging. The Three-point Gauging of Gears. Machy. (Lond.), vol. 26, no. 670, July 30, 1925, p. 573, 2 figs. Use of gap gage for gears having unequal number of teeth

Lead, Finding. A Method of Finding Lead Gears, B. M. Haverstick. Am. Mach., vol. 63, no. 11, Sept. 10, 1925, pp. 419-420. Method was developed for purpose of finding four gear combinations where extreme accuracy is desired and at same time to provide method which would be simple and easily understood.

Lubrication. Gear Lubrication. Lubrication, vol. 11, no. 6, June 1925, pp. 71-72, 23 figs. Advantages, purposes, and types of gears; selection of gear lubricants and methods of lubrication.

Planetary. Planetary Gearing, F. D. Furman. Machy. (N. Y.), vol. 31, nos. 5, 6, 7, 8, 9, 10, 11, 12, and vol. 32, no. 1, Jan., Feb., Mar., Apr., May, June, July, Aug. and Sept. 1925, pp. 379-382, 468-472, 553-558, 635-639, 709-714, 803-807, 891-896, 973-978, and 36-41, 61 figs. Jan.: Use of bevel wheels and their effect on analysis and solution of planetary gearing. Feb: Marine reversing gears as examples of planetary form of construction; Ford transmission problems. Mar.: Planetary type of automobile transmission; Watt's sun and planet wheels; planet wheel of internal type. Apr.: Application to marine steering-gear indicator, rope-making machinery, speed reducer, etc. May: Additional examples of planetary-gear construction, illustrating interesting modifications and methods of solution. June: Compound type of planetary mechanism; secondary drive for modifying velocity ratio; multiplying gear; "tell-tale" mechanisms. July: Mechanism of rope-making machine; planet wheels mounted on eccentric; special applications of planetary principle. Aug.: Oldham coupling and its graphical solution; analysis of actions in automobile differential gearing. Sept.: Secondary drives for increasing range of speed ratios; compound planetary trains; form of planetary mechanism for very large speed reductions.

GOVERNORS

Internal-Combustion Engines. Characteristics of the Internal-Combustion-Engine Governor, E. F. Lowe. Soc. Automotive Engrs.—Jl., vol. 17, no. 3, Sept. 1925, pp. 268-270 and (discussion) 270-272, 1 fig. Author cites statistics to show that, although commercial vehicles constitute only 24 per cent of motor vehicles in New York City, 53 per cent of 1924 accidents there were from this source; describes different types of governor available and discusses capabilities of each; states 12 charaeteristics of good governor.

GRAIN ELEVATORS

Baltimore, Md. Locust Point Grain Elevator, B. & O. R.R. Ry. Rev., vol. 77, no. 6, Aug. 8, 1925, pp. 191-196, 10 figs. Improvement consists of reinforced-concrete working house, storage annex consisting of 182 cylindrical tanks, large drier house, dust house, track shed and marine tower with steel conveyor galleries.

GREASES

Properties. Lubricating Greases, Their Compositiou, Properties, and Application, J. E. Babb. Nat. Petroleum News, vol. 17, no. 28, July 15, 1925, pp. 82-83, 85-86, 1 fig. Discusses fatty acid soaps of elements calcium and sodium; soda greases, fiber or sponge greases, solidified oils, properties of greases, bearings, etc.

Use in Lubrication. The Use of Grease in Modern Lubrication Practice, A. F. Brewer. Indus. Mgmt. (N. Y.), vol. 70, no. 3, Sept. 1925, pp. 153-158, 6 figs. Essential difference between grease and oil, and where latter is to be preferred.

GRINDING

Centerless. Theory and Practice of Centerless Grinding, W. J. Peets. Mech. Eng., vol. 47, no. 9, Sept. 1925, pp. 695-700, 14 figs. Advantages and disadvantages; dressing for through-grinding; work guides; producing round work on centerless grinder; production by through-grinding method; straight-in or form grinding. See also (abstract) in Machy. (N. Y.), vol. 32, no. 1, Sept. 1925, pp. 57-59, 3 figs.

GRINDING MACHINES

Circular. The Heim Circular Grinder Without Points (Die spitzenlose Rundschleifmaschine Bauart "Heim"), O. Dähne. Maschinenbau, vol. 4, no. 15, Aug. 6, 1925, pp. 716-717, 5 figs. This grinder consists of two disks, work piece passing between them, one of disks in actual grinder, other, slightly out of parallel, is feed disk, going at 13-30 r.p.m., thus also exerting a braking action; this grinder performs 6-8 times more work than usual type.

Internal. Heald Automatic Internal Grinding Machine. Am. Mach., vol. 63, no. 10, Sept. 3, 1925, pp. 410-414, 6 figs. Describes machine in which movements are fully automatic from moment operator places work p ece in chuck until grinding is completed accurately to gage size.

Roll. Large Roll Grinding Machine. Machy. (Lond.), vol. 26, no. 671, Aug. 6, 1925, pp. 589-591, 5 figs. Machine for grinding body of large rolls or cylinders such as are used in paper, textile, rubber and other industries.

H

HARDNESS

Ball-Indentation Number. A Comparison of Modified Ball-Indentation Hardness Numbers, E. Stanley Ault. Mech. Eng., vol. 47, no. 9, Sept. 1925, pp. 732-734, 2 figs. Modifications proposed by various investigators; summary of search for single number to express indentation hardness independently of load and diameter of ball, and comparison of various methods when applied to accepted data; references.

Magnetic Inspection. Mechanical and Magnetic Hardness, K. Heindlhofer. Iron Age, vol 116, no. 10, Sept. 3, 1925, pp. 606-608, 8 figs. Studies in practical magnetic inspection of ball-bearing races heat treated in quantity; correlation of hardness; results of a.c. magnetic readings taken on large number of hardened ball-bearing rings.

HEAT

Latent, Determination of. Latent Heat Determinations, A. W. Smith. Optical Soc Am.—Jl., vol 10, no. 6, June 1925, pp 711-722. Heat of fusion; method of mixtures; method of cooling; heat of evaporation.

HEAT TRANSMISSION

Graphic Calculation. Solving Heat Transfer Problems Graphically, J. A. Potter, Jr. Chem. & Met. Eng., vol. 32, no. 14, Aug. 1925, pp. 690-691, 4 figs. How simple chart can be used to analyze or synthesize overall rates of heat flow.

HEATING

Industrial. Industrial Heating, H. F. Smith. Am. Soc. Steel Treating—Trans., vol. 8, no. 3, Sept. 1925, pp. 350-356. Discusses industrial heating from viewpoint of engineer; selection of fuel or heat source, liberation of this heat in proper manner and transfer of heat to work; various sources of heat and their advantages and disadvantages; problems of handling various types of fuels and their conversion into heat units; details of furnace design.

HEATING AND VENTILATION

Codes. Wisconsin's Revised Heating and Ventilation Code. Heat. & Vent. Mag., vol. 22, nos. 5, 6, 7 and 8, May, June, July and Aug. 1925, pp. 86-87, 74-75, 89-91, and 76-79. Full text of latest state law adopted Apr. 8, 1925, covering standards for heating and ventilation of public buildings and places of employment.

HIGH PRESSURES

Research in. Certain Aspects of High-Pressure Research, P. W. Bridgman. Franklin Inst.—Jl., vol. 200, no. 2, Aug 1925, pp. 147-160. Outlines briefly results obtained by author in research to determine effects of high hydrostatic pressure on number of physical properties, and suggests their possible significance.

HIGHWAYS

Banked Curves. Designing Banked Highway Curves for Safety, C. J. Myers. Eng. News-Rec., vol. 95, no. 8, Aug. 20, 1925, pp. 303-304, 3 figs. Curve pavement constructed in two strips, each of parabolic section, gives varying bank for different speeds.

Three-Strip Pavement. Massachusetts Building Its First Three-Strip Pavement. Eng. News-Rec., vol 95, no. 8, Aug 20, 1925, p. 299, 1 fig. Reconstruction job of 4-mi. length involves laying of two 10-ft. concrete strips with bituminous center.

HYDRAULIC TURBINES

High-Specific-Speed. High Specific Speed Hydraulic Turbines in Their Bearing on the Proportioning of the Number of Units in Low-Head Hydro-Electric Plants—A Symposium. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 6, Aug. 1925. Contains following papers: High Specific Speed Turbines, Geo. A. Orrok, pp. 1000-1008, 11 figs.; The Propeller Type Turbine, L. F. Moody, pp. 1009-1031, 16 figs.; High-Speed Suction Turbines, F. Nagler, pp. 1032-1042, 9 figs.; High Specific Speed Hydraulic Turbines in Their Bearing on the Proportioning of the Number of Units in Low-Head Hydro-Electric Plants, Gel. A. Jessop, pp. 1043-1049, 9 figs.; Some Applications of the Propeller Type Water Turbine in Europe, Chas. C. Egbert, pp. 1050-1061, 12 figs.; Proportioning of Units in Low-Head Plants, J. P. Hogau, pp. 1062-1064.

Propeller-Type. Hydro Turbines With Propeller Runners, E. J. Taylor. Can. Engr., vol. 49, no. 9. Sept. 1, 1925, pp. 263-265, 5 figs. Notes on European practice; double-runner horizontal turbines frequently installed; Kaplan and Lawaczeck types being employed for fairly large units in Norway and Sweden; Nagler-type runner.

The Wynau Power Station. Elec. Rev., vol. 97, no. 2493, Sept. 4, 1925, pp. 364-365, 3 figs. Particulars of new propeller-type turbine installed in station at Wynau, Switzerland.

Turgo Impulse. Hydraulic Turbines for New Zealand. Engineer, vol. 140, no. 3635, Aug. 28, 1925, pp. 223-224, 5 figs. Hydro-electric plant installed at Christmas Creek for purpose of supplying Westport with electricity; it comprises two similar turbines supplied by single pipe line; each turbine is designed to develop maximum of 208 hp. on net fall of 410 ft., when running at 1000 r.p.m.; they are of Gilkes patented Turgo impulse type which is somewhat similar to Pelton type.

HYDRO-ELECTRIC DEVELOPMENTS

California. Hetch Hetchy Hydro-electric Development of the City of San Francisco, P. J. Ost. Jl. of Electricity, vol. 55, no. 1, July 1, 1925, pp. 25-30, 9 figs. Novel features of 80,000-kva. Moccasin plant of San Francisco, operated by water supply of Hetch Hetchy reservoir.

Hydro-Electric System of Pacific Gas & Electric Company, J. P. Jollyman. Elec. Jl., vol. 22, no. 6, June 1925, pp. 274-277, 5 figs. Details of dams and reservoirs; water conduits; transmission system; steam plants; operation

Pit River Hydraulic Development Involves Novel Features, W. Dreyer and G. R. Henninger. Jl. of Elec., vol. 55, no. 4, Aug. 15, 1925, pp. 118-124, 6 figs. Geologic formation of rock in Pit River basin is such that storage is not required for hydro plants of Pacific Gas & Elec. Co. on that stream; describes the various hydraulic phases of development.

Canada. La Gabelle Hydro-Electric Development, S. Svenningson and J. A. McCrory. Can. Engr., vol. 49, no. 4, July 28, 1925, pp. 161-164, 6 figs. Particulars regarding power development of Shawinigan Water & Power Co., at La Gabelle Rapids on St. Maurice River; initial capacity 120,000 hp. with a normal head of 60 ft.; provision made for a fifth unit; I. P. Morris turbines and Canadian Westinghouse generators.

La Gabelle Power Development an Example of speedy Construction, S. Svenningson and J. A. McCrory. Contract Rec., vol. 39, no. 39, July 29, 1925, pp. 736-740 and 751, 10 figs. Details of dam, power house, construction, concreting methods, and form erection.

Newfoundland. Extensive Hydro-Electric Development and Industrial Project in Newfoundland, A. A. Paoli and F. A. McLean. Elec. News, vol. 34, no. 13, July 1, 1925, pp. 31-37, 14 figs. Large-scale construction works in Humber River valley, started in 1923, to be completed in 1925.

HYDRO-ELECTRIC PLANTS

Automatic. Automatic Hydro-Electric Plant of the San Gorgonic Power Company, P. B. Garrett. Elec. Jl., vol. 22, no. 6, June 1925, pp. 286-289, 4 figs. Unique hydraulic features, necessitating unusual scheme of operation, of 750-kw. automatic hydro-electric generating station near Banning, Cal.; this station, together with 1500-kw. manually operated station on same stream, are leased to and feed into system of Southern Sierras Power Co.

California. Second Largest Plant on Coast Completed by Pacific Gas and Electric Company, G. R. Henninger. Jl. of Elec., vol 55, no. 4, Aug. 15, 1925, pp. 129-137, 11 figs. Pit No. 3, fourth of a series of hydro-electric power houses being constructed by Pacific Gas & Elec. Co. on Pit River, officially dedicated July 18, 1925; this plant embodies many new ideas in design and operation; discusses electrical features of generating station.

Ice Troubles. Ice Troubles in Swedish Power Plants, A. F. Samsioe. Can. Engr., vol. 49, no. 7, Aug. 18, pp. 231-232. Methods employed in dealing with ice formations in hydro-electric plants in Sweden; electricity, steam and hot air used under various conditions. From paper read at World Power Conference.

I

INDUSTRIAL MANAGEMENT

Budgeting. Bell Telephone System Budget Plans, C. A. Heiss. Mgmt. & Admin., vol. 10, no 3, Sept. 1925, pp. 133-136. Provide working basis for co-ordinating activities in light of past experience and careful and logical plans for future.

Cost System, Waste Stoppage through. Our Largest Savings Come from Prompt Costs, H. S. Oven. Factory, vol. 35, no. 2, Aug. 1925, pp. 199-200, 218 and 220. Shows how standard-cost system can be made to function as tool for stopping multitude of wasteful practices within factory.

Departmental Sectioning and Costing. Departmental Sectioning and Costing, W. J. Hiscox. Machy. (Lond.), vol. 26, no. 671, Aug. 6, 1925, p. 605, 2 figs. Brief particulars of scheme of departmental sectionizing devised with view to facilitating costing, which also served to localize various labor units.

Group Simplification. Group Simplification Gains Momentum, R. M. Hudson. Factory, vol 35, no. 2, Aug. 1925, pp. 193-196, and 286. Deals with following questions: Is simplification by group action a paying proposition? Does it work as well in an industry as it does in individual plant? What progress is it making?

Maintenance Jobs, Despatching. A Simple Method for Dispatching Maintenance Jobs, A. F. Graves. Factory, vol. 35, no. 3, Sept. 1925, pp. 384-386 and 402, 3 figs. Describes method used by author to schedule shop orders which have to do with general factory maintenance, and also making an installation of equipment for large manufacturing plants.

INDUSTRIAL PLANTS

Small, Future of. What Is Going to Happen to the Small Manufacturing Plant? D. S. Cole. Indus. Mgmt. (N Y.), vol. 70, no. 3, Sept. 1925, pp 173-177, 1 fig. Question is answered in light of present tendencies; how growth of large plant may seriously affect small plant's market; grouping of small plants about large one, to supply its needs, often breeds ruinous competition; industry's evolution toward co-operation and away from destructive competition; growing tendency toward specialization, and what it means to small plants.

INDUSTRIAL RELATIONS

Trade Organization. Trade Organization and Labour Legislation, J. A. Veraart. Int Labour Rev., vol. 11, no. 6, June 1925, pp. 784-802. Describes first attempt made at setting up economic and legal organization in printing trades of Netherlands, author's efforts to extend system to other industries, and results of these ventures; points out ways in which he considers industrial council superior to works council.

INDUSTRIAL TRUCKS

Electric, in Process Work. Electric Trucks and Tractors in Process Work, H. J. Payne. Chem. & Met. Eng., vol. 32, no. 14, Aug 1925, pp. 695-699, 13 figs. Economies effected by this equipment; sugar-refining practice; paper and pulp-mill application; leather plants and rubber industry.

INSULATION, HEAT

Developments. Modern Developments in Insulation, W. H. Mikkelson. Refrig. Eng., vol. 12, no. 1, July 1925, pp. 7-8. Preparation, application and finish.

INSULATORS, ELECTRIC

High-Voltage. High-Voltage Insulator Development, K. A. Hawley. Elec. World, vol 86, no. 8, Aug. 22, 1925, pp 360-362, 3 figs. Ample safety factors should be used; modern systems demand heavier duty parts; developments in high-strength insulators; protection of units and use of grading shields for arc control.

INTERNAL-COMBUSTION ENGINES

See also Airplane Engines; Automobile Engines; Diesel Engines; Governors; Oil Engines.

IRON

Electrolytic. Making Pure Iron Commercially. Iron Age, vol. 116, no. 11, Sept 10, 1925, pp. 675-679, 7 figs. Initially made in tube form by electrolytic method at Niagara Falls; wide scope of possible uses; process of manufacture; separating tube from mandrel; examples of tests; continuous circuit of electrolyte.

IRON ALLOYS

Cementation by Chromium. Cementation of Iron Alloys by Chromium (Cémentation des alliages ferreux par le chrome), J. Laissus. Académie des Sciences —Comptes Rendus, vol. 180, no. 26, June 29, 1925, pp 2040-2043. Steels of varying carbon content were heated to high temperatures while immersed in powdered ferrochrome, containing 53 to 66 per cent of chromium and varying amounts of carbon; results of microscopical examination; provided carbide of chromium is present, cemented alloy is resistant to action to nitric acid, and also to oxidation at high temperatures.

IRON AND STEEL

Definitions of Terms. Differentiation of Iron and Steel (Qu'est-ce que du fer, qu'est-ce que de l'acier?), A. Sauveur. Revue de Métallurgie, vol. 22, no. 6, June 1925, pp. 355-356.

Magnetic Analysis. Magnetic Analysis Needs More Study. R. L. Sanford. Iron Trade Rev., vol. 77, no 10, Sept. 3, 1925, pp. 555-559 and 595. Indicates something of nature of problem and seeks to arouse interest in fundamental investigation for establishment of basic relationship which must be discovered if magnetic analysis is to take its proper place as one of most powerful tools in hands of physical metallurgist. Published by permission of U. S. Bur. of Standards.

IRON CASTINGS

Shrinkage Stresses. Overcoming Shrinkage Stress in Castings, F. G. Edwards. Machy. (Lond), vol. 26, no. 670, July 30, 1925, p. 571, 2 figs Means of overcoming shrinkage stresses which are produced (1) by different rates of cooling in thin and thick sections of same casting, and (2) by unyielding contour of adjoining parts of uniform section; points out that second source is frequently overlooked.

IRRIGATION

Pipe for. Use of Burned Clay, Concrete and Wood Pipe for Irrigation, R. K. Tiffany. Eng. News-Rec., vol. 95, no. 11, Sept. 10, 1925, p. 419, 2 figs. Some of clay and concrete pipe without bells and with mortar joints and collars; internal expanding forms.

L

LABOUR

Conciliation of Disputes. The Industrial Round Table for Conciliation in Labour Disputes, M. M Marks. Monthly Labour Rev., vol. 20, no 6, June 1925, pp 1-10. Factors to be considered in maintenance of industrial peace; wage-payment plans; unionization matters, dismissals; prevention of disputes; procedure after strike is called; arbitration of differences; compulsory arbitration and investigation; arbitration by commission.

LATHES

Center Break. 25-inch Centre Break Lathe. Machy. (Lond.), vol. 26, no. 672, Aug. 13, 1925, p. 633, 3 figs. Designed to swing work of large diameters while turning and boring comparatively small diameters.

Motor-Headstock Unit, with. Lathe with Motorheadstock Unit. Machy. (Lond.), vol. 26, no. 674, Aug. 27, 1925, pp. 699-700, 4 figs. In latest design of Boehringer lathes, made in Germany, casing of driving motor forms part of headstock, armature spindle pinion transmitting power directly to gear box without intervention of belt and single pulley or chain drive.

Oval Chuck. Oval Chuck Lathe with Trimming and Beading Attachment. Machy. (Lond.), vol. 26, no. 674, Aug. 27, 1925, p. 683, 2 figs. Lathe developed by Hordern, Mason & Edwards, Birmingham, Eng., is intended for trimming and beading at one operation edges of fancy goods, such as silver dishes, trays, and other irregular-shape table and ornamental ware.

Roll-Turning. Roll Turning Lathe of 26-inch Centres. Machy. (Lond.), vol. 26, no. 670, July 30, 1925, pp. 570-571, 2 figs. Lathe constructed by Brightside Foundry & Eng. Co., Sheffield, Eng., for turning roll necks and barrels.

Turret. Typical Turret-Lathe Tooling. Am. Mach., vol. 63, no. 9, Aug. 27, 1925, pp. 353-355, 10 figs. Standard Jones & Lamson tools that enable turret lathes to be quickly set up to handle large variety of work.

LEAD ALLOYS

Anti-Friction. The Influence of Pouring Temperature and Mould Temperature on the Properties of a Lead-Base Anti-Friction Alloy, O W. Ellis. Inst. Metals—advance paper, no. 7, for mtg Sept. 1-4, 1925, 18 pp., 7 figs.

LIGHTING

Buildings. The Natural and Artificial Lighting of Buildings, P. J Waldram Roy. Inst. Brit. Architects—Jl., vol. 32, no. 13, May 1925, pp. 405-426, 30 figs. The eye as measuring instrument of natural and artificial light; difference between natural and artificial light; daylight lamps; color in light; horizontal and vertical illumination; photometers; natural illumination; principles of measuring daylight; light diffusely reflected; reflection from building fronts and light walls; determination of practical problems in natural illumination; picture-gallery lighting; flood lighting.

Factories. Lighting's New Challenge to Management, W. Harrison and R. A. Palmer. Factory, vol. 35, no. 3, Sept. 1925, pp. 378-381, 432 and 434, 7 figs. Survey of current industrial lighting practice.

LIGHTNING ARRESTERS

Connecting. Connection of Lightning Arresters, P. B Yates. Elec. News, vol. 34, no. 14, July 15, 1925, pp. 36-37. Methods of installation; undesirable type of layout; successful method of relieving surges.

LOCOMOTIVES

Consolidation. Consolidation Type Locomotive for Lehigh & Hudson River. Ry Age, vol. 79, no. 10, Sept. 5, 1925, pp. 439-440, 1 fig. Rated tractive force at 85 per cent cutoff is 71,500 lb.; grate area 100 sq. ft. See also description in Ry. Rev., vol. 77, no. 10, Sept. 5, 1925, pp. 339-341, 2 figs.

Diesel-Electric. The First Russian Diesel-Electric Locomotive, J. M. Hackel. Electritchestvo, no. 1, Jan. 1925, pp. 6-13, 5 figs. Description of first 1200-hp. Diesel-electric locomotive built in Leningrad in 1924, according to author's project. (In Russian)

Electric. *See Electric Locomotives.*

Oil-Electric. Oil-Electric Locomotive Performance. Ry. Elec. Engr., vol. 16, no. 8, Aug. 1925, pp. 251-253, 2 figs. Performance data obtained while locomotive was in service on different roads; reduction in fuel, lubrication, per 1000-ton miles and per-mile costs are obtained; stand-by losses reduced.

Lubricants. *See Greases.*

M

MACHINE SHOPS

European, Production Methods in. Production Methods in European Shops, J. Q. Tilson. Am. Mach., vol. 63, no. 12, Sept. 17, 1925, pp. 455-456. Lower wages affect type of machine equipment employed; many American tools are used; quantity-production methods spreading rapidly.

Machine Grouping. A Note on the Economics of Plant Grouping, A. Whitehead. Machy. (Lond.), vol. 26, no. 671, Aug. 6, 1925, pp. 599-601, 1 fig. Discusses practice of grouping machines together according to process sequence so that each group is self-contained production unit for manufacture of one type of component; comparison with usual way of arranging machines.

Materials Fabrication in. Fabrication of Materials in Machine Shops, Jos. K. Wood. Am. Mach., vol. 63, no. 9, Aug. 27, 1925, pp. 357-359, 1 fig. Forming and sizing of component parts; their influence on machine design; relative movements of work and tools; contour angles of tools; recommendations for best results.

Standardization in. Standardization in the Machine-Shop Industries, C. J. Oxford. Mech. Eng., vol. 47, no. 9, Sept. 1925, pp. 772-773. Gives list of projects carried on by Am. Eng. Standards Committee indicating present status of project together with explanatory comments.

MACHINE TOOLS

Axle-Ending and Centering. Axle-ending and Centering Machine. Machy. (Lond.), vol. 26, no. 671, Aug. 6, 1925, p. 595, 1 fig. Constructed by Wm. Asquith, Halifax, for efficiently and continuously operating upon railway-car axles.

Replacement Policy. Getting the Most out of Your Machine Tool Dollar, F. H. Colvin. Am. Mach., vol. 63, no. 11, Sept. 10, 1925, pp. 417-419. Railway referred to counts on machine paying for itself in 6 years, and buys on that basis; one new machine frequently replaces two old ones.

MACHINING METHODS

Lapping. Precise Cylindrical Lapping, P. M. Mueller. Mech. Eng., vol. 47, no. 9, Sept. 1925, pp. 701-704, 11 figs. Method of production; preparation before lapping; preparation of laps; lobing; measurement; international tests. See also (abstract) in Machy. (N. Y.), vol. 32, no. 1, Sept. 1925, pp. 60-62, 3 figs.

MATERIALS HANDLING

Equipment. Increasing Production through the Use of Automatic Equipment, C. H. Gullion. Soc. Indus. Engrs.—Bul , vol. 7, no. 6, June 1925, pp 8-10. Automatic machinery used by Swift & Company to increase production and eliminate as far as possible human handling of food products and containers.

Industrial Handling. Industrial Handling. Factory, vol. 35, no. 2, Aug. 1925, pp. 184-192, 276, 278, 280, 282 and 284, 38 figs. Importance of industrial handling; costs shown to be 5 to 80 per cent of pay roll. Finding hidden costs of industrial handling. Economics beyond cost figures; far-reaching effects of improved handling. Question of equipment. Method to fit the machine.

Installation in Old Plant. How Modern Handling Was Installed, M W. Potts. Indus. Mgmt. (N Y.), vol 70, no 3, Sept. 1925, pp. 168-172, 11 figs. Shows how De La-Vergne Machine Co. solved problem and answered this question to their own satisfaction and profit.

Large-Quantity. Material Handling Problems at the Western Electric Company, F. J. Feeley. West. Soc. of Engrs.—Jl., vol. 30, no 8, Aug. 1925, pp 360-371, 4 figs. Handling large quantities of various materials in process of manufacture. Methods may be applied to smaller plants with proportionate savings.

MECHANISMS

GENEVA MECHANISM. The Geneva Mechanism, A. F. Cornock. Machy. (Lond.), vol. 26, no. 671, Aug. 6, 1925, p. 585, 1 fig. Consists of circular plate, having slots in its surface; diagram for calculation of velocities and angles.

METALS

DEFORMATION. Molecular Deformation of Metals in Elongation (Les déformations moléculaires des métaux à la traction), Fraichet. Technique Moderne, vol. 17, no. 16, Aug. 15, 1925, pp. 490-495, 7 figs. Discusses magnetization of steel after elongation, action of terrestrial field during elongation, influence of direction of elongation, elastic and permanent deformation, variation of electric conductivity, etc.

ELECTRIC CONDUCTIVITY. A Theory of Electrical Conduction in Metals, A. Wolf. Physical Rev., vol. 26, no. 2, Aug. 1925, pp. 256-260. Presents theory of conduction based on properties of space lattices and theory of Brownian motion; gives brief discussion of limitations of theory and compares numerical values obtained from given equation with those actually observed.

FATIGUE. The Failure of Materials in Engineering, G. Stoney. Engineering, vol. 120, no. 3112, Aug. 21, 1925, p. 224. Notes on fatigue failure, based largely on work by H. J. Gough, entitled, The Fatigue of Metals.

TEMPERATURE-TENSILE CURVE. The High Temperature-Tensile Curve, D. H. Ingall. Inst. Metals—advance paper, no. 13, for mtg. Sept. 1-4, 1925, 12 p., 5 figs. Effect of rate of heating: results of investigation strengthen author's belief that straight-line portion of temperature curve is of fundamental importance to engineer, and that each material will have fundamental straight-line curve which will express breaking load when subjected to any given temperature indefinitely. Tensile curves of some brasses: method of experiment, data, materials, and representation of results.

TENSILE TESTS. The Influence of the Time Factor on Tensile Tests Conducted at Elevated Temperatures, J. S. Brown. Inst. Metals—advance paper, no. 3, for mtg. Sept. 1-4, 1925, 17 pp., 6 figs. Results obtained in review of testing procedure adopted in determination of ultimate tensile strength of materials at elevated temperatures; experimental work covers range of non-ferrous alloys, and its important feature is demonstration of critical temperature condition above which rate of application of load has prominent influence on observed strength; describes special machine used throughout investigation.

VOLUME CHANGE DURING SOLIDIFICATION. On the Measurement of the Change of Volume in Metals during Solidification, H. Endô. Japanese Jl. Physics, vol. 3, nos. 7-10, 1924, pp. 15-16 (Abstracts). Results of measurements made upon number of metals, whose melting points are below 1100 deg. cent.; method of investigation consists in measurement of change of buoyancy of mass of metal under examination, suspended by inactive liquid during its solidification or melting, by means of thermo-balance.

MILLING MACHINES

FINISHING PLANE SURFACES. Finishing Small Surfaces in the Milling Machine, W. W. Tangeman. West. Machy. World, vol. 16, no. 8, Aug. 1925, pp. 316-319, 12 figs. Presents elements of cost which must be taken into consideration when considering various methods of finishing plane surfaces and sepcially to show possibilities of modern milling machine to produce such surfaces at minimum cost.

MOLDS

SKIN-DRIED. Skin-Dried Moulds. Foundry Trade Jl., vol. 32, no. 470, Aug. 20, 1925, pp. 157-158, 5 figs. Points out that for light castings skin-dried mold will give finished casting the color and surface of dry sand molds; notes on finishing joint; finishing and finishing tools; methods of drying; gating and gating troubles costs and other considerations.

MOLYBDENITE ORE

CONCENTRATION. The Concentration of Canadian Molybdenite Ores, W. B. Timm and C. S. Parsons. Can. Min. Jl., vol. 46, no. 37, Sept. 11, 1925, pp. 859-865, 1 fig. Character and types of molybdenite ores; concentration process best suited for Canadian ores; general flow sheet; concentration results on the various types of ores; flotatiou of ores; etc.

MONEL METAL

CHARACTERISTICS. Characteristics of Monel Metal. Am. Mach., vol. 63, no. 11, Sept. 10, 1925, p. 445. Polishing, spinning, drawing and punching, machining, and pickling.

MORTARS

GYPSUM. Factors Affecting the Time of Set of Mechanically Mixed Gypsum Mortars, L. E. Smith. Rock Products, vol. 28, no. 17, Aug. 22, 1925, pp. 61-63, 2 figs. Results of investigations of U. S. Bur. Standards show it is set gypsum in mixer that causes difficulty. Pub. by permission U. S. Bur. Standards.

MOTOR-BUS TRANSPORTATION

RELATION BETWEEN STREET-RAILWAY AND. Using the Motor Bus Effectively, J. A. Ritchie. Elec. Ry. Jl., vol. 66, no. 5, Aug. 1, 1925, pp. 175-167. Considers true relationship between street car and motor bus; motor bus not best used as a "rubber-tired street car"; by giving a quality service it can be used to provide a new type of service and gain riders without loss to railway systems.

MOTOR BUSES

BRITISH VS. AMERICAN. British v. American Omnibus Chassis. Motor Transport (Lond.), vol. 41, nos. 1067 and 1068, Aug. 10 and 17, 1925, pp. 173-175 and 193-194, 8 figs. Details of some comparative tests made by London General Omnibus Co., with its own "N. S.", and a Yellow Coach chassis.

CO-ORDINATION OF RAIL AND. Philadelphia Co-ordinates Bus and Rail. Elec. Ry. Jl., vol. 66, no. 6, Aug. 8, 1925, pp. 197-200, 5 figs. Extensive adoption of gas-electric principle to both double and single deck type; routes are feeders as well as supplemental to present rail lines; suitable garage facilities provided.

MOTOR-TRUCK TRANSPORTATION

RAILWAY TRANSFER SERVICE. Electric Trucks in Transfer Service. Ry. Elec. Engr., vol. 16, no. 8, Aug. 1925, pp. 247-250, 9 figs. Central of Georgia has fleet of 55 trucks operating at full capacity under trying conditions.

N

NON-FERROUS METALS

FATIGUE. Notes on the Fatigue of Non-Ferrous Metals, H. F. Moore. Min. & Metallurgy, vol. 6, no. 225, Sept. 1925, pp. 465-467, 1 fig. Gives conclusions which seem to be fairly well established; phenomenon known as fatigue is really progressive fracture of metals; for wrought ferrous metals, there is limiting intensity of stress; endurance limit is not so clearly defined for non-ferrous metals tested as it is for wrought ferrous metals. Paper presented before Inst. Metals Division, Syracuse.

NOTCHED-BAR TEST. The Effect of Temperature on the Behaviour of Metals and Alloys in the Notched-Bar Impact Test, R. H. Greaves and J. A. Jones. Inst. Metals—advance paper, no. 9, for mtg. Sept. 1-4, 1925, 17 pp., 13 figs. Describes experimental results of tests on non-ferrous materials, including lead, aluminum, copper, tin, coinage bronze, bronze bearing metals, brass, aluminum bronze; notes on use of Izod machine for non-ferrous metals and alloys.

THERMAL CONDUCTIVITIES. Thermal Conductivities of Industrial Non-Ferrous Alloys, J. W. Donaldson. Inst. Metals—advance paper, no. 6, for mtg. Sept. 1-4, 1925, 11 pp., 2 figs. Experiments were carried out to gain information regarding conductivity of alloys used in construction of internal-combustion and other types of engines, and to determine effect of temperature on conductivity.

NOZZLES

SUPERSATURATED STEAM IN TURBINE. Supersaturated Steam in Turbine Nozzles. Power, vol. 62, no. 12, Sept. 22, 1925, pp. 445-446, 1 fig. At temperatures above or below 345 deg. fahr. actual nozzle efficiency tends to decrease, indicating that moisture at lower temperatures lowers nozzle efficiency, and higher superheat increases losses as well as tending to cut down undercooling effect.

O

OIL ENGINES

COMBUSTION PROCESSES. Combustion Processes in the Oil Engine, H. F. Shepherd. Power, vol. 62, no. 11, Sept. 15, 1925, pp. 411-412. Principles of cylinder design; fuel preparation; dual-combustion engines.

INDUSTRIAL APPLICATION. Industrial Aoplications of Oil Engines. Mech. Eng., vol. 47, no. 9, Sept. 1925, pp. 743-745. Their employment as drive for oil-pipe lines, in flour-mill operation and refrigerating practice, and as drive for pumps and compressors. Summaries of papers presented during Oil and Gas Power Week at Kansas City.

OIL FIELDS

FORMATION THICKNESSES, DETERMINATION OF. The Determination of Formation Thicknesses by the Method of Graphical Integration, E. L. Ickes. Am. Assn. Petroleum Geologists—Bul., vol. 9, no. 3, May-June 1925, pp. 451-463, 3 figs. Describes method for estimating with considerable accuracy thickness of strata exposed in any section at surface; method is especially adapted for calculating thicknesses in sections having low angles of dip.

OIL FUEL

ATOMIZATION. Atomization of Liquid Fuels, Kuehn. Nat. Advisory Committee for Aeronautics—Tech. Memorandums, no. 329, Sept. 1925, 31 pp., 1 fig. Relation between atomization and combustion; methods employed for determining size of particles and small drops; choice of experimental method. Translated from Motorwagen, July 10 and 20, 1924.

OIL SHALES

RETORTING. The Adoption of Gas Producer Practice to the Retorting of Oil Shales, F. G. Green. Can. Chem. & Met., vol. 9, no. 8, Aug. 1925, pp. 185-186. Developments of direct heating method in Europe and America; successful yields obtained; importance of factor of costs.

OPEN-HEARTH FURNACES

INSULATION. Reducing Steel Melting Costs, E. A. Phoenix. Iron Trade Rev., vol. 77, no. 10, Sept. 3, 1925, pp. 553-554, 2 figs. Proper insulation of open-hearth equipment an aid to furnace efficiency; treatment of roof and walls would effect material fuel saving; describes general installation.

STEEL CASTINGS FROM SCRAP. Makes Steel from Unselected Scrap, S. H. Bunnell. Iron Trade Rev., vol. 77, no. 10, Sept. 3, 1925, p. 551. New furnace, developed in Germany, is claimed to have produced good grade of steel castings from ordinary unsorted scrap which averages much poorer than unsorted American scrap; introduced and built in United States by Am. Bosshardt Furnace Corp., New York.

OXY-ACETYLENE WELDING

CAST-IRON PIPE, BRONZE WELDING OF. Procedure Control for Bronze Welding Cast Iron Pipe. Oxy-Acetylene Tips, vol. 4, no. 1, Aug. 1925, pp. 4-9, 11 figs. Outline of precautions to be taken when selecting and testing welder, preparing pipe and performing work.

ELECTRIC-RAILWAY WORK. Welding Electric Railway Work, C. E. Mitchell. Can. Machy., vol. 34, no. 6, Aug. 6, 1925, pp. 15-16 and 38, 2 figs. Advances several reasons for ever-increasing use of welding art in repair, emergency and maintenance work in electric railway field.

MONEL METAL CASTINGS. Procedure Control for Oxywelding Monel Metal Castings. Oxy-Acetylene Tips, vol. 3, no. 11, June 1925, pp. 174-177. Outline of precautions to be taken when selecting and testing welder, preparing casting and performing work.

P

PAPER

TESTING. Paper Testing, A. G. Rendall. Paper Trade Jl., vol. 81, no. 9, Aug. 27, 1925, pp. 47-54, 7 figs. Deals with properties possessed by paper and manner in which they are obtained; notes on specifications, sampling, tests applied, sizing, color shade and color performance, interpretation of tests, etc.

WEIGHT, VARIATIONS IN. Instantaneous Variations in the Weight of Paper Coming from the Machine, H. Micoud. Paper Trade Jl., vol. 81, no. 12, Sept. 17, 1925, pp. 51-54, 6 figs. Particulars of experiments; transverse and longitudinal variations, causes of variations in weight, magnitude of variations in weight, importance of the variation in weight. Translated from Papier, vol. 27, Dec. 1924, pp. 1357-1366.

PAPER MACHINERY

BEATER ROLLS AND BARS. Bandless Beater Roll and Bar. Paper Trade Jl., vol. 81, no. 12, Sept. 17, 1925, pp. 47-50, 8 figs. Describes invention of F. B. Dilts, assignor to Dilts Machine Wks., Inc., Fulton, N.Y., which relates to a beater roll for "beater engines" adapted to be used for reducing paper stock to desired consistency for manufacture into paper and refers more particularly to construction of fly bars and supporting drum therefor and other means for securing fly bars to drum.

PAPER MANUFACTURE

WASTE RECOVERY. Waste Recovery, von Pssander. Paper Trade Jl., vol. 81, no. 6, Aug. 6, 1925, pp. 53-55. Discusses solid waste materials, waste liquors, chemical pulp digestion, recovering soda and removing organic matter, recovery of organic ingredients, sulphite waste liquor, application of waste sulphite liquor, purification and treatment of waters, and paper machine waste waters. Translated from Fabrikant.

PILES

CONCRETE JACKETED. Concrete Jacketed Piles on the Pacific Coast, F. G. White. Eng. News-Rec., vol. 95, no. 11, Sept. 10, 1925, pp. 420-421. Comparison of structural capacity aud difficulties of erecting different types of protection against marine borers.

MARINE STRUCTURES, FOR. Piling for Marine Structures, G. F. Nicholson. Pac. Mar. Rev., vol. 22, no. 9, Sept. 1925, pp. 415-416 and 427, 3 figs. Analyzes factors determining selection of materials for waterfront foundation construction. Paper read before Pac. Coast Assn. of Port Authorities.

PIPE, STEEL

CORROSION. The Corrosion Problem in Steel and Iron Pipe, F. N. Speller. Fire & Water Eng., vol 78, no. 8. Aug. 19, 1925, pp. 349-350 and 378-379, 1 fig. Cause and theory of corrosion of pipe; different external conditions under which it can occur; methods of elimination. Paper read before N. E. Water Works Assn.

PISTON RINGS

AIR-PUMP. Piston Rods and Rings for Air Pumps, F. H. Colvin. Am. Mach., vol. 63, no. 9, Aug. 27, 1925, pp. 339-340, 6 figs. Measuring tightness of fit between threaded parts by hydraulic cylinder and gage, riveting rod ends and tooling for piston-ring work.

DEVELOPMENTS. The Development of the Piston Ring, J. W. S. Moss. Mar. News, vol. 12, no. 4, Sept. 1925, pp. 58-61, 7 figs. Discusses evolution, methods of manufacture and relative merits of various types of rings.

PLANING MACHINES

OPEN-SIDE. Open Side Planing Machine. Machy. (Lond.), vol. 26, no. 672, Aug. 13, 1925, p. 629, 1 fig. Machine constructed by White Machine Tool Co., Halifax.

POLES

CONCRETE-STEEL. A Design for Light Concrete Steel Poles, J. C. Stobie. Instn. Engrs. Australia, vol. 2, no. 6, Apr. 1925, pp. 45-54, 4 figs. Describes a light steel and concrete pole for use on transmission lines, for which a provisional patent has now been granted; has been developed with a view to cheapening construction so that it may be manufactured by unskilled labour near locality where it is required; consists of standard sections of rolled steel joists, bolts and a 1:2:4 mixture of cement.

SETTING BY MACHINE. Cost of Pole Setting by Machine, R. N. Carter. Elec. World, vol. 86, no. 11, Sept. 12, 1925, pp. 507-510, 7 figs. Compared with cost of hand methods of digging holes, setting and pulling of poles; based on user's experiences; unit cost depends on amount of usage per year.

POWER FACTOR

CORRECTION. The Economic Value of Power Factor Correction, H. C. Oaten. Elec. Engr., vol. 2, no. 4, July 15, 1925, pp. 151-153, 2 figs. Draws upon practical experience in a discussion of economies to be effected by maintenance of a high power factor; describes a recent installation of static condensers on a reticulation system in New Zealand, and gives figures showing its beneficial results.

IMPROVEMENT. Power Distribution Problems, S. Q. Hayes. Electrician, vol. 95, no. 2467, Aug. 28, 1925, pp. 232-235, 5 figs. Control of wattless current and regulation on transmission lines; use of phase modifiers and static condensers.

POWER PLANTS

SIPHON-DROP. Siphon Drop Power Plant. U. S. Bur. Reclamation, Specifications no. 438, July 6, 1925, 26 pp., 12 figs. General and detail specifications for construction of building and foundations, and installation of machinery, for siphon-drop power plant, Yuma project, Arizona-California.

PRESSES

WORK-STRIPPING DEVICES. Making Good Use of the Idle Press Stroke, C. J. Williams. Machy. (Lond.), vol. 26, no. 675, Sept. 3, 1925, pp. 718-722, 6 figs. Novel work-stripping devices; automatic work ejector; cam and plunger ejector.

PRINTING MACHINERY

MONOTYPE MACHINES, CONSTRUCTING. Building Monotype Machines, Chas. O. Herb. Machy. (N. Y.), vol. 32, no. 1, Sept. 1925, pp. 1-5, 11 figs. Unusual methods used in producing line of machines well known in printing field.

PRESSES, CYLINDERS FOR. Cylinders for Printing Presses, F. H. Colvin. Am. Mach., vol. 63, no. 9, Aug. 27, 1925, pp. 351-352, 5 figs. Methods and fixtures used in machining and assembling cylinders for small printing presses; inspection gages for hole location.

PULVERIZED COAL

COPPER-REFINING FURNACES. Pulverized Coal as Fuel for Copper-Refining Furnaces, E. S. Bardwell and R. H. Miller. Am. Inst. Min. & Met. Engrs.—Trans.; no. 1497-D, Sept. 1925, 8 pp., 3 figs. During period extending from May 1922 to Sept. 1923, copper-refining furnaces of Great Falls Reduction Department of Anaconda Copper Mining Co. at Great Falls, Mont., were operated exclusively with pulverized coal as fuel; description of coal-pulverizing plant; transportation of pulverized coal; furnaces; effect of pulverized coal on furnace operations.

UNIT SYSTEM. Unit System of Pulverized Fuel Firing. Eng. & Boiler House Rev., vol. 39, no. 1, July 1925, pp. 22, 25-26, 28 and 31-32, 6 figs. Details of unit plants on British market, together with operating experiences supplied by makers.

WEIGHING MACHINES FOR. Automatic Weighing Machines for Pulverized Coal. Eng. & Boiler House Rev., vol. 39, no. 2, Aug. 1925, pp. 75-76, 3 figs. Describes Avery machine which is of even-armed beam type; two different types of machines have been devised to weigh pulverized coal from pulverizer to feeder.

PUMPING STATIONS

CHICAGO. The Western Avenue Pumping Station, L. D. Gayton. West. Soc. of Engrs.—Jl., vol. 30, no. 5, May 1925, pp. 235-248, 7 figs. Economy and reliability of operation features of station. Detailed costs of designs based on five different prime movers are given. Selection of auxiliaries based on carefully calculated heat balance.

OIL-ENGINE DRIVE. New Pumping Station Shows Low Operating Costs, H. W. Machamer. Ry. Rev., vol. 77, no. 10, Sept. 5, 1925, pp. 354-355 and 359, 4 figs. Change from steam to fuel oil brings large saving at important water point on Lackawanna.

PUMPS

LUBRICATION. Industrial Pumps and their Lubrication. Lubrication, vol. 11, no. 5, May 1925, pp. 49-60, 23 figs. Types of pumps; deals with centrifugal and rotary pumps; typical pump-lubrication problems.

PUMPS, CENTRIFUGAL

SIDE-SUCTION. Side-Suction Centrifugal Pumps More Efficient for Small Capacity, R. K. Annis. Power, vol. 62, no. 12, Sept. 22, 1925, pp. 451-452, 3 figs. For small discharge rates side-suction centrifugal pump is more efficient than double-suction type, and with appropriate thrust bearings and piping connections side-suction design is equally convenient.

PYROMETERS

RECORDING. New Pyrometer Makes 12 Records on one Chart. Automotive Industries, vol. 53, no. 11, Sept. 10, 1925, p. 423, 1 fig. Operates on "frictionless" principle; embodies novel features; built by Brown Instrument Co., Philadelphia.

R

RADIOTELEPHONY

LOUD SPEAKERS. Notes on the Development of a New Type of Hornless Loud Speaker, C. W. Rice and E. W. Kellogg. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 9, Sept. 1925, pp. 982-991, 19 figs., and (discussion) pp. 1015-1021, 9 figs. Describes series of tests directed to evolution of loud speaker, free from resonance; various types of sound source were tried; it is shown that small diaphragm motion of which is controlled by inertia only, and located in opening in large flat wall, will give output sound pressure proportional to actuating force, independent of frequency; it should be possible to make ideal sound reproducer on this principle; practical loud speaker which approximately fulfills these.

RECEIVERS. Selectivity, H. J. Round. Wireless World, vol. 17, no. 7, Aug. 12, 1925, pp. 197-200, 8 figs. Discusses different types of selective receivers, reasons for selectivity, its theory, and superheterodyne.

The Super-Heterodyne Radio Receiver, R. Robert. Elec. Rev., vol. 97, no. 2493, Sept. 4, 1925, pp. 370-371, 2 figs. Simple explanation of principles involved.

RAILS

BREAKAGE. What Causes the Silvery Oval Spot in Rails? Ry. Rev., vol. 77, no. 8, Aug. 22, 1925, pp. 277-278. Experts in International Railway Congress make recommendations for tests covering breakages.

STRENGTH AND WEAR. Strength and Wear of Rails and Their Influence on the Selection of the Most Economical Section, A. F. Harvey. Instn. Engrs. (India)—Jl., vol. 5, Apr. 1925, pp. 1-51, 14 figs. partly on supp. plates. Limit of strength; rate and permissible limit of wear; selection of most economical section. Extracts from report of special committee appointed by American Railway Engineering Association to report on stresses in railroad track.

RAILWAY CONSTRUCTION

SHOO-FLY BUILT AROUND TUNNEL. Well-Organized Work Clears Damage Done by Earthquake. Ry. Eng. & Maintenance, vol. 21, no. 9, Sept. 1925, pp. 353-355, 5 figs. Shoo-fly, 1800 ft. long, built to restore traffic around tunnel blocked by great rock slide.

SUBSOIL WATER LEVEL, LOWERING OF. Modern Procedure for Lowering Water Level in Subsoil, With Special Reference to Underground Railway Construction (Procedimenti moderni per l'abbassamento del livello dell'acqua nel sottosuolo, con speciale riguardo alla costruzione di ferrovie sotterranee), Walch. Energia Elettrica, vol. 2, no. 8, Aug. 1925, pp. 727-737, 12 figs. Details of new method consisting of sinking wells at various points of a given territory and drawing off water by means of suction pipes or pumps; examples.

RAILWAY ELECTRIFICATION

DANBURY, CONN. New Haven Electrifies Danbury Branch, H. F. Brown. Elec. Ry. Jl., vol. 66, no. 9, Aug. 29, 1925, pp. 309-315, 18 figs. Substitution of electric for steam power on this 25-mile line practically completes conversion of New York division; changeover was made to reduce operating costs by unification of system; construction methods employed.

ENGLAND. The Southern Railway Electrification. Elec. Rev., vols. 96 and 97, nos. 2472, 2480, 2491 and 2492, Apr. 10, June 5, Aug. 21 and 28, 1925, pp. 566, 899-901, 299-303 and 330-331, 6 figs. Apr. 10: Facts and Figures on Suburban system. June 5: Rolling stock equipment; Gen Elec. Co. electric gear. Aug. 21 and 28: High- and low-pressure cable systems and substation equipment.

RAILWAY MAINTENANCE

COST DATA, COLLECTION OF. A Practical Method of Collecting Maintenance Cost Data, C. P. Hoff. Ry. Eng. & Maintenance, vol. 21, no. 9, Sept. 1925, pp. 345-347, 4 figs. How St. Louis—San Francisco keeps check on performance of various gangs.

RAILWAY MOTOR CARS

DIESEL-ELECTRIC. Diesel-Electric Motor Cars Are Used Extensively on Swedish Railroads, E. Nilsson. Ry. Rev., vol. 77, no. 9, Aug. 29, 1925, pp. 301-307, 12 figs. Developed primarily for handling light traffic at moderate speed; electrical equipment; fuel consumption and maintenance cost; types of Diesel-electric cars.

GASOLINE. The Development of the Self-Propelled Railway Car, Chas. J. McPherson. Southern & Southwest. Ry. Club—Proc., vol. 18, no. 3, May 1925, pp. 28, 31-32, 35-36 and 39-40 and (discussion) 40, 41-42, 43-44 and 47. Review of outstanding developments during evolution of present gasoline car and engineering problem confronting further development.

RAILWAY TRACK

MAINTENANCE. How the World's Railways Maintain Their Tracks. Ry. Eng. & Maintenance, vol. 21, no. 8, Aug. 1925. Four papers read at International Railway Congress, held in London, June 22-July 2, 1925, viz.: Review of American Maintenance Practices, G. J. Ray, pp. 296-299; Practices of France and Her Colonies, R. Ruffieux, pp. 299-301; British Practices, W. H. Coomber, pp. 301-305, 3 figs.; and Methods Employed in Countries Other Than Great Britain, America and France, H. Deyl, pp. 305-308, 3 figs.

RAILWAY YARDS

BATTERY CHARGING PLANTS. Charging Plants for Car Lighting Batteries. Ry. Elec. Engr., vol. 16, no. 7, July 1925, pp. 199-200, 2 figs. Describes two yard charging plants recently installed on Ill. Central Ry. at New Orleans, one is a 20-kw. plant, located at station, and other a 35-kw. plant located at coach yards, about one-half mile from station; are of type suitable to great majority of railroad requirements.

OPERATION. Yard Operation, W. P. Arntz. Pac. Ry. Club—Proc., vol. 9, no. 3, June 1925, pp. 11, 13, 15, 17, 19 and 21-22. Notes on shape of train and classification yard, organization, and operation.

REFRIGERATING MACHINES

DRIVES FOR. Different Drives for Refrigerating Machines, T. Mitchell. Power, vol. 52, no. 8, Aug. 25, 1925, pp. 287-289, 6 figs. Choice of prime mover for ammonia compressors; examples of drives used.

Modern Refrigerating Machines, their Treatment and Advantages (Neuartige Kältemaschinen, ihre Behandlung und Vorzüge), C. Redzich. Wärme-u. Kälte-Technik, vol. 26, no. 24, Dec. 15, 1924, and vol. 27, nos. 1, 2, 3, 4, 6, 8, 12, and 13, Jan. 1, 15, Feb. 1, 15, Mar. 15, Apr. 15, June 15, and July 1, 1925, pp. 227-228, 4-6, 11-13, 21-23, 31-34, 59-60, 79-80, 125-126, and 135-137, 20 figs. Design and operation of Astra CO_2 machine, and functions of various parts; maintenance; lubrication and lubricants; treatment of milk; superheating process and apparatus; operating results with dry air coolers; content of germs in air of refrigerating establishments; application and operation of various high-pressure compressors and gas-liquefaction apparatus.

REFRIGERATING PLANTS

COTTON PROCESSING. Complete Automatic Fifty-Ton Refrigerating Plant for Processing Cotton, F. L. Fairbanks. Refrig. Eng., vol. 12, no. 1, July 1925, pp. 5-6 and 9, 1 fig. Describes installation which is first to be installed in United States for processing of cotton cloth; process is of German-Swiss origin and patented.

REFRIGERATION

AMMONIA COMPRESSION, MULTIPLE-EFFECT. Multiple Effect Compression of Ammonia and Carbon Dioxide, J. C. Goosmann. Ice & Refrigeration, vol. 69, no. 3, Sept. 1925, pp. 164-168, 2 figs. Deals with multiple-effect compression of ammonia and carbon dioxide, with its graphical representation; some historical facts concerning Mollier; Bur. of Standards Mollier ammonia chart; multiple-effect compression with two evaporators.

OTTESEN PROCESS. Ottesen Freezing Process Applied to Meat, Poultry, Rabbits, Etc., W. J. Williams. Ice & Refrigeration, vol. 69, no. 1, July 1925, pp. 47-48. Results of experiments carried on in municipal cold storage plant in Australia which author states were of such a character as to command attention of those interested in meat trade.

REFUSE DISPOSAL

DESTRUCTORS. New Refuse Destructor at Toronto, Ont., J. A. Burnett. Can. Engr., vol. 49, no. 6, Aug. 11, 1925, pp. 203-208, 9 figs. Describes new plant on Welding Street West, embodying latest improvements in design; results obtained in official performance tests show greater capacity than guaranteed in specification; four Steeling 4-cell furnaces.

RESEACRH

STIMULATION OF INVENTION AND. Stimulation of Research and Invention, D. S. Jacobus. Franklin Inst.—Jl., vol. 20, no. 2, Aug. 1925, pp. 249-253, Author suggests rules as to how research fund should be administered.

RIVERS

EROSION AND DEPOSITION, EFFECT OF STORAGE ON. Effect of Rio Grande Storage on River Erosion and Deposition, L. M. Lawson. Eng. News-Rec., vol. 96, no. 10, Sept. 3, 1925, pp. 372-374, 6 figs. Great variability of flow and high silt content of uncontrolled river; equalized conditions; no change of length or degradation observed.

ROAD CONSTRUCTION

CANADIAN NATIONAL PARK HIGHWAYS. Highway Work in the Canadian National Parks, J. M. Wardle. Eng. Jl., vol. 8, no. 9, Sept. 1925, pp. 382-384. Construction details applying particularly to park highways designed for tourist traffic; location and construction problems; maintenance considerations; treatments for elimination of dust. See also Discussion on Park Highways, F. L. Macpherson, pp. 384-385.

RESEARCH. Coordinated Research Playing Big Part in Highway Development, A. N. Johnson. Automotive Industries, vol. 53, no. 10, Sept. 3, 1925, pp. 384-385. States, universities, municipalities, counties and industries all aiding in movement to improve methods of road construction; huge savings effected; tests to date total 479. (Abstract.) Paper read before North Carolina Section of Am. Soc. Civ. Engrs.

ROAD MATERIALS

CONCRETE. Laboratory Control of Concrete Materials, S. Pritchett Highway Engr. & Contractor, vol. 13, no. 1, July 1925, pp. 47-50, 5 figs. All materials entering into concrete work under specifications of North Carolina State Highway Commission are tested at concrete laboratory of commission at Raleigh. Outlines manner in which quality of various materials is controlled.

ROADS

CREOSOTE-BLOCK. Maintenance of Creosote Block Pavements, A. D. Carpenter. Mun. & County Eng., vol. 68, no. 6, June 1925, pp. 299-301. To keep water out of creosote block pavement, creosote blocks should be kept impregnated and joints and limits of pavement properly sealed by means of bituminous treatments; discusses preparation of blocks for treatment; gives some cost figures supplied by city of St. Paul, Minn. Paper read before Minn. Engrs. & Surveyors Soc.

ROADS, BRICK

DESIGN. Economical Design of Brick Pavements, W. D. P. Warren. Eng. & Contracting (Roads & Streets), vol. 64, no. 3, Sept. 2, 1925, pp. 535-546. Improvements and modifications in design based on recent research work suggested in paper presented at convention of Am. Road Bldrs.' Assn.

ROADS, CONCRETE

BUCKET LOADER FOR PAVING. Economic Uses of the Bucket Loader in Paving Work, J. E. Marson. Eng. & Contracting (Roads & Streets), vol. 64, no. 3, Sept. 2, 1925, pp. 511-517, 10 figs. Application in handling materials for construction of concrete pavements on city streets and country roads.

CONCRETE MIXERS. The Economic Waste of Non-Standard Mixers, P. A. Koehring. Eng. & Contracting (Roads & Streets), vol. 64, no. 3, Sept. 2, 1925, pp. 531-534. Reviews situation on mixer sizes and makes suggestions for official tests and ratings by a committee fairly representing concrete industry.

MACHINE-MOLDED CENTER JOINT, WITH. Concrete Road with Machine-Molded Center Joint. Eng. News-Rec., vol. 95, no. 9, Aug. 27, 1925, pp. 354-355, 5 figs. Machine molds mid-slab groove establishing plane of weakness for longitudinal cracking and marking traffic line.

PATCHING. Quick-Hardening Concrete Patching with Ordinary Cement, A. H. Hinkle. Eng. News-Rec., vol. 95, no. 9, Aug. 27, 1925, pp. 356-357, 1 fig. Materials, methods and costs as determined by practice in Indiana; extreme care required for perfect repairs. (Abstract) Paper read at Annual Road School held at Purdue Univ.

PRACTICE. Reinforced Concrete Pavement Practice, H. E. Breed. Mun. & County Eng., vol. 69, no. 2, Aug. 1925, pp. 84-89. Anything that tends to promote stress or be of low resistance to it is a source of weakness in pavement; discusses most important of these, which are: faulty materials, improper proportioning, low density poor mixing and working, too much water, disregard of temperature conditions, inadequate curing, and high porosity permeability and absorption; Bates tests.

ROADS, GRAVEL

RECONSTRUCTION. Reconstruction of Old Gravel Roads, C. C. Albright and R. E. Mills. Purdue Univ.—Bul., vol. 9, no. 1, Jan. 1925, 14 pp., 17 figs. Table giving total amount of money spent in 1921 in United States on highway construction and maintenance; describes experimental work undertaken to demonstrate economic possibilities of new methods of maintenance reconstruction of gravel roads.

ROLLING MILLS

BRASS. Novel Motor Drive in Brass Mill, G. L. Lacher. Iron Age, vol. 116, no. 12, Sept. 17, 1925, pp. 733-737, 5 figs. Flexible melting units and annealing, pickling, drying and finishing equipment are other features.

ELECTRIC DRIVE. Electrical Drives for Rolling Mills, H. C. Uhl. Iron & Steel Engr., vol. 2, no. 8, Aug. 1925, pp. 322-327. Electrical equipment for non-reversing and for reversing mills; power-factor correction; switchboards.

PLATE MILLS. 34-in. Universal Plate Mill at the Clydesdale Steel Works. Engineering, vol. 120, nos. 3106, 3108, 3110 and 3112, July 10, 24, Aug. 7 and 31, 1925, pp. 36-38, 93, 156-159, and 222-224, 26 figs., partly on supp. plates. Describes rolling mill and ancillary plant installed by Stewarts & Lloyds, Ltd., in their Clydesdale Steel works at Mossend as part of a comprehensive scheme of modernization, and gives notes on scope of this scheme.

ROD, ORIENTATION OF. Orientation of Steel Rod Mills, G. H. Cole. Iron & Steel Engr., vol. 2, no. 8, Aug. 1925, pp. 334-336. Annoyance of accidental magnetization; factors favorable to permanent magnetism; strength of magnetic field; permanent magnetism produced in straightening machines and in quenching operation; cumulative magnetic effect; intensity of magnetization; elimination of accidental magnetization; demagnetization; declination.

S

SAND, MOLDING

TESTS. Tests for Molding Sand, A. Bregman. Metal Industry (N. Y.), vol. 23, nos. 3 and 7, March and July 1925, pp. 99-102 and 277-278, 8 figs. Résumé of tentatively adopted methods of tests developed by joint committee on molding and sand research of American Foundrymen's Association.

SCYTHES

MANUFACTURE. Manufacture of Scythes (La fabrication des faux), E. Weiss. Nature (Paris), no. 2676, July 18, 1925 (Supp.), pp. 38-43, 8 figs. Detailed description of successive processes in manufacture in France and machinery used; lengths 55-110 cm., center widths 40-130 mm.

AMERICAN DEVELOPMENTS. Recent Sewage Treatment Developments in America, K. Imhoff. Eng. News-Rec., vol. 95, no. 5, July 30, 1925, pp. 180-181, 8 figs. Notes on screens, tanks, separate sludge digestion, trickling filters and activation, made during visit by German engineer.

EXPERIMENTS. Sewage Experimental Work Investigations, Willem Rudolfs. Can. Engr., vol. 49, no. 1, July 7, 1925, pp. 103-104. Describes some experiments conducted during 1924 at sewage sub-station of New Jersey Agricultural Experiment Station.

SEWAGE DISPOSAL

ACTIVATED SLUDGE. Jamshedpur Sewage Disposal Works with Special Reference to the Activated Sludge Plant, F. C. Temple and V. N. Sarangdhar. Instn. Engrs. (India) — Jl., vol. 5, Apr. 1925, pp. 61-88, 7 figs. on supp. plates, and (discussion) pp. 134-139. It is shown that activated-sludge system is remarkably well suited to Indian conditions both as method of sewage purification and as means of producing valuable fertilizer, and by its judicial management on irrigated plots, it is possible to obtain best yields without causing any appreciable nuisance in locality and without losing valuable nitrogen in sewage.

SEWER CONSTRUCTION

OPEN-SEA. Open Sea Construction of a Concrete Pipe Sewer Outfall, H. A. Van Norman. Eng. News-Rec., vol. 95, no. 8, Aug. 20, 1925, pp. 292-294, 5 figs. Mile of 7-ft. pipe line laid outshore on exposed coast by submersible pontoons and submerged towing to prevent damage from heavy ground swell.

REINFORCED-CONCRETE ARCH IN. The Reinforced Concrete Arch in Sewer Construction. A Review of Past Practice in Design and an Account of Recent Studies in St. Louis, Missouri, Chas. E. Sharp. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 6, Aug. 1925, pp. 1082-1113, 19 figs. Describes elastic design of reinforced-concrete sewer arch; conditions of loading common to such sewers; formulas for corresponding vertical and horizontal loading, due to back-fill or plastic soil; conditions of arch support; fundamental equations for determination of arch stresses.

SEWERS

FLOW IN. Determinations of Kutter's n in 15- and 18-In. Pipe Sewers, Chas. W. Sherman. Eng. News-Rec., vol. 96, no. 11, Sept. 10, 1925, pp. 434-436 Tests on sewers in Cambridge, Mass., built in 1893 show n of 0.011 to 0.020 and indicate general use of 0.015 for Kutter's n; sewers tested represented normal conditions.

MANUFACTURE. Methods and Manufacture of Sewer Pipe in Canada, Chas. A. Millar. Am. Ceramic Soc.—Jl., vol. 8, no. 7, July 1925, pp. 452-456. Describes clays used and methods employed in production of sewer pipe in Canada.

SHAFTS

DEFLECTION AT CRITICAL SPEED. Deflection of a Shaft at the Critical Speed, J. A. Dent. Mech. Eng., vol. 47, no. 9, Sept. 1925, pp. 724-726, 2 figs. Attempts to discuss effect of neglected components on deflection of shaft at critical speed, and with further assumption that shaft is uniformly accelerated.

INTERNAL FRICTION IN REVOLVING DEFLECTED. Measurement of Internal Friction in a Revolving Deflected Shaft, A. L. Kimball, Jr. Gen. Elec. Rev., vol. 28, no. 8, Aug. 1925, pp. 554-558, 14 figs. To determine quantitatively influence exerted by internal friction to produce whipping, author has devised special testing model for conducting investigation which is described.

WHIPPING OF. Shaft Whipping Due to Oil Action in Journal Bearings, B. L. Newkirk and H. D. Taylor. Gen. Elec. Rev., vol. 28, no. 8, Aug. 1925, pp. 559-568, 12 figs. Traces cause of whipping to action of oil film in bearings; to prevent trouble from this source, authors suggest that very low unit bearing pressures be avoided on that friction-damped spring be used.

SILVER METALLURGY

CHLORIDIZING MILL. Chloridizing Mill of the Standard Reduction Co., H. P. Allen and Wm. C. Madge. Am. Inst. Min. & Met. Engrs.—Trans., no. 1481-B, Aug. 1925, 22 pp., 9 figs. Process consists essentially of chloridizing roast followed by percolating leach with nearly saturated solution of common salt, acidified with sulphuric acid, precipitation of silver on sponge copper and of copper and lead on tin-plate cuttings; precipitates are sent to a smelter.

SLAG

COMPOSITION AND FUNCTIONS. The Composition and Functions of Slag, M. J. Bradley. Fuels & Furnaces, vol. 3, no. 7, July 1925, pp. 721-724. Notes on classification, formation, fluidity, functions and importance of slags.

SMOKE

ABATEMENT. Smoke Problems Discussed at Grand Rapids Meeting. Ry. Age, vol. 79, no. 3, July 18, 1925, pp. 144-146, 2 figs. Possibilities of smoke control by fireless steaming, with separate firing-up shed. Contains abstracts of following papers read before Smoke Prevention Assn.; Smoke Prevention in Pittsburgh, A. T. Mitchell; The Fireless Steaming System at Locomotive Terminals, L. G. Plant.

SOUND

TRANSMISSION THROUGH PARTITION WALL. Theory and Interpretation of Experiments on the Transmission of Sound Through Partition Walls, E. Buckingham. U. S. Bur. Standards, Scientific Papers, No. 506, May 26, 1925, pp. 193-219, 2 figs. Principles brought out by W. C. Sabine's work on reverberation of closed rooms are discusses, and equations needed for interpreting observed facts are deduced for further reference. Theory of reverberation suggests experimental methods for measuring acoustic transmittance of panels by means of observations in two closed rooms which are in acoustic communication only through.

SPRINGS

Code of Design. A Code of Design for Mechanical Springs, Jos. K. Wood. Mech. Eng., vol. 47, no. 9 Sept. 1925, pp. 713-718, 11 figs. Gives new deviation of general spring formulas developed by author from numerous existing orthodox spring formulas; the two sets of formulas, although derived independently, are identical in form; in view of general manner in which new derivation establishes logical arrangement of formulas, author has drawn up and included in paper brief code of design for mechanical springs, which, it is hoped, will serve as nucleus for more complete code in future.

Railway, Heat Treatment of. The Reclamation of Railway Springs, F. H. Belle. Pac. Ry. Club—Proc., vol. 9, no. 1, Apr. 1925, pp. 5, 7, 9, 11, 13, 15, 17, 19, 21 and 23 and (discussion) 23-24. Deals with heat treatment of springs; tempering and drawing operation; factors entering into successful heat treatment of elliptic and coil-type springs.

STAMPINGS

Weight of Raw Material for. Chart Giving Weight of Material Required for Stampings, R. L. Wakelee. Machy. (N. Y.), vol. 31, no. 12, August 1925, pp. 940-941. Gives chart designed to assist tool engineering department in work of estimating weight of raw material required to make 1000 sheet-metal stampings, stock size for one piece having been predetermined by size of blank.

Bright Drawn. Some Notes on Bright Drawn Steel R. T. Rolfe. Metal Industry (Lond.), vol. 27, nos. 5 and 6, July 31 and Aug. 7, 1925, pp. 101-102 and 125-127, 1 fig. Desirable properties; machining properties; machining difficulties with low phosphorus and sulphur, effect of quenching; tensile strength; advantages and limits of sulphur; influence of phosphorus; danger of too high sulphur.

Ductility. Limit of Ductility of Hot Steel (Die Grenze der Warmbildsamkeit des Stahles), E. Cotel. Zeit. für das Berg-, Hütten- and Salinenwesen, vol. 73, no. 1, 1925, pp. B45-B47, 1 fig. Discusses uncertainty of carbon limit and shows that full malleability (or normal rolling), is at 0.95 to 1.0 per cent; i.e., near pure pealitic structure. Proposes 1.3 per cent as limit for practical malleability.

High Machining Costs. Causes and Prevention of High Machining Costs of Steel Castings. Research Group News, vol. 2, no. 2, July 1925, pp. 2-4, 2 figs. Probably most serious causes are distinctly related to molding and melting procedures, as distinguished from cleaning methods; furnace practice may occasion trouble in causing hardness; other possible causes, and preventive measures.

Slag, Prevention of. Prevention of Slag in Steel Castings. Research Group News, vol. 2, no. 2, July 1925, pp. 6-8. Results of investigation into elimination of slag spots; possible causes for defects and their elimination.

Tests. Cutting Tests with High-Speed Steels (Schneidversuche mit Schnellarbeitstählen), R. Hohage and A. Grützner. Kruppsche Monatshefte, vol. 6, June 1925, pp. 105-112, 9 figs. Discusses feeds and speeds, angle of cut, hardness of cutter and their relation; effect of vanadium, tungsten, carbon, etc., content; shows that comparison of high-speed alloys is only possible when sources of error are reduced to a minimum.

STANDARDS

Austrian O. N. I. G. Reports. Report of the Austrian Industrial Standards Committee (Oesterr. Normenausschuss für Industrie und Gewerbe). Sparwirtschaft, vol. 5, no. 8, Aug. 1925, pp. 75-79, 2 figs. Proposed standards for portland cement, including definition, properties, tests, storage, commercial usages.

German N. D. I. Reports. Report of the German Industrial Standards Committee (Normenausschuss der Deutschen Industrie). Maschinenbau, vol. 4, no. 17, Aug. 27, 1925, pp. 855-870, 16 figs. Proposed standards for bolts, threaded, headed, plain, and adjustable; bolt locking device; plain disks for bolts; straightway and angle valves.

STEAM

Properties. The Properties of Steam. Engineering, vol. 120, no. 3112, Aug. 21, 1925, pp. 231-232. Editorial remarks on investigation into properties of steam at high pressures and temperatures being conducted by Prof. Callendar, showing that simple and consistent formulas proposed by Callendar to represent properties of steam are reliable over much greater range than had been anticipated.

STEAM ENGINES

Accidents. Some British Steam Engine Accidents. Power, vol. 62, no. 11, Sept. 15, 1925, pp. 410-411. Report of failures, abstracted from technical report of British Engine, Boiler, and Electrical Insurance Co.

STEAM METERS

Boiler Plant Control. Steam Flow Meter in the Control of Boiler Plants (Le rôle du débitmètre de vapeur dans le contrôle des chaufferies), A. Stievenart. Chaleur et Industrie, vol. 6, no. 63, July 1925, pp. 320-326, 7 figs. Discusses function of steam flow meters corresponding to ampere meters in electric generators; application of meter to combustion control and general control of boiler house and tenders.

Process-Steam Accounting. Flow Meters in the Accounting of Process Steam. C. Tyler. Chem. & Met. Eng., vol. 32, no. 15, Sept. 1925, pp. 755-756, 2 figs. Maximum operating economy and accurate distribution of departmental expense impossible without precise control devices.

STEAM POWER PLANTS

Developments. Modern Tendencies in Steam Plant Construction (Le tendenza moderne nella tecnica degli impianti a vapore), R. San Nicolo. Elettrotecnica, vol. 12, nos. 15, 16 and 17, May 25, June 5 and 15, 1925, pp. 358-367, 381-391 and 408-412, 42 figs. Discusses increased thermal efficiency, properties of steam at very high temperature, increased pressures and temperatures, steam regeneration, preheating air of combustion, new types of boilers and steam plants, mercury-vapor plants, turbines for very high pressures and temperatures, modern high-pressure steam-electric plants.

Record and Cost System. Industrial Power-Plant Records Versus Costs, H. H. Force. Power, vol. 62, no. 11, Sept. 15, 1925, pp. 408-410, 6 figs. Record and cost system of 9000-kw. industrial plant which, with others similar, are of interest and value to plant engineers; readings taken every 2 hours; plant divided into two parts for cost computing; distribution of costs.

STEAM TURBINES

House, Floating Type of. The Floating Type of House Turbine, R. Kelly. Elec. Jl., vol. 22, no. 6, June 1925, pp. 299-301, 3 figs. Unit normally operates with generator end floating on essential auxiliary bus as synchronous condenser, while turbine end operates idly without steam; very satisfactory reports have been received of operation of this type of unit in actual service.

Mixed-Pressure. Mixed-Pressure Turbine an Important Link in Improving Ice Plant, F. A. Westbrook. Power, vol. 62, no. 10, Sept. 8, 1925, pp. 354-356, 2 figs. Installing steam-electric drive makes possibles addition of two 75-ton ice machines in place of one 30-ton steam-driven unit, and increases economy of manufacture.

Test Code. Test Code for Steam Turbines. Mech. Eng., vol. 47, no. 9, Sept. 1925, pp. 759-768, 1 fig. Tentative draft of code in series of 19 being formulated by A.S.M.E. Committee on power test codes.

Vacuum-Tripper Installation. Atmospheric Relief Valves Eliminated at Toronto Station. Power, vol. 62, no. 12, Sept. 22, 1925, pp. 442-444, 3 figs. Vacuum failure acting through mercury column, tripper, weight, levers and pilot valve, closes maintrip throttle of turbine; rupturing diaphragm provided as additional safeguard.

STEEL

Corrosion. Corrosion of Cold-Drawn Steels by Varying Concentrations of Sulphuric Acid (Etude de la corrosion dans l'acide sulfurique à divers degrés de concentration des aciers étirés à froid), M. Delbart. Académie des Sciences—Comptes Rendus, vol. 180, no. 25, June 22, 1925, pp. 1942-1943. Five industrial steels were treated with 2 per cent sulphuric acid, 98 per cent sulphuric acid, 20 per cent oleum, and 60 per cent oleum, and amount of corrosion determined in each case; corrosion decreases steadily as concentration of acid increases, but increases with 20 per cent oleum and again decreases to minimum with 60 per cent oleum.

Fatigue. American Researches on the Fatigue of Steel Metallurgist (Supp. to Engineer, vol. 140, no. 3635), Aug. 28, 1925, pp. 118-121. Review of papers presented before Am. Soc. Testing Matls., dealing with accelerated fatigue tests, relation of fatigue range to other physical tests, effect of inclusions on fatigue range, variation of fatigue range with mean stress.

Rolled, International Stresses in. Internal Stresses in Rolled Steel, with Special Reference to Rails, P. Bardenheuer. Iron & Coal Trades Rev., vol. 111, no. 2995, July 24, 1925, p. 141. Notes on question of internal stresses in rolled bars, with special reference to flange rails, in which stress conditions are somewhat involved owing to unfavorable cross section. Stresses due to unequal cooling and stresses due to unequal shaping temperatures.

Tensile Stress and Torsion, Effect of. Effect of Tensile Stress and Torsion in Combination on the Elastic Limit and Resistance of Reheated Mild Steel (Limite élastique et résistance des aciers doux recuits dans le cas d'efforts combinés de traction et de torsion), J. Seigle and F. Cretin. Revue de Métallurgie, vol. 22, no. 6, June 1925, pp. 374-382, 10 figs. Combined effects of tensile and torsional stress on steel have been studied by means of machine on which tensile stress or torsion applied may be maintained constant or varied at will; test pieces 200 mm. long and 2-4 mm. diam. were used; proposes formula for practical use for determination of fatigue.

STEEL CASTINGS

Nichrome Alloy for. Nichrome Alloy Successfully Used to Strengthen Castings. Automotive Industries, vol. 53, no. 8, Aug. 20, 1925, pp. 295-296, 2 figs. Brinell hardness is increased 20 points; greater transverse and tensile strength; more resistant to abrasion; no increase in difficulty of machining; used by International Motor Co., makers of Mack truck, for such parts as jack shaft, axles, frame, steering knuckle, etc.

STEEL, HEAT TREATMENT OF

History of. The Story of Steel Treating, P. Winchell. Iron Age, vol. 116, no. 10, Sept. 3, 1925, pp. 593-604. First investigators; making heat measurement practical; theories; allotropists vs. carbonists; contributions of physicists; testing apparatus is improved; coming of high-speed steel; application to industry.

Methods and Equipment. Heat Treating Key to Success, E. L. Shaner. Iron Trade Rev., vol. 77, no. 12, Sept. 17, 1925, pp. 680-683, 7 figs. Flexible heat-treating department of Ferry Cap & Set Screw Co. big factor in manufacturing scheme; standard equipment supplemented by apparatus of own design; efficient handling of material essential.

Slip Interference. Heat Treatment and Metallography of Steel, H. C. Knerr. Forging—Stamping—Heat Treating, vol. 11, no. 8, Aug. 1925, pp. 264-267 and 283. Slip interference; hardness and its fundamental cause; great inherent cohesion of metals; properties of metal crystals—slip; plasticity and brittleness; slip bands; hardening effect of grain refinement.

Tempering. Trend of Decrease in Tensility and Brinell Hardness by Tempering, E. J. Janitzky. Am. Soc. Steel Treating—Trans., vol. 8, no. 3, Sept. 1925, pp. 324-328, 1 fig. Offers mathematical equation for interpolation of physical properties, such as tensile strength and Brinell hardness, as obtained in tempering of hardened steel, when three experimental observations are given.

STEEL MANUFACTURE

Mechanical Treatment. The High Points in the Manufacture and Working of Steel, L. F. Johnson. Am. Soc. Steel Treating—Trans., vol. 8, no. 3, Sept. 1925, pp. 329-339. Outlines manufacture and mechanical working of steel; points out essential differences between acid and basic open-hearth practice; working of heat and methods of producing satisfactory slag; method used in controlling elements in bath; discusses drop forgings.

The Manufacture of Iron and Steel, F. T. Sisco. Am. Soc. Steel Treating—Trans., vol. 8, no. 3, Sept. 1925, pp. 357-373, 9 figs. Discusses mechanical treatment of steel, including hot and cold working; effects that mechanical working have upon steel, and equipment and methods of handling steel in mill.

Processes. The Manufacture of Iron and Steel, F. T. Sisco. Am. Soc. Steel Treating—Trans., vol. 8, no. 2, Aug. 1925, pp. 191-240, 24 figs. First step in smelting of iron ore with coke in blast furnace to produce pig iron; molten pig iron is refined by acid Bessemeir process to produce steel; acid and basic open-hearth processes; electric and crucible processes; details of furnaces, their operation, and refining; quality of steel made by different processes is compared.

STEEL MILLS

Power Production and Application. Operating Plate, Billet, Bar and Rod Mills, H. A. Hatfield. Power House, vol. 18, no 12, June 20, 1925, pp 26-28, 6 figs. Describes methods of producing and applying power for reduction of ingots at Besco's (British Empire Steel Corp.), at Sydney, N.S., plant; ingots) reduced to 8 in. by 8 in. for rail steel, to 5 in. by 5 in. for billet mill, and to special sizes for axles, etc.

STOKERS

Water-Tube Boilers. Stokers for Water Tube Boilers. Eng. & Boiler House Rev., vol. 39, no. 1, July 1925, pp. 9-16, 7 figs. Principal features in modern design of travelling-grate stoker; balanced-draft compartment stoker of chain-grate type of Babcock & Wilcox design; underfeed stokers; Bennis chain grate; Illinois chain grate; special ignition zone; sandwich system; Riley retort stoker; Erith-Roe retort stoker.

STREET RAILWAYS

Chicago Project. Street Car and Rapid Transit Subways Proposed for Chicago. Elec. Ry. Jl., vol. 66, no. 5, Aug. 1, 1925, pp. 159-162, 3 figs. Particulars of construction plan that is sponsored by President Blair of Chicago Surface Lines, designed to relieve street congestion and provide co-ordinated transportation service; provision is made for operation of surface and elevated cars underground in loop district.

STRUCTURAL STEEL

Stresses and Fatigue in Structures. Stress Repetition and Fatigue in Steel Structures. H. F. Moore. Eng. News-Rec., vol. 95, no. 10, Sept. 3, 1925, pp. 376-377. Present experimental data indicate small risk of fatigue; localized stress, screw threads and corrosion.

SUBSTATIONS

VENTILATION. Improved Ventilating Features in Los Angeles Automatic Substations, L. J. Turley. Elec. Ry. Jl., vol. 66, no. 5, Aug. 1, 1925, pp. 153-157, 8 figs. In new division No. 1 station cooling air is dry cleaned and forced into machine room by a blower, being exhausted by a second blower; building was made virtually soundproof with few precautions; operating data of automatic substations.

SUPERHEATERS

EXPLOSION OF. Explosion of a Power Station Superheater. Engineering, vol. 120, no. 3112, Aug. 21, 1925, p. 225. Investigation of explosion of superheater n service at South Wales Elec. Power Distribution Co.'s power station, Pontypridd, Glamorganshire.

SUPERPOWER

JAPAN. Super-power in Japan. Minoru Fukuda. Gen. Elec. Rev., vol. 28, no. 8, Aug. 1925, pp. 542-549, 1 fig. Comprehensive plan for establishment of superpower in Japan.

SURVEYING

BAROGRAPHS. A Surveying Barograph, Negretti & Zambra. Jl. Sci. Instruments, vol. 2, no. 9, June 1925, pp. 280-288, 5 figs. Describes a new types of surveying barograph which has been designed to meet certain requirements specified by Survey Laboratory of Canada with regard to calibration. creep, friction, temperature change, etc ; details of construction of instrument and summary of results obtained with it.

T

TAR

LOW-TEMPERATURE. A Study of the Tars and Oils Obtained from Coal, F. S. Sinnatt and G. C. King. Chem. & Industry, vol. 44, no. 33, Aug. 14, 1925, pp. 413T-424T, 2 figs. Low-temperatures tar; treatment of low-temperature tar by distillation; treatment of low-temperature tar by separation; constituents of low-temperature tar; production of motor fuels from carbon monoxide.

TELEPHONY

CARRIER-CURRENT. Carrier Current Telephony on Power Transmission Lines, N. H. Slaughter. West. Soc. of Engrs.—Jl., vol. 30, no. 8, Aug. 1925, pp. 345-352, 5 figs. Describes telephoning over transmission lines carrying high-voltage currents. Safeguards for operators.

TERMINALS, LOCOMOTIVE

DESIGN. Locomotive Terminals, R. W. Bell. Ry. Jl., vol. 31, no. 8, Aug. 1925, pp. 30-34. Notes on design, including coal handling facilities, doors, floors, concrete engine pits, lighting at inspection pits, cranes used, machine shop, tool room, boiler shop; Monitor type roof favoured; heating by direct radiation; how oil is handled.

TERMINALS, RAILWAY

PASSENGER. Noteworthy Passenger Terminal Completed at Chicago, W. S. Lacher. Ry. Age, vol. 79, no. 1, July 4, 1925, pp. 7-28, 30 figs. Union station provided for Pennsylvania, Burlington, St. Paul and Alton roads;outline of plan adopted; exterior appearance; station tracks in two groups; how baggage is handled; illumination; new type of train shed; track innovations; mail terminals; interlocking system; power facilities; problems of construction program.

TINNING

PROCESSES. A Comparison of Old and New Tinning Processes, E. L. Collis and H. M. Vernon. Iron & Coal Trades Rev., vol. 111, no. 2993, July 10, 1925, pp. 58-59. Discusses improved conditions attending operation of new "Melingriffith" machine, which holds two to three times as much tin as an Abercarn pot, and bath is correspondingly larger; comparison with conditions attending usual process, with results as measured by lost time. From article reprinted from Jl. Indus. Higiene.

TOOLS

TOOL HOLDERS. Tool Holding Devices (Begriff und Umfang der Vorrichtungen), Hans D. Brasch. Maschinenbau, vol. 4, no. 13, July 2, 1925, pp. 611-615, 9 figs. Discusses types of tool holders, tool stock, tool posts, jigs and fixtures, chucks, etc., used in metal-working operations, their properties and standardizable parts.

STORE SYSTEM. A Tool Store System. Automobile Engr., vol. 15, no. 204, July 1925, pp. 222, 2 figs. Describes a simple scheme that eliminates clerical work as far as possible.

TRACTORS

POWER TAKE-OFF. Power Take-Off for Tractors, F. N. G. Kranich. Soc. Automotive Engrs.—Jl., vol. 17, no. 3, Sept. 1925, pp. 249-253, 6 figs. Power take-offs are divided into two types: (1) those in which speed varies with and is function of rate of travel of tractor, and (2) those in which speed is constant, being directly a function of engine speed and independent of rate of travel; advantages of latter lie in fact that it is frequently necessary to maintain speed of attachment while working under conditions that render low speed of tractor desirable or obligatory.

PRODUCTION METHODS. Production Methods in a Tractor Plant. Machy. (N. Y.), vol. 32, no. 1, Sept. 1925, pp. 32-35, 10 figs. Describes some of more unusual operations performed at tractor works of International Harvester Co., Chicago, Ill.

TRANSFORMERS

OUTDOOR STATION. Modern Transformer Station. Elec. World, vol. 86, no. 12, Sept. 19, 1925, pp. 553-555, 8 figs. Hydro electric Power Commission of Ontario builds 110-kv. outdoor station in Toronto; design features and electrical layout; spray pond for transformer cooling water.

POLARITY OF. The Polarity of Transformers, R. C. Philipp. Elec. Engr., vol. 2, no. 4, July 15, 1925, pp. 141-143, 13 figs. Meaning of term Polarity, as applied to transformers, is defined and a description given of means whereby polarity of either single or polyphase transformers may be ascertained; gives diagrams, and instances showing how polarity may be altered in order to enable transformers to be run in parallel.

REGULATION. Charts for Regulation of Transformers, A. A. Boelsterli. Instn. Elec. Engrs.—Jl., vol. 63, no. 343, July 1925, pp. 692-696, 7 figs. Charts are presented from which results can easily be read; simple "chord diagram" is developed, which is well suited for approximate estimates; both methods are based upon formula recommended by Am. Inst. Elec. Engrs.

VENTILATION. Ventilation for Self-Cooled Transformers, T. C. Lennox. Elec. World, vol. 86, no. 12, Sept. 19, 1925, pp. 569-570, 3 figs. Use of this type of equipment for indoor installations analyzed; design of air-venting system important; quantity of air that is necessary.

TUBES

BRASS, INTERNAL STRESS IN. The Effect of Low-Temperature Heating on the Release of Internal Stress in Brass Tubes, Rob. J. Anderson and E. G. Fahlman. Inst. Metals—advance paper, no. 1, for mtg. Sept. 1-4 1925, 29 pp., 23 figs. Summarizes results of investigation of effect of low-temperature heating on release of internal stress in cold-worked leaded-brass tubing; work was carried out to determine suitable heat treatment which would prevent warping and other movement of manufactures made of tubing on standing over period of time at ordinary temperature, and at same time effect stress release without material loss in hardness and strength.

CONDENSER AND LOCOMOTIVE. Some Notes on Condenser Tubes. Locomotive Tubes and Cupro-Nickel. A. Cameron. Instn. Engrs. (India)—Jl., vol. 5, Apr. 1925, pp. 89-108, and (discussion) 139-143, 15 figs. partly on supp. plates. Deals with processes in use for making such tubes of copper or brass, and with procedure practised at works from which illustrations have been made. See also (abstract) in Engineer, vol. 140, no. 3636, Sept. 4, 1925, p. 250.

WROUGHT-IRON. Report of the Wrought Iron Tubing Inquiry Committee. Gas Jl., vol. 171, no. 3245, July 22, 1925, pp. 3-13 (Gas Instn. Supp), 20 figs. Adopted by committee Apr. 29, 1925; work done by South Metropolitan Gas Co., and by Gas Light & Coke Co., in connection with corrosion and rusting of wrought-iron and steel gas barrel; results of examination of deliveries of wrought-iron tubing supplied to South Metropolitan Gas Co.

BRASS, INTERNAL STRESS IN. Release of Internal Stress in Brass Tubing, R. J. Anderson and E. G. Fahlamn. U. S. Bur. Standards, Technologic Paper No. 285, May 14, 1925, pp. 235-265, 16 figs. partly on supp. plates Discusses investigation carried out at Pittsburgh experimental station of U. S. Bur. Mines in connection with related metallurgical studies on brass. Effect on low-temperature heat treatment on release of stress and on physical properties of cold-worked leaded brass tubing of nominal composition 66.33:33.17:0.5 copper-zinc-lead; effect of heating in range 250 to 400 deg. cent. on resultant hardness of tubing and upon release of stress thereby, and effect of such treatment on tensile properties of cold-worked brass sheet of same composition as tubing.

TUNNELING

WANAQUE, N. J. Driving Wanaque Tunnel for North Jersey Water Supply. Eng. News-Rec., vol. 95, no. 12, Sept. 17, 1925, pp. 460-461, 3 figs. 860-ft. tunnel to carry supply line under overflow channel of dam; power and concrete plant existent at site.

TRAVELING CANTILEVER BEAM FOR. A New Device for Tunnel Work, J. F. Cohig. Eng. & Contracting, (Gen. Contracting), vol. 64, no. 1, July 15, 1925, pp. 173-175, 3 figs. Describes Lewis traveling cantilever beam as used at Moffat tunnel; device essentially consists of two parallel 3½-ft. plate girders, 60 ft. long, spaced on 6-ft. centers with necessary cross frames and bracing.

TUNNELS

ALOUETTE-STAVE LAKE, CANADA. Alouette-Stave Lake Hydro Development, C. E. Blee. Can. Engr., vol. 49, no. 7, Aug. 18, 1925, pp. 223-228, 8 figs. Particulars regarding construction of tunnel between Alouette and Stave Lakes for British Columbia Elec. Ry. Co., to divert water to new power plant on Stave Lake; dam built at lower outlet of Alouette Lake.

TURBO-ALTERNATORS

60,000-KVA. Three-Phase, 60,000-Kv-a. Turbo Alternators for Gennevilliers, E. Roth. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 9, Sept. 1925, pp. 927-937, 18 figs. Calls attention to unusual features of these machines which may interest American engineers, and points out methods and results of tests carried out on them; comparison between dimensions of 60,000-kva. and 45,000-kva. alternators; consideration of advantage of employing leakage slots; ventilation of 45,000-kva. and 60,000-kva. alternators; measurement of temperature rise.

V

VACUUM TUBES

SCHOTTKY EFFECT IN LOW-FREQUENCY CIRCUITS. The Schottky Effect in Low Frequency Circuits, J. B. Johnson, Physical Rec., vol. 26, no. 1, July 1925, pp. 71-85, 13 figs. This effect, which depends on probability fluctuations of electron emission from filament, has been measured over considerable range of conditions in resonant circuits of which natural frequency was varied from 8 to nearly 6000 p.p.s.; presents results of considerable series of measurements on Schottky effect as it appears in circuits of comparatively low natural frequency, and of preliminary studies upon possible relation between Schottky effect and "noise" in vacuum-tube amplifiers.

VALVES

TRIPLE, FOR AIR BRAKES. Triple Valves for Air Brakes, F. H. Colvin. Am. Mach., vol. 63, no. 12. Sept. 17, 1925, pp. 457-460, 12 figs. Conveyors and special equipment for handling and machining valves in large quantities; grinding, lapping and testing piston rings; special tooling for turret lathes.

VAPORS

WATER, VISCOSITY. The Determination of the Viscosity of Water Vapor (Die Bestimmung der Zähigkeit des Wasserdampfes), H. Speyerer. Forschungsarbeiten auf dem Gebiete des Ingenieurwesens, no. 273, 1925, 30 pp., 13 figs. Account of investigation undertaken in laboratories of Technical High School at Karlsruhe to determine viscosity of steam, describing elaborate installation employed and methods undertaken and giving numerical data showing viscosity found under various conditions; it was found that viscosity of water vapor is function of pressure and temperature; functional relation derived from kinetic theory of gases to effect that viscosity is independent of pressure holds good only within region of ideal state of gas; viscosity of gases at high pressures and of vapors at even lower pressures show variations not in accordance with general theory.

VIADUCTS

APPROACHES, RENEWAL OF. Rebuilding Bridge Viaducts Under Extreme Difficulties, J. M. Salmon. Ry. Eng. & Maintenance, vol. 21, no. 9, Sept. 1925, pp. 348-349, 3 figs. Louisville & Nashville renews approaches of Ohio River crossing at Cincinnati with company forces.

REINFORCED CONCRETE AND ENCASED STEEL. Viaduct Is Built of Reinforced Concrete and Encased Steel. Eng. News-Rec., vol. 95, no. 8, Aug. 20, 1925, pp. 297-299, 5 figs. Roosevelt Road viaduct in Chicago built in two parallel sections; forms hung across tracks; continuous concrete girders.

VISCOSIMETERS

OIL TESTING. The Measurement of Viscosity by the Ostwald Viscometer: Conversion to Time by the Redwood Viscometer, S. T. Minchin. Instn. Petroleum Technologists—Jl., vol. 11, no. 50, June 1925, pp. 284-295, 6 figs. Discusses practicability and advantage of use of Ostwald viscometers for routine oil testing.

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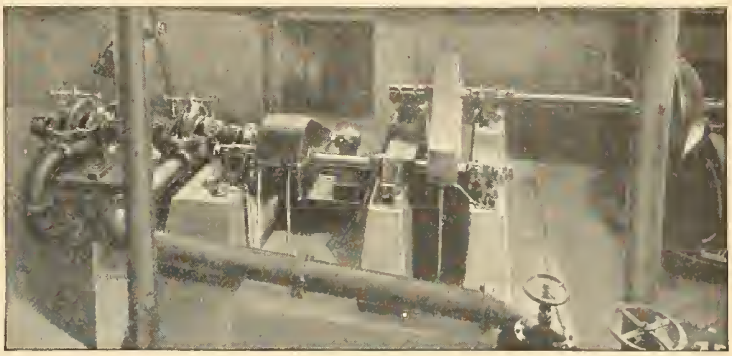

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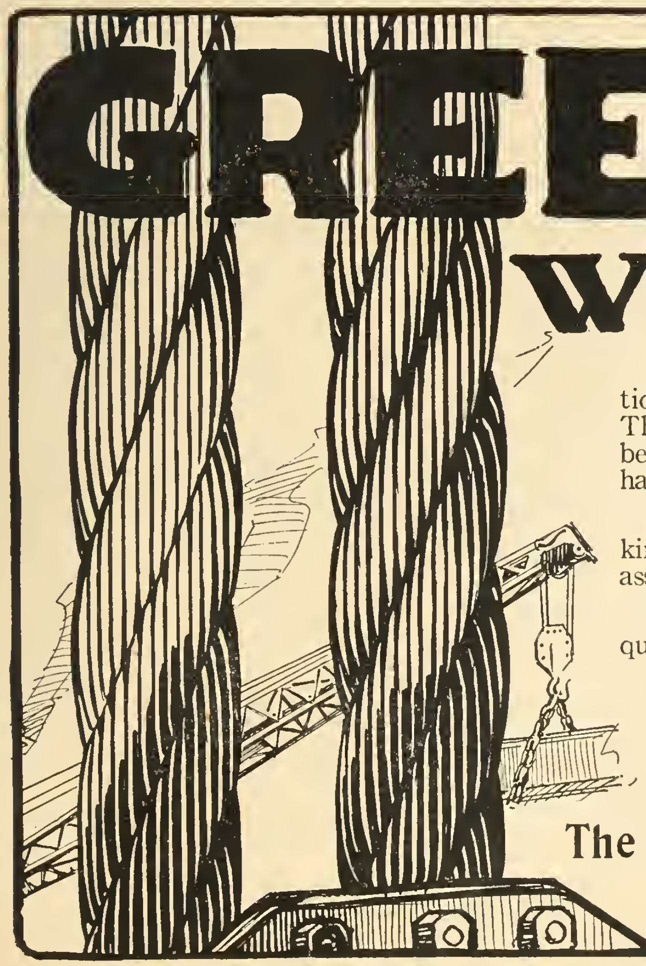

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Notice to Contractors

SEALED tenders, addressed to the undersigned and marked "Tender for Steel Mitering Lock Gates, Welland Ship Canal," will be received at this office until 12 o'clock noon on Tuesday, November 24, 1925.

Plans, specifications and form of contract to be entered into can be seen on or after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Engineer in Charge, Welland Ship Canal, St. Catharines, Ont.

Copies of plans and specifications may be obtained on the payment of the sum of $1,000. To bona fide tenderers this amount will be refunded upon the return of the above in good condition.

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By order,
J. W. PUGSLEY,
Secretary.

Department of Railways and Canals,
Ottawa, October 16th, 1925.

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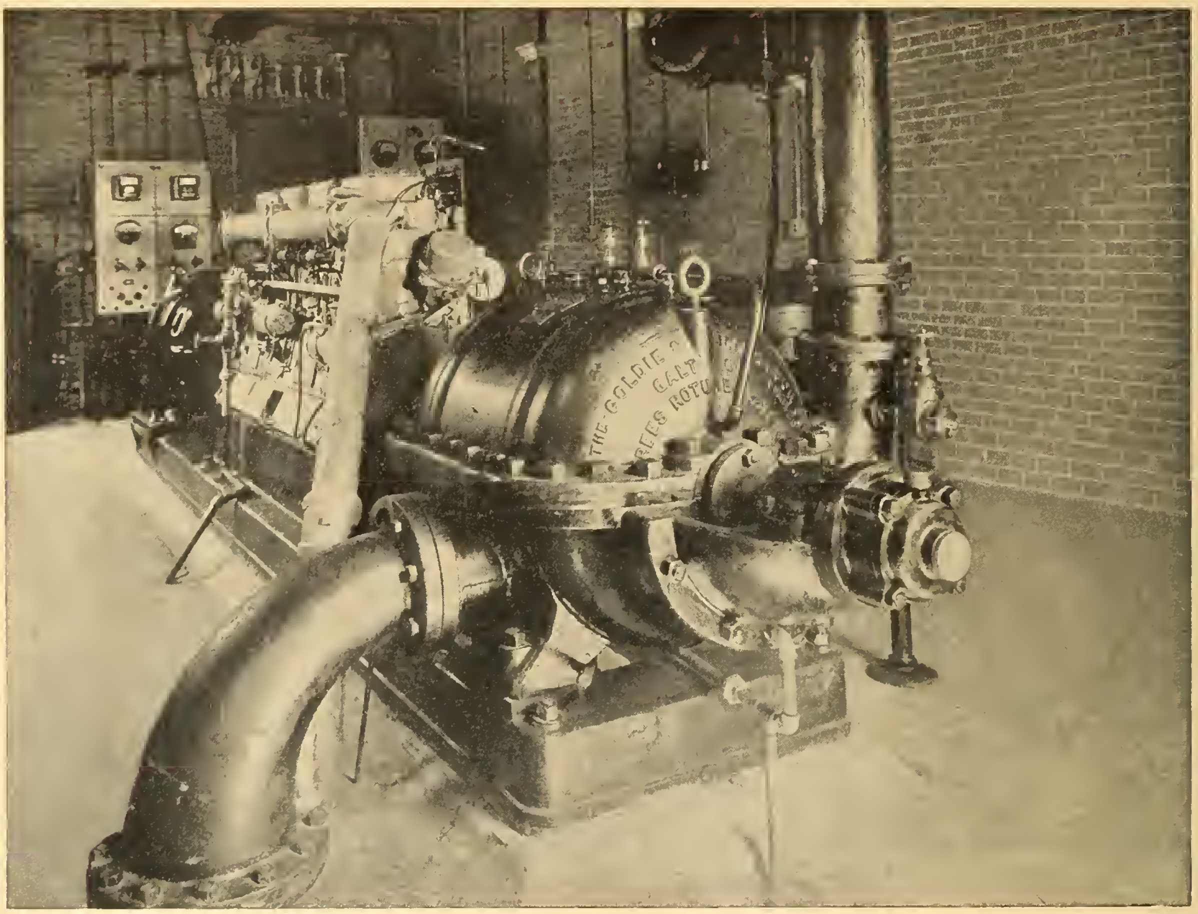

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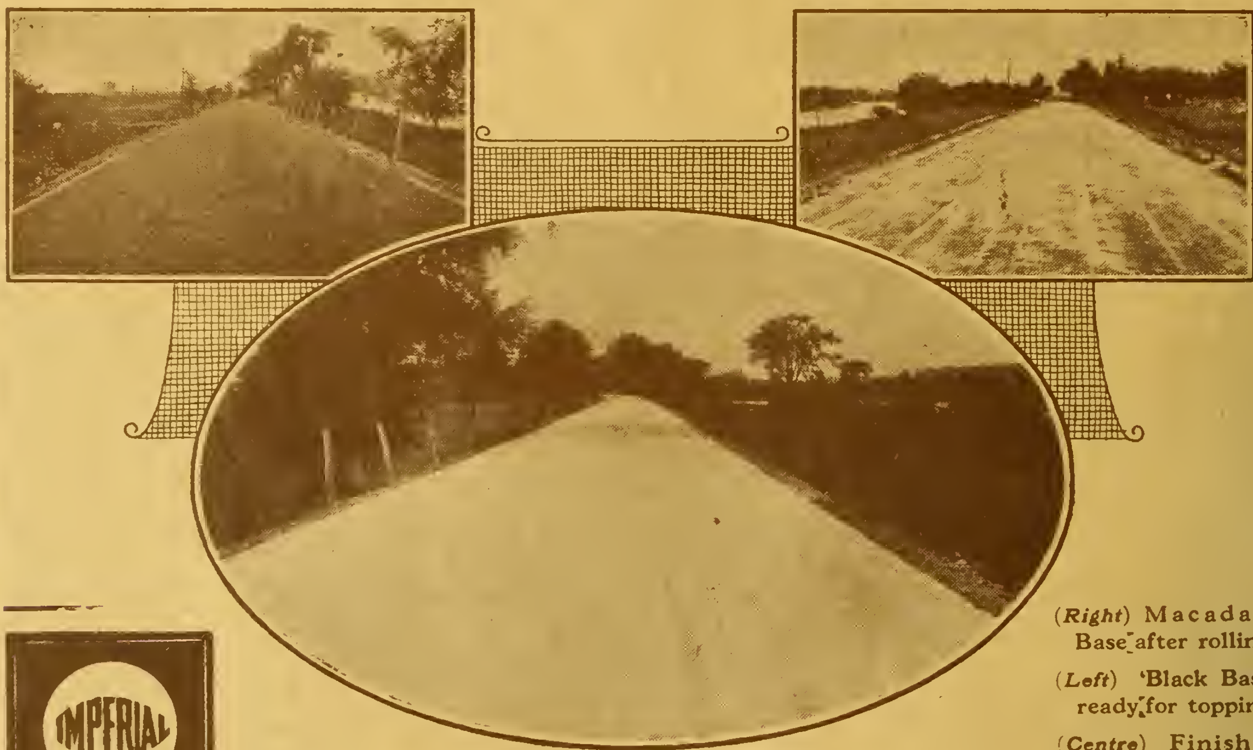

(*Right*) Macadam Base after rolling.

(*Left*) 'Black Base' ready for topping.

(*Centre*) Finished Sheet Asphalt surface.

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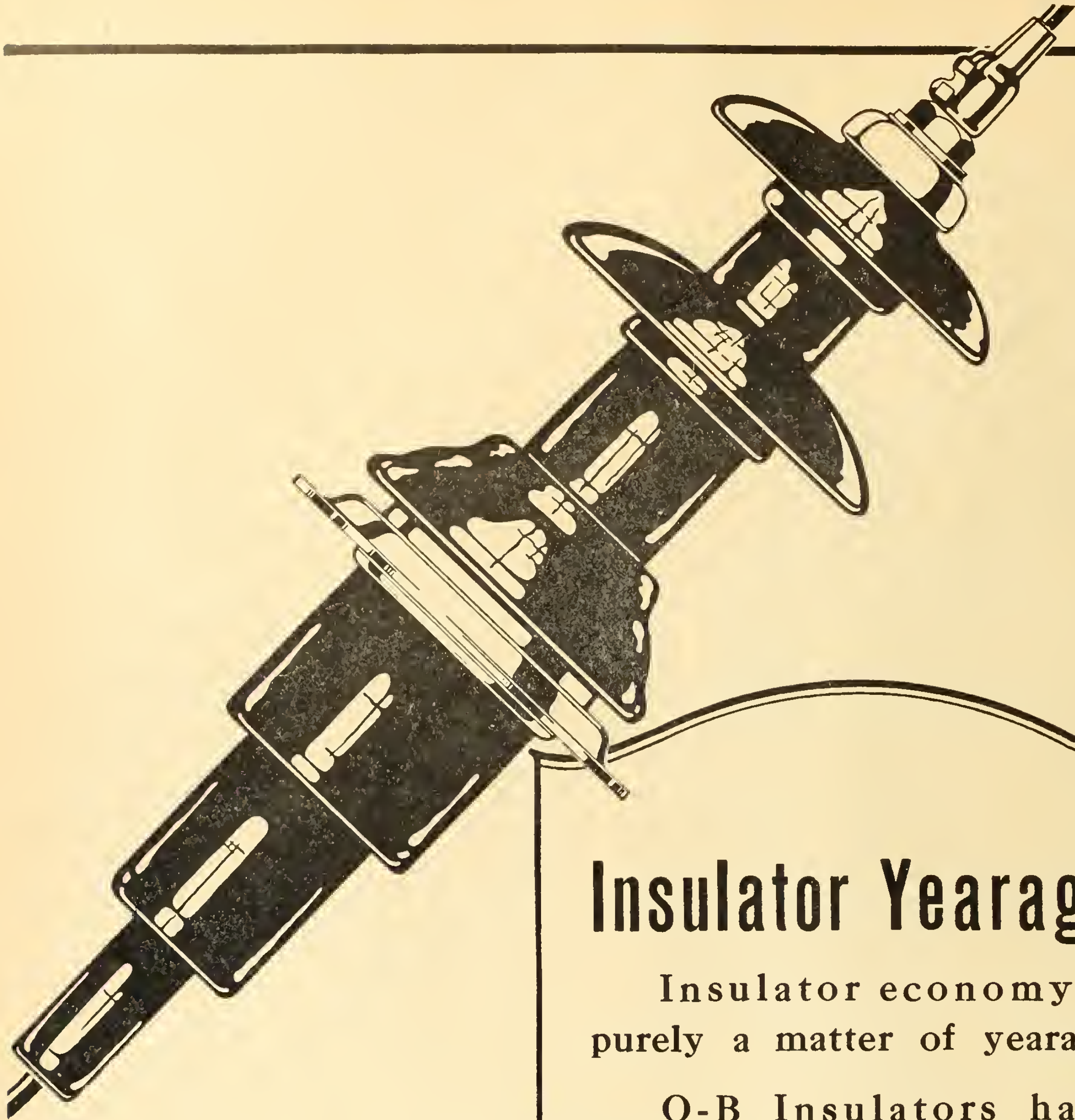

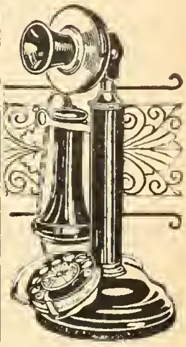

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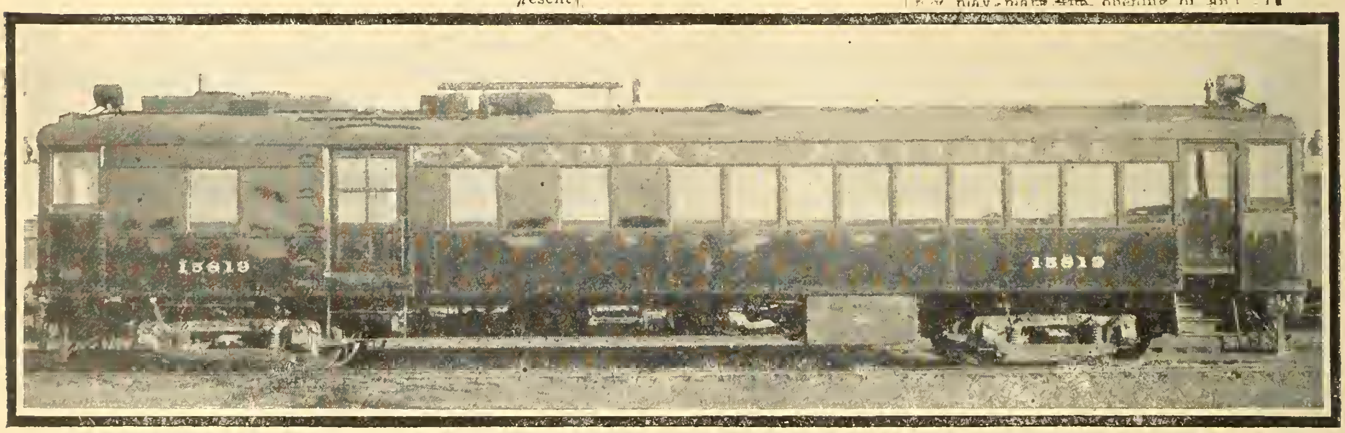

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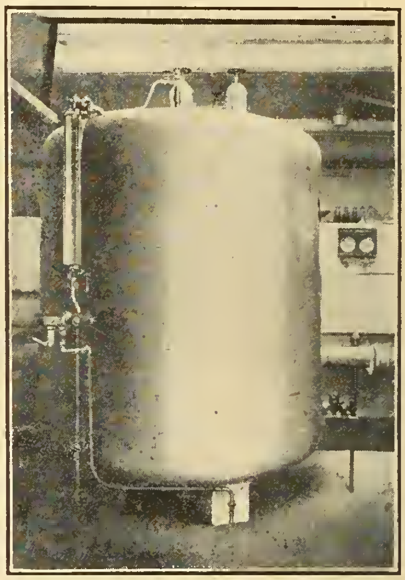

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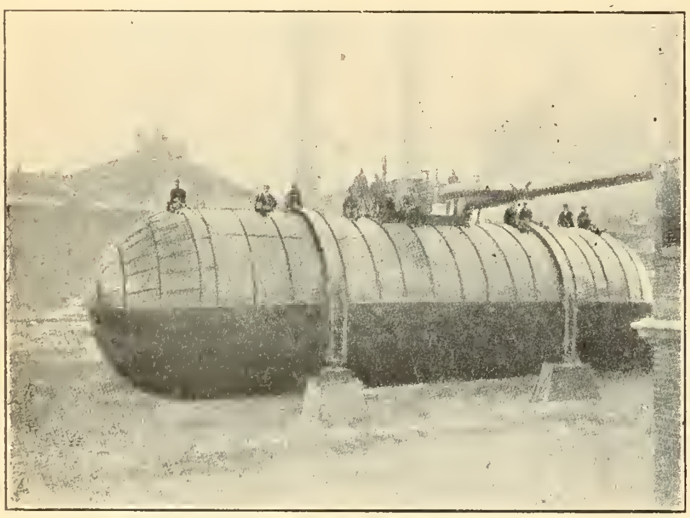

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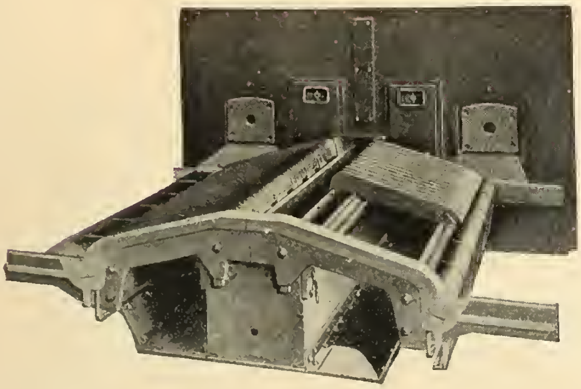

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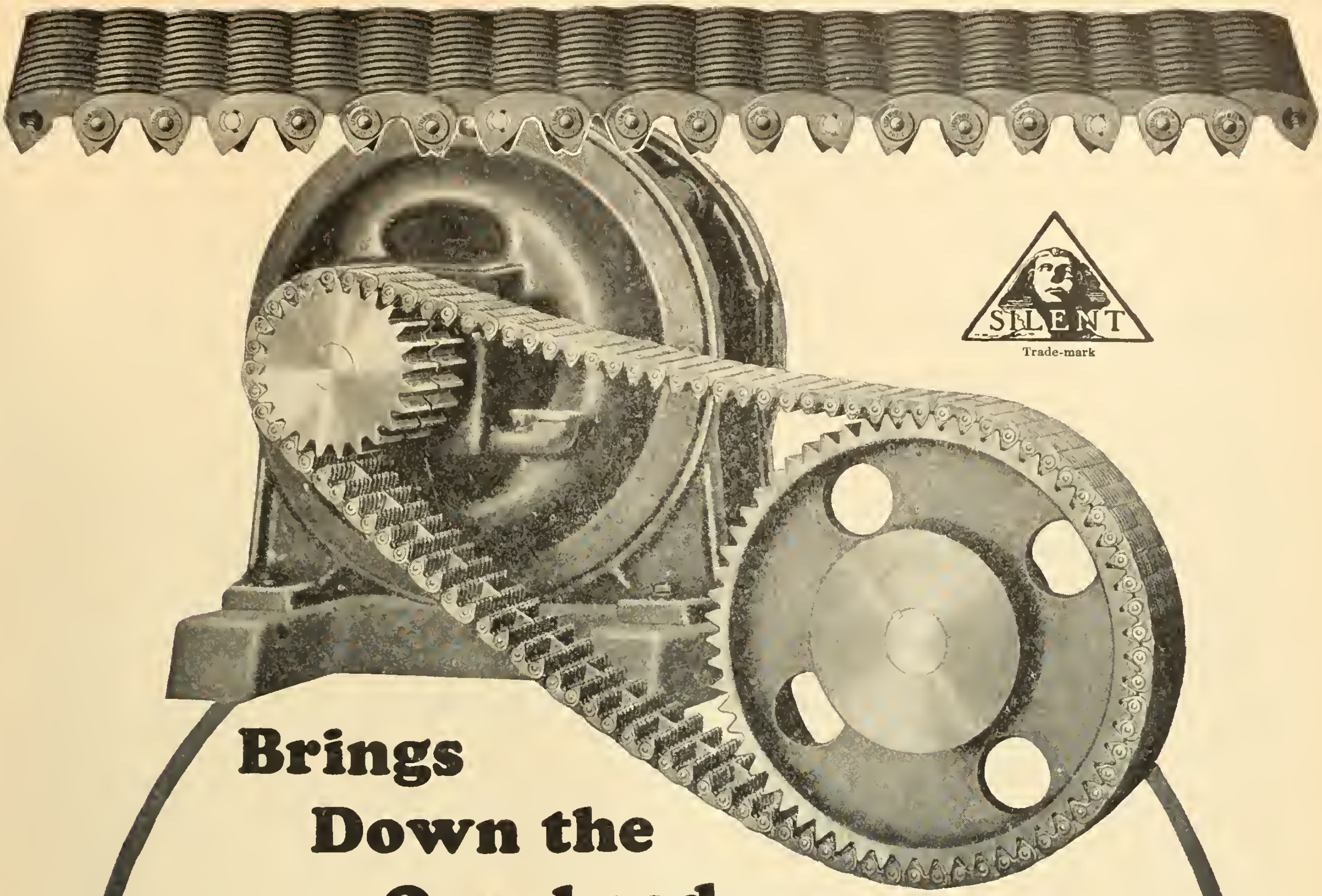

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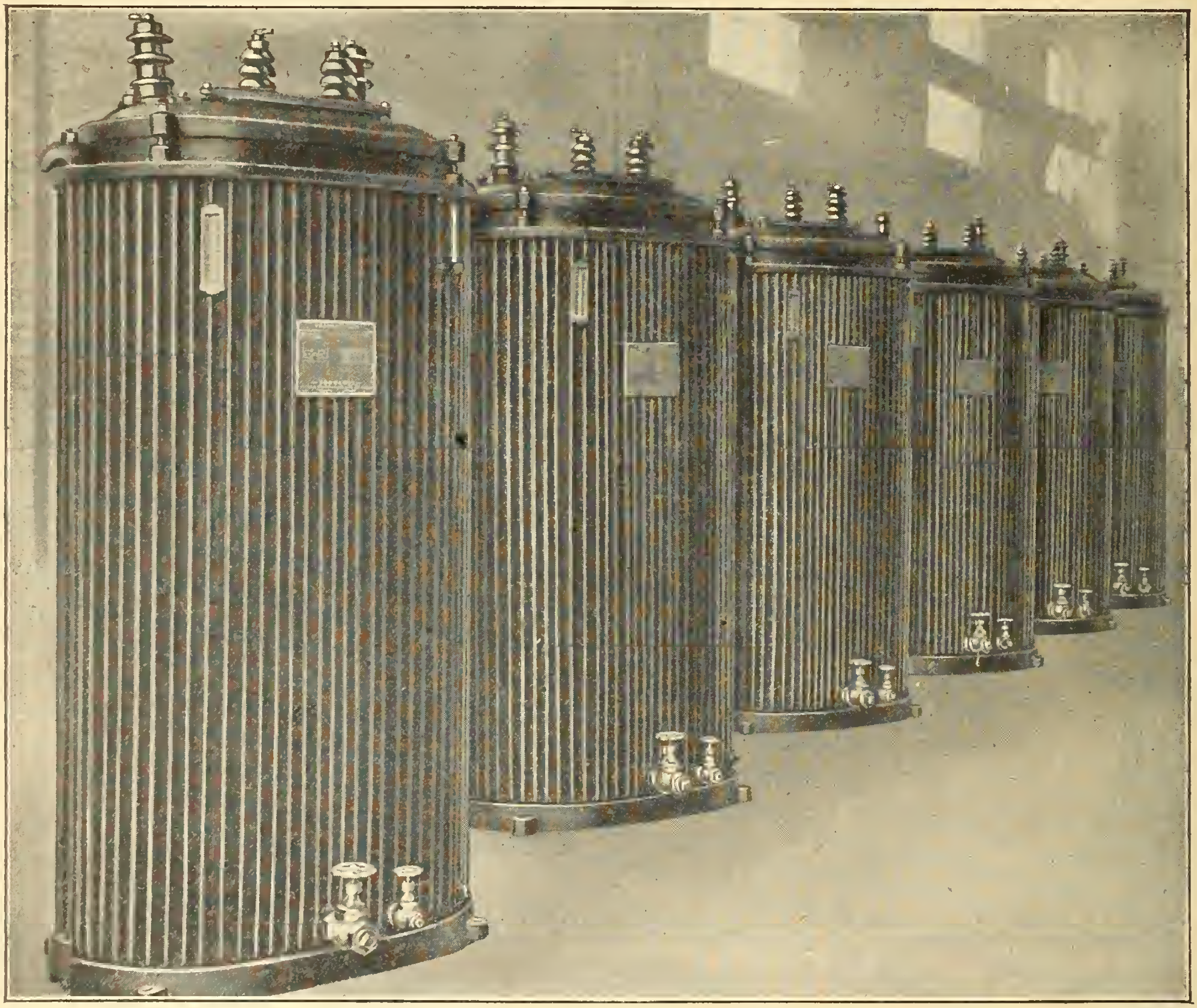

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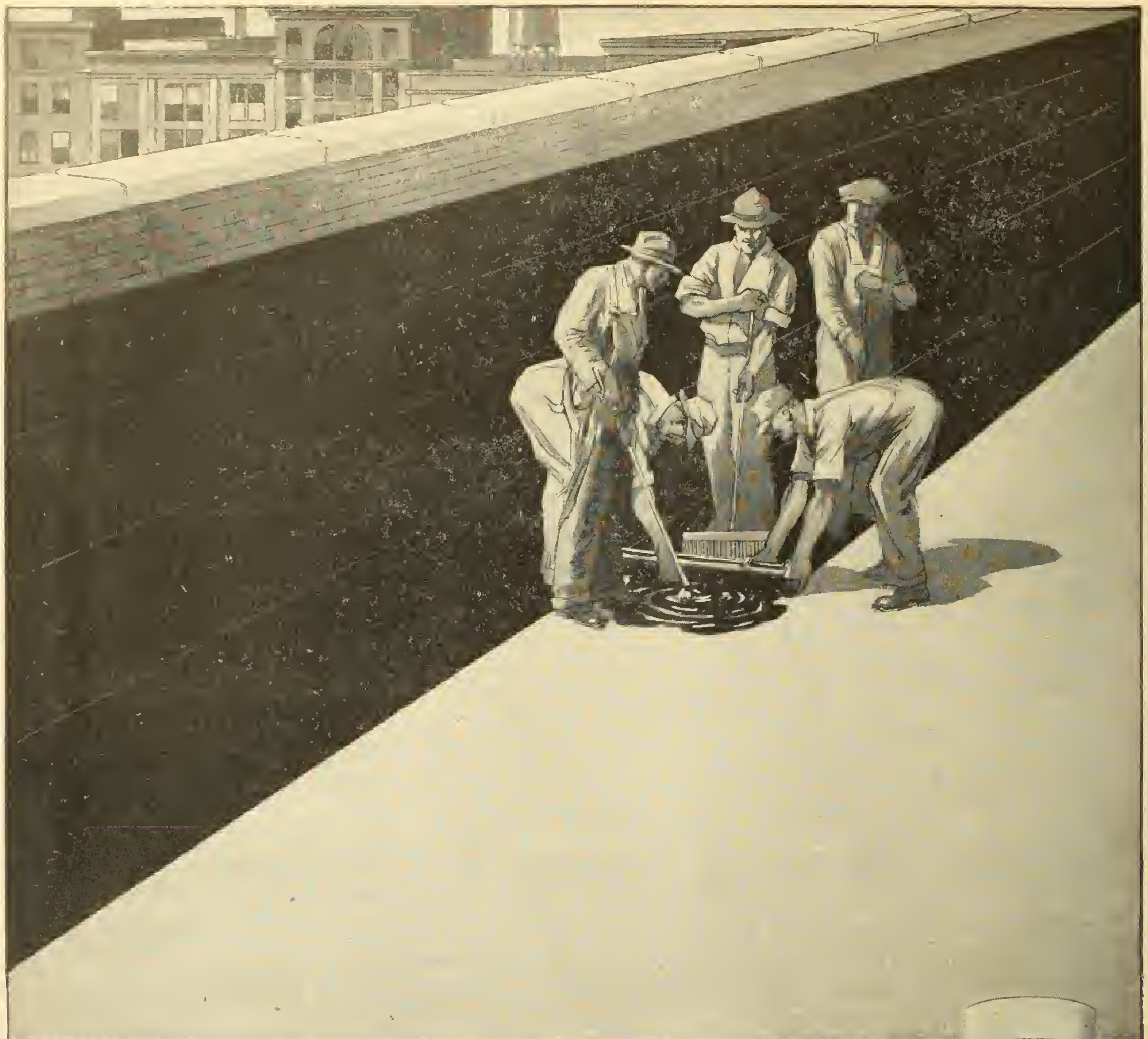

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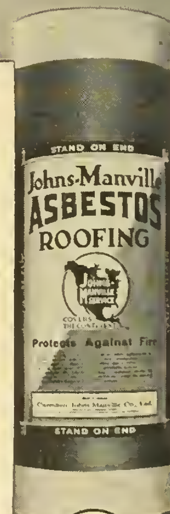

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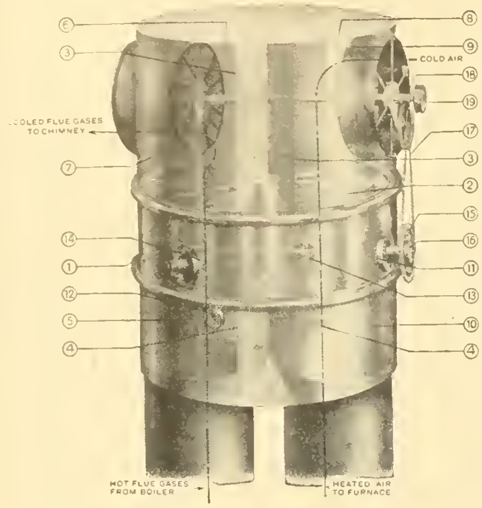

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The New Esquimalt Drydock

General Details of the Construction and Equipment of the New Drydock at Esquimalt, B.C.

J. P. Forde, M.E.I.C.

District Engineer, Department of Public Works, Canada.

Paper read before the Victoria Branch, The Engineering Institute of Canada, April 8th, 1925.

In 1887 the Esquimalt drydock, which was built jointly by the governments of Great Britain, Canada and British Columbia, was completed and put into operation, and has since been operated by the Public Works Department of Canada for the docking of naval and merchant vessels. It is 450 feet long, 65 feet wide and has 29 feet of water on the sill at high water. The main pumping plant consists of two 5- by 4-foot bucket pumps operated by two high pressure steam engines and it is interesting to note that these engines, built by James Watts and Company, in 1876, and operated since 1887, are today in excellent condition.

Owing to the rapid increase of shipping and of the size of vessels in service on the Pacific this drydock has not been able to accommodate all vessels wishing to dock there, and early in 1921 the government of Canada, after long consideration, decided to proceed with the construction of a new and larger dock at Esquimalt.

Choice of Site and Its Characteristics

Esquimalt harbour is eminently suitable as a site for such a work, being sheltered from all winds, having first-class holding bottom for anchorage and having depths of from 30 feet close inshore to 40 feet in the harbour. It is the base for the Pacific Squadron of the Royal Canadian Navy. It is three miles distant from Victoria, Esquimalt being a suburb of that city, with which it has easy means of communication by roads, electric and steam railways and water.

Before the site for the new dock was finally decided upon, the fullest information regarding all possible locations was obtained and considered, but the site finally chosen at Skinner's cove was so preeminently the best that it was adopted without hesitation.

As will be seen by the accompanying photographs Skinner's cove is a natural rock basin on the easterly side of Constance cove, the main anchorage ground in Esquimalt harbour, and naturally lends itself to the construction of a drydock. By the removal of the overlying material on the rock bed of the harbour and of a comparatively small amount of rock, a solid rock floor was obtained at the proper level, with the exception of one deep pocket between stations 9 and 11, which required the placing of about 10,000 cubic yards of concrete to bring it up to sub-grade. All of the north wall, the end wall and about one third of the south wall are on and against rock and the remainder of the south wall and all of the tunnels are on rock, as are also the various dock buildings and the rubble mound on which the landing wharf is placed, while the bay behind this wharf provided an excellent waste ground for surplus excavated material, by means of which an area of approximately ten acres has been reclaimed, which will be very valuable for yards, fitting-out shops, etc.

The rock is a volcanic trap, running approximately parallel with the centre line of the dock for almost its entire length, and having an average dip towards the south of about 55 degrees, and while this dip necessarily caused a certain amount of overbreak, this was by no means excessive, and in fact did not exceed four per cent of the total quantity to be removed. After the surface rock had been stripped the underlying material was found to be almost entirely free from faults or fissures and as a consequence leakage through the formation has so far been found to be negligible.

General Dimensions and Comparison with Other Docks

The principal dimensions of the dock are, — length, 1,150 feet; clear width at entrance and at intermediate sills, 124 feet; width at coping, 149 feet; depth on sill at high water, 40 feet; area at bottom, 142,600 square feet.

Figure No. 1.—Airplane View Showing Location of New Esquimalt Drydock at Skinner's Cove.

Figure No. 2.—Site of New Esquimalt Drydock at Skinner's Cove before Construction Operations — 1921.

A comparison of the size of this dock with the other existing drydocks, of 1,000 feet or over in length, is:—

Name	Location	Length	Width at sill	Depth on sill H.W. O.S.T.
Commonwealth,	Boston, Mass.	1,171	120	46
Lauzon,	Quebec.	1,150	120	40
St. John,	St. John, N.B.	1,150	110	42
Congella,	Durban, S.A.	1,150	110	41
Peter,	Cronstadt,	1,058	63	19
Gladstone,	Liverpool, Eng.	1,050	120	43
Bassin deMaree,	Havres, France	1,049	113	26
Navy Yard,	Philadelphia, Pa.	1,022	115	43
Pearl Harbour,	Honolulu, H.T.	1,008	114	35
No. 4,	Norfolk, Va.	1,001	116	44
Balboa,	Panama, C.Z.	1,000	110	48
Hunter's Point,	San Francisco,	1,000	110	40
Hughes,	Bombay, India	1,000	100	36

There is small probability of the whole length of the dock often being required for one vessel, and it has been so constructed, as to allow of its being divided into two separate chambers. This has been done by the provision of two intermediate stops at distances of 400 feet and 750 feet from the main sill. Such a plan allows of great flexibility in arranging for the docking of vessels, since although only one intermediate caisson is provided, it can be used at either of the intermediate stops. The dock can, therefore, be used as one basin 1,150 feet long, or as two separate basins, the outer one being 400 feet long and the inner one 750 feet long, or vice versa, as may be required by the order in which vessels arrive for docking.

Construction Details

It was necessary to construct a cofferdam around the area to be occupied by the dock, but as there was not sufficient rock excavation available above low water level for the entire dam it was decided to build it in two sections, each section to enclose approximately one-half of the total area, and the rock excavated from the inner area to be used in the outer dam. The inner dam was built of rock dumped from a pile trestle and was then faced on the outer side with a mat of clay dredged from Lang's cove, an adjacent bay in the harbour. It was found that this clay, while very stiff in its original position, became extremely soft when worked and exposed to air and water, and instead of lying on a slope of 3 to 1, as was anticipated, it flattened out to a slope of 8 to 1, and between high and low water levels, where it was subject to constant wave action, it was inclined to wash away. To prevent this it was necessary to construct a bulkhead of round piling supporting tongue and grove sheet piling along the entire face of the section. After this was done no difficulty was experienced in keeping the enclosed area dry.

The outer section of the dam was built in a similar manner, with the difference that a core of interlocking steel sheet piling was used to prevent the entrance of water. This was not entirely successful, owing, probably, to leaks through the joints of the piling and to the fact that the steel piles did not entirely penetrate the overlying material on the harbour bed, and as a consequence some difficulty was experienced in unwatering this section. Later, a clay mat was laid on the outer face of the cofferdam and, although the leakage was still large when the enclosed area was first unwatered, it was very considerably lessened after blasting operations began, due, no doubt, to the heavy concussions from the blasting settling and consolidating the fill.

Considerable change has taken place in recent years in drydock design, necessitated by the change in modern ship design. Formerly vessels had outstanding keels and high sheer and if left without proper support would roll over on their bilges or sides. Consequently extensive shoring was required to maintain them in an upright position and, to allow of the placing of these shores, the sides of docks were built in the form of steps or altars from top to bottom. Now, however, when vessels are built with flat bottoms and vertical sides no such support is necessary, since, when in drydock, they rest on keel blocks under the centre line of the bottom and are supported by a row of blocks under each bilge. Not only does this system allow of more expeditious docking of vessels but the absence of shoring allows of the free movement of material along the ships' sides and unobstructed work on ships' plates or frames, and freedom for cleaning and painting.

As already mentioned, the entire floor of the dock is on solid rock and consequently no extreme thickness of concrete in the floor was necessary. The floor consists of a concrete slab of 1.3.5 mixture, having a thickness of 3 feet 6 inches on the centre line of the dock, and sloping off to 3 feet 0 inches at a line 10 feet from the foot of the side walls, and again increasing in thickness to 3 feet 3 inches at the foot of the walls, these slopes being to facilitate drainage. This slab is overlaid with a finished floor of 1.2.4 mix having a uniform thickness of one foot. Possible hydrostatic pressure from the underside of the floor is provided against by tile drains placed in a layer of loose rock overlying the solid rock and led to the emptying and filling culverts. At only one place on the site was there, any indication of leakage through the rock, during construction and at this point special care was taken in the laying of the tile drains, which were also enclosed in broken rock. To prevent the accumulation of water from surface drainage or other sources in the loose material behind the walls, open tile drains were also laid from the bottom of the back fills to the emptying and filling culverts.

Attention has already been drawn to the fact that the greater part of the walls are in solid rock and as it was anticipated that this rock would be found to be almost entirely of an impervious nature it was planned to face it with concrete having an average thickness of 4 feet. The rock was found to be largely as anticipated and consequently this plan was adhered to as far as possible, particularly near the bottom, although overbreak rendered necessary the construction of a gravity wall at the higher levels. Along the portion of the south wall, which was originally open to the harbour, a gravity wall for the entire height has, of course, been necessary, these walls having a uniform batter on the back side of 1 in 10.

Tunnel for Compressed Air, Water and Power Mains

The dock walls have been provided with three altars or steps to afford access to staging at various levels. These altars are each 3 feet 4 inches in width and are topped by granite. Located in the walls and directly under the coping is a tunnel circuiting the sides and head of the dock, in which compressed air and water pipes, electric light and power mains, etc., can be installed. By placing these accessories in this tunnel, instead of burying them in a trench or trenches, they are always accessible at all points, not only for repair if required, but also allowing for the making of connections at any required point at a minimum of time and expense. Access to the tunnel is obtained by manholes placed 100 feet apart.

In addition to the piping systems carried in the above tunnel both compressed air and salt water pipes have been provided around the foot of the dock wall, these pipes being placed in a chase or recess which allows them to be kept inside the line of the face of the wall, thus protecting them from breakage by falling tools or timbers. Provision is made for hose or pipe connections every fifty feet along these mains.

Lighting Equipment

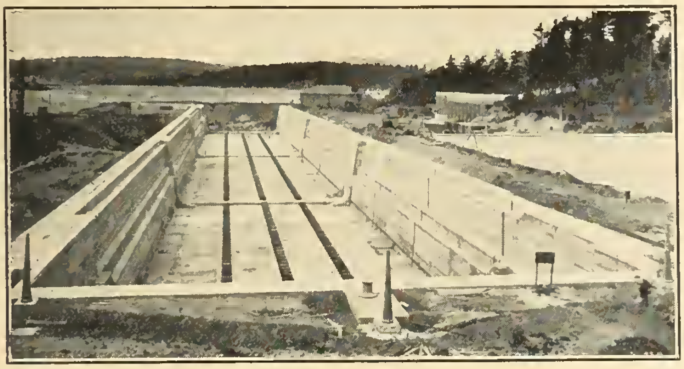
The electric mains for lighting the dock grounds and for carrying power to the capstans, caissons, etc., have not, however, been placed in this tunnel, it having been found more economical to lay them in separate conduits, laid in concrete, with manholes and pull boxes at 100-foot intervals. The reason for this is that, as the light standards and capstans are placed at the far side of the roadway from the dock, the length of connections required from the tunnel to the various outlets would exceed the length of a continuous conduit on the line of the outlets, to which would have to be added the cost of the required fibre conduit in the tunnel and the necessary outlets through the tunnel wall. The only exception to the above is the main for the floodlights in the dock.

The lighting equipment of the dock consists mainly of two systems,—one for distributed light around the dock grounds and roadways and the other for lighting the dock basin. The first system consists of forty-nine combination 500-watt floodlights carried on cast iron columns placed at approximately 90-foot intervals around the dock and along the landing wharf, and eleven similar standards and lights along the roadway forming the main entrance to the dock grounds. For the dock basin lighting, floodlights will be placed in recesses in the dock wall just below coping level. There will be nineteen of these lights, and each outlet will be fitted with a duplex plug, so that in addition to the flood lights which will be placed and operated from coping level, flexible extensions will be provided to allow lights to be carried to any part of the dock floor or ship's sides or bottom, as required.

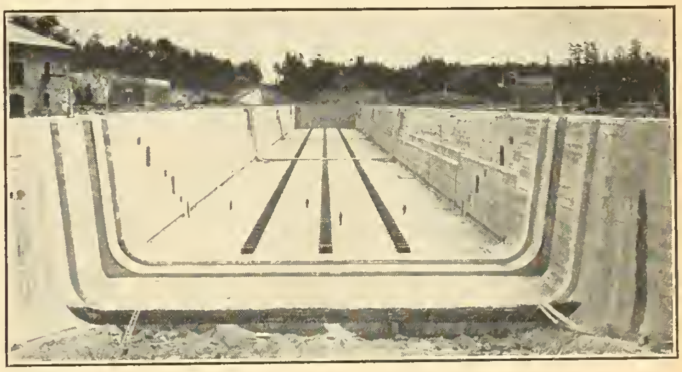
In addition to the facilities already mentioned, (light, electric power, salt water and compressed air), fresh water will also be available, being provided from a 6-inch main from the gravity supply of the Esquimalt Water Works Company, Ltd., and delivered at the dock at a pressure of 110 pounds per inch.

Sanitary Provisions

At a dock such as this, where not only merchant vessels but also vessels of His Majesty's Navy may be held under repair for considerable periods of time, the provision of sanitary accommodation is a very important matter, and as the British Admiralty intimated their wish that provision be made for as many as 1,000 men it was considered advisable to follow the St. John drydock



Looking West Towards Entrance.



Looking East — Taken from Entrance.

Figure No. 3.—New Esquimalt Drydock.

plan of arranging for crews to remain on board, all discharges from ships' accommodations, waste from galleys, etc. being taken care of by a special drainage system. This system consists of flexible hose outlets from ships' ports led to 8-inch cast iron pipes which encircle each section of the dock. Spaced along these pipes at about 100-foot centres are manholes having special cast iron covers, to which portable galvanized iron buildings can be set to accommodate workmen employed in the dock.

The pipes will be flushed continuously with salt water and will drain into a sewage sump tank placed in a corner of the main suction chamber. This tank will have a capacity of 2,000 gallons and will be emptied by a 3-inch fullway electrically operated pump, discharging into the sea through the auxiliary emptying and filling tunnel.

Easy Access to Various Parts of the Dock

At each corner of the dock is provided a stairway built into the wall, which will give access to the dock floor and to the various altars along the walls. These stairways are lighted by openings in the wall as well as by the exits to the altars. In addition to the stairways are vertical ladders placed along the walls at approximately 100-foot. intervals. For easy access to the altars in the centre section and to the dock floor from the pump house, a stairway and access tunnels to the intermediate altars and dock floor have been provided. This stairway is in a vertical shaft so arranged as to allow of the installation of an elevator if it is found advisable to do so at a later date.

At the inner end of the dock a sloping timber slide, faced with granite, has been placed to allow of the quick lowering of timbers, blocking, etc., to be lowered quickly into the basin. It is also proposed to provide the usual equipment of cranes for the handling of propellors, rudders, tail shafts, frames, plates, and other material required in connection with repairs to vessels.

To allow of economical transport of stores and supplies to the dockyard, a standard gauge track connecting with the main line of the Esquimalt and Nanaimo Railway, (C. P. R. Island line), has been laid.

Mechanical Equipment

The mechanical equipment for the dock consists of main and auxiliary pumps for emptying the dock; sump pump; sewage pump; fire pump; air exhauster pump; motor exciter; penstock motors; capstans; and small machine shop.

The main pumps are three 54-inch vertical centrifugal pumps, each capable of discharging 60,000 gallons of water per minute, driven by 1,000-h.p., self-starting, synchronous motors, three-phase, 60-cycle, 2,200 volts, a.c., 360 r.p.m., together with a 48-k.w. vertical shaft, d.c. generator, 125 volts, as an exciter for these motors. Each pump is provided with an automatic reflux valve and an electrically operated gate valve on the sea side of the pump. These pumps are designed to empty the dock, which has a capacity of 42,000,000 gallons of water, in four hours. All of the dock drainage tunnels enter a common suction chamber from which the pumps can be used to empty any one or more sections of the dock, thus providing a very flexible arrangement of the pumping system.

The auxiliary pumps are two 22-inch vertical centrifugal pumps, each capable of discharging 9,000 gallons of water per minute and will be used for emptying the drainage tunnels and suction chamber and taking care of seepage water. The sump pump is a 3-inch centrifugal pump and is for the purpose of keeping the pump floors clear of water.

The fire pump is a 7-inch centrifugal pump and the discharge pipe from it is fitted with standard hose connections. It will be supplied with salt water through a suction pipe from the main emptying and filling tunnel.

The water to and from the various sections of the dock drains through separate tunnels, 5 by 7 feet, into the main suction chamber.

The main pumps discharge into the main emptying and filling tunnel, 9 by 14 feet, and the auxiliary pumps discharge into a small separate tunnel 3 by 4 feet, parallelling and on top of the main tunnel.

The dock is filled through the main and separate tunnels just described, the only variation of route between the emptying and filling systems being that the filling water, instead of passing through the pumps, is led from the main tunnel into the suction chamber by a by-pass tunnel, which is closed by a 7- by 12-foot penstock when the dock is being emptied.

The tunnels from the various sections of the dock to the main suction chamber are each provided with electrically operated penstocks, so that the emptying and filling operations can be confined to the required sections of the dock.

The pumps are all placed on the floor of a special pump chamber underneath the pump house, 38.5 feet below coping level, while the motors are on the main

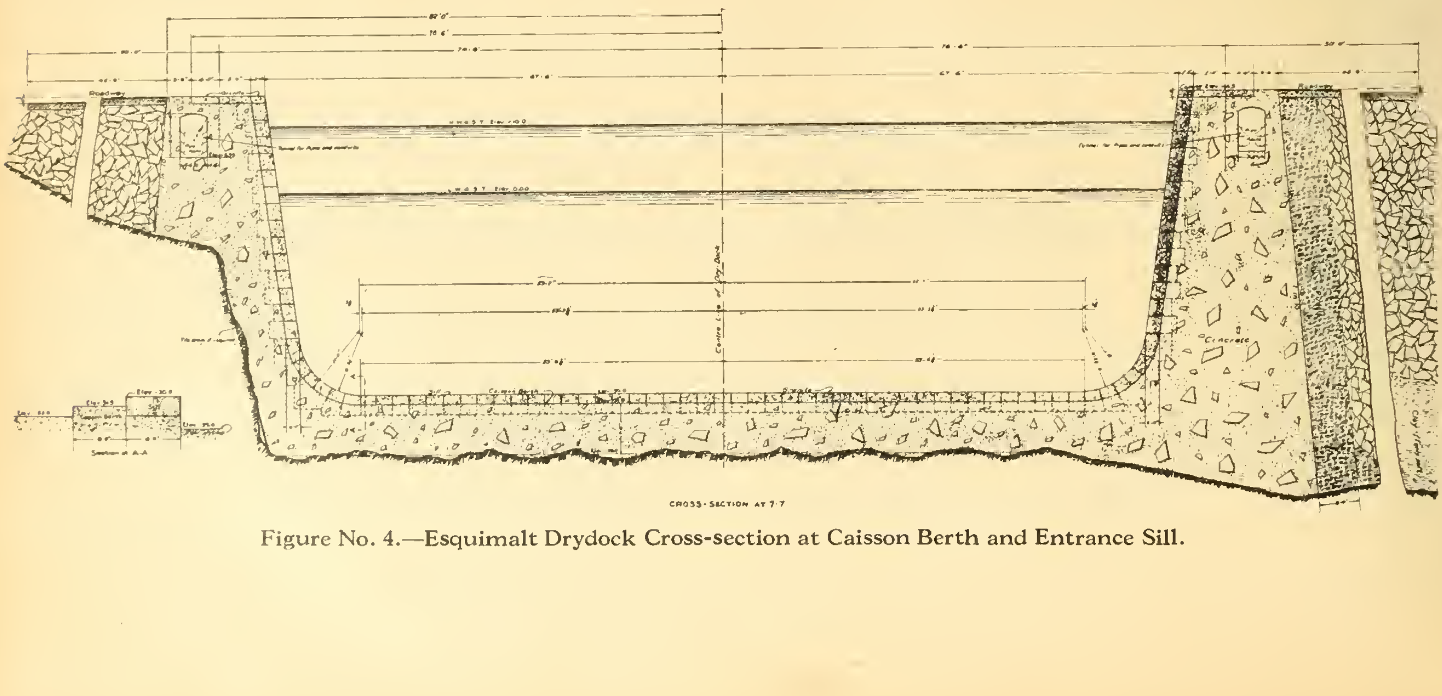


Figure No. 4.—Esquimalt Drydock Cross-section at Caisson Berth and Entrance Sill.

pump house floor, at coping level. This pump house is set 130 feet back from the edge of the dock, to allow the free passage of a travelling crane along the dock side, and so as not to interfere in any way with the free and unobstructed movement of material or plant along the dock. This arrangement allows the pump house to be situated above ground so that all motors are free from moisture which might exist if they were placed underground, and also permits proper natural lighting and ventilation.

Electric Power Supply and Capstans

The power for operating the equipment is purchased on a long time contract from the British Columbia Electric Railway Company. It is generated at their main hydro-electric station at Jordan River, and is delivered at the drydock transformer house at 60,000 volts. There it is stepped down to the various requirements of the dock machinery and lighting systems and will be used at voltages of 2,200, 550 and 110.

All of the current consumed is alternating current, with the exception of the power for the capstans and the generator exciter already mentioned, which is direct current provided by a motor-generator set installed in the pump house. In the event of a failure of power from the Jordan River system the power can be obtained from the Brentwood or Goldstream plants of the company.

The capstans consist of a head capstan placed behind the centre of the end wall of the dock, having a pull of 65,000 pounds at a cable speed of 12 feet per minute, and four capstans on each side of the dock, each having a pull of 25,000 pounds at a cable speed of 12 feet per minute. The capstans are operated by d.c. motors, 550 volts, the speed of the head capstan motor being 900 r.p.m., at full load, and 700 and 800 r.p.m., being the speed of the side capstan motors. It was originally intended to have a total of seven capstans, one at the dock head and three on each side, all having a pull of 25,000 pounds, but the experience of the U.S. Navy officials at the Commonwealth dock at South Boston in docking the White Star S.S. "Majestic" showed it to be advisable, and in fact necessary, to make the increases in number and power, as mentioned above.

Caissons for Closing Dock

The caissons, for closing the dock when it is to be emptied, are almost similar in design to those in use at the St. John drydock and at the Commonwealth dock at South Boston, practically the only changes being the necessary differences in dimensions required by the different measurements of the stops.

Two caissons are provided, it being the intention to use the dock in two sections only, but each caisson is interchangeable and can be used in any of the berths. They are of the type known as *ship caissons* and are really steel ships of a design to fit into the dock berths. The ends are similar and at each end and along the bottom is a decided projection. This projection is faced with hardwood which, when the caissons are in position, butts against the granite stop or berth, and with the dock or any section of it pumped out the pressure from the sea on the outside of the caisson holds it firmly in position and seals the dock against the entrance of water. Deck No. 2 is a watertight compartment in which are placed the motors to operate the pumps and the operating headstocks for the valves. The remaining decks provide chambers used for purposes of buoyancy or for holding either permanent concrete ballast or temporary water ballast.

The caissons are moved into position on their sills or taken out of the dock by means of lines carried to the electric capstans alongside, to allow of the entrance or exit of vessels. When out of position they will be moored alongside the wall of the south entrance to the dock and will be protected from possible damage from collision with moving ships by pile dolphins which will be placed so as to assist in the safe entrance of vessels into the dock.

The Landing and Fitting-out Wharf

Adjacent to the dock and really a continuation westerly of the north wall is the landing and fitting-out wharf, 750 feet in length. The site for this wharf was dredged to the rock bottom of the harbour, which lies at an average depth of 54 feet below low water level. Along this dredged area was built a rubble mound to a height of 32 feet below low water level. The upper 12 inches of this mound consists of fine spawls and gravel and was levelled by means of a heavy steel beam dragged over it at the proper level by tugs. After an inspection by a diver and very close soundings had shown that the top of mound was level and that no low spots had been left, timber cribs with reinforced concrete outer surfaces were placed and ballasted with gravel, the dimensions of these cribs being, length 100 feet, width 40 feet, height 35 feet. The details of the completed cribs are as shown on the plan.

The bottom ten feet of the cribs were built on Messrs. Yarrows launching ways in Esquimalt harbour, and the concrete facing was carried to a height of eight feet and sufficient ballast placed to stabilize them in the

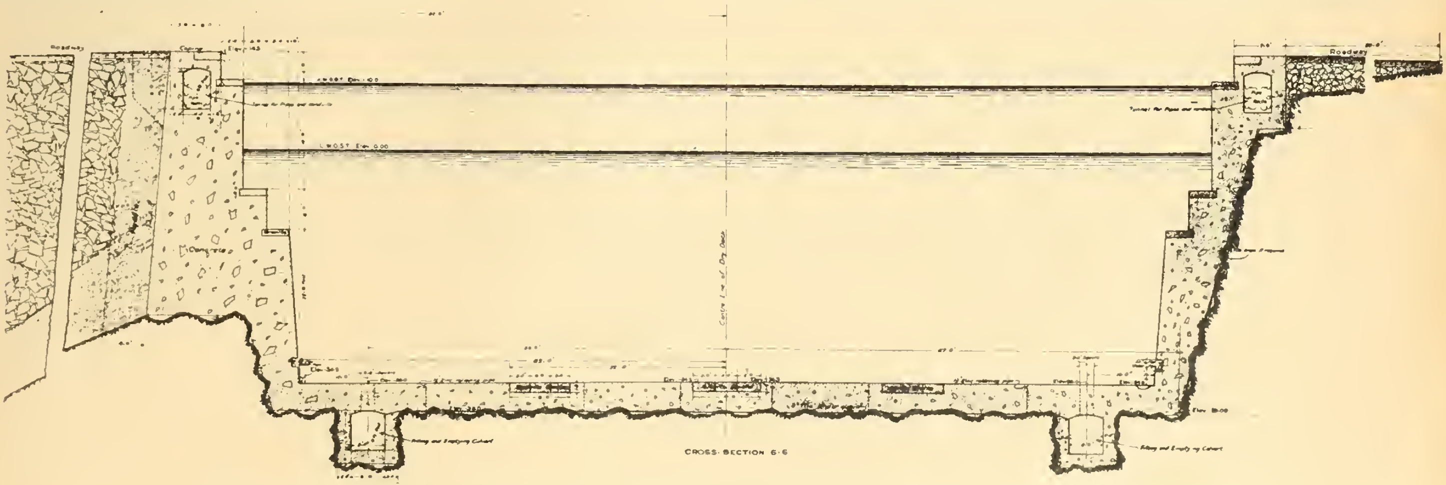


Figure No. 5.—Esquimalt Drydock Typical Cross-section Through Inner and Outer Berths.

water. They were then launched and towed to the site of the work, where the remainder was added, the building, reinforcing, concreting and ballasting being carried on simultaneously although at different levels until top level was reached. The height of the cribs brought their tops, when they were placed on the prepared mound, to three feet above low water, and this allowed the placing of forms and the building of a gravity retaining wall on the cribs, the top of this wall being 4 feet 6 inches above H.W. O.S.T., or at the same level as dock coping. The space behind the wall was then filled to coping level.

The special crib required for the south entrance to the dock was built and placed in a similar manner before the dock area was enclosed by the cofferdam, and was afterwards incorporated in the south wall, having a facing of eight feet of mass concrete, and a similar retaining wall to that on the landing wharf was built on it and the area behind this wall filled to coping level.

It is not proposed to give in this general description of the dock, details of the manner in which the various parts of the work was carried on. One item of the equipment, however, which is of perhaps more than ordinary interest is the saw with which the granite, used in the dock construction, was cut. This is known as the "Parker Rotary Saw". This saw is somewhat similar in appearance to the ordinary circular saw of the lumber mill, but has two blades on the one shaft. The teeth are rivetted to the blade proper and can be replaced as they wear down. The saws revolve in the opposite direction to a wood saw, the stone being worn by the backs of the teeth instead of being cut by the points. They are driven by a 75-h.p. motor, belt connected. The saw shaft is hung from an overhead cross member of the frame and is kept from longitudinal movement by a compression member at each end. The vertical hanging bars are threaded so that the shaft can be raised or lowered as desired. These hangers also provide horizontal adjustment for the shaft.

Cutting is done by the abrasion of steel shot and saw tooth, the shot, in a stream of water, being fed to the saw cut in the stone by a spout from an overhead trough, and after passing from the saw is collected in a trough below, where a coarse worm screw carries it to an elevator which discharges into an overhead trough where another worm screw delivers it to the down spout, all extra passing down an overflow to the lower worm screw and thence to the elevator.

The stone to be cut is set on a carriage running on tracks below the saw. The carriage is driven forward by means of a rack and pinion gear and the motion is controlled by friction drive gear. The rate of travel is controlled by the lateral motion of the driving pulley outwards from the centre of the driven disc. Reverse motion is accomplished by shifting the driver to the opposite side of the axis of driven shaft. The power for operating the elevator, worm screws and stone carriages, is obtained from a 10-h.p. motor, which also lifts the saws.

The saw shaft is built in sections so that the distance between blades can be altered to suit requirements. An auxiliary track parallels the main carriage track and if a stone projects too far over the side of the track it can be supported on an auxiliary and so make possible the use of both blades at the same time.

When one stone follows immediately behind another on the carriage, the space between is filled with plaster of Paris in order to make the cut continuous and prevent any warping of the blade as it enters the new stone. Also, if only a thin slice is being taken off a stone a facing of plaster is first put on to insure that the saw will always have a complete face to work against.

Surface obtained from the saw is equivalent to *six cut* work of a stone hammer. Stone was cut at an average rate of 5 lineal feet of stone per hour per saw, and the depth of cut being four feet, made 40 square feet of surface sawn per hour. This type of saw is only useful for granites and other hard stones. On the Nelson Island granite used here, teeth had to be changed after about 150 hours run or approximately after sawing about 3,000 square feet of surface.

The P. Lyall and Sons Construction Company, of Montreal and Victoria were the general contractors for the construction of the dock. The dredging, excavation, concreting and stone-setting was sub-let by them to the Pacific Construction Company of Vancouver. The caissons were fabricated by the Canadian Bridge Company, under contract from Yarrows Ltd. of Esquimalt, who were charged with their erection and the installation of the pumping machinery in them. Hodgson, King and Marble of Vancouver built the pump house and transformer house and installed all of the mechanical and electrical equipment. The dock was designed by a board of engineers of the Department of Public Works of Canada, and the construction carried out by the local departmental engineering staff.

The principal items of work handled in the construction of the dock were:—

Earth excavation and dredging	185,000 cu. yards.
Rock excavation	362,000 " "
Submarine rock excavation	10,000 " "
Underdrains	9,000 lin. ft.
1.2.4. concrete	20,500 cu. yards.
1.3.5. concrete	117,500 " "
Rock bolts	11,200 lbs.
Reinforcing steel in dock	116,000 "
Reinforcing steel in cribs	334,000 "
Steel grates, frames and ladders	45,000 "
Cast bollards and manhole covers	163,000 "
Cast keel blocks	1,020 tons
Oak caps for keel blocks	32,000 ft. b.m.
Air and water pipes	9,600 lin. ft.
Granite	115,000 cu feet.
Puddle behind walls	11,000 cu. yds.
Macadam roadway	22,000 sq. yds.
Rubble mound for landing wharf	60,000 tons.
Cribwork for landing wharf	33,000 cu. yds.

It is expected that the dock will be ready for operation about the beginning of 1926; the total cost of the work, including equipment, land, engineering expenses, etc., being approximately six million dollars.

The Geodetic Survey of Canada

The necessity for Geodetic Surveys and the Scope of this work in Canada

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Supervisor of Triangulation, Geodetic Survey of Canada, Department of the Interior, Ottawa.

Paper read before the Hamilton Branch of The Engineering Institute of Canada, March 27th, 1925.

The commencement of geodetic work in Canada in 1906 was the outcome of the necessary application to surveying and mapping of one of the fundamental principles of all engineering operations, — the necessity for checks and controls. Upon this principle rests the whole fabric of construction design; without its application co-ordination could not be achieved. In building practice the steel or concrete framework provides the control which determines the shape and strength of the building. The framework control enables the engineer to design various parts to take care only of local stresses or requirements, and the larger the structure the greater the care necessary in the design of the framework.

The same fundamental principles exist in surveying and mapping operations, on the accuracy of which so many engineering problems rest, and the larger the area or the more valuable the land the greater the necessity that the checks and controls be properly designed and possess adequate strength. One of the most common manifestations of the use of checks is in levelling, and every leveller has experienced the anticipation or perhaps fear of checking on bench marks of his own or another's planting. The land surveyor checks his work by the closing error on his own or another's work or by observing polaris to check his azimuth. So one may go through the list of topographer, hydrographer, city surveyor, etc., until one comes to the geographer, who perhaps more than any other requires control points or checks. Indeed, it is the geographer or mapper who is the most consistent upholder of geodetic control, as is quite natural, since the geographer deals with large areas.

The Geodetic Survey of Canada was commenced in 1906 with the running of certain precise level lines in the Eastern Townships of Quebec and with a primary triangulation scheme in the vicinity of Ottawa. Why was it not started before? In all newer countries the reason has been the same. Small land values and sparse population at the start do not warrant the cost of scientific surveys. In Canada the division of control and responsibility between the Dominion and provinces added to the difficulties, and we were forced in our geographical work to start with details first and with methods which we now look upon as crude. The system of surveying the details first by inaccurate methods gradually brought the inevitable result of expensive litigation where boundaries were in question in lands which had grown in value. Overlaps, discrepancies, offsets and jogs were discovered, while in a larger way the geographic position of large areas was questioned as further data became available.

Astronomical Stations a Useful Makeshift

To attempt to fill a growing need for geographic control a temporary expedient was early resorted to — the establishment of astronomical positions, (latitude and longitude), — although the originators of this policy realized its limitations and warned users against an unwarranted reliance being placed on these astronomical positions. Boundaries were located by astronomical methods, such as the 49th parallel from Lake of the Woods to the Pacific coast, and the 45th parallel along the southern side of Quebec province, the errors of which exemplified the dangers of relying on astronomical positions for control of surveys. Many early geographers, through ignorance, actually distorted their maps by making well executed surveys "fit in" between astronomical stations. The prevalence of such practices urged the following warning which appeared in the annual report of the Chief Astronomer, Department of the Interior, Ottawa, for 1906, page 3:

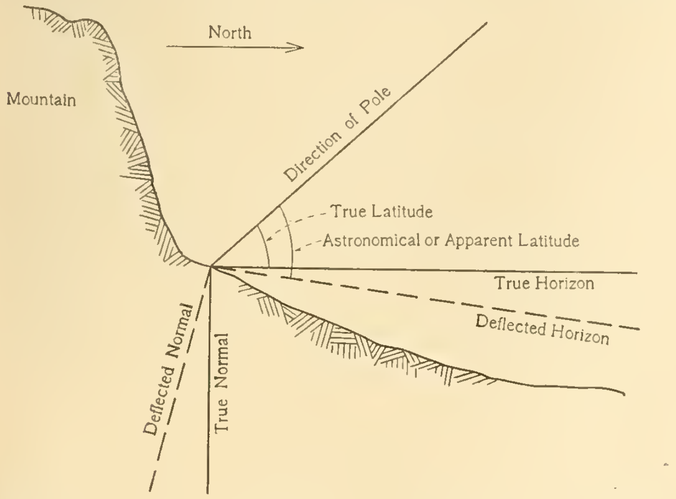


Figure No. 1.—Effect of Deflection of Plumb Line on Latitude.
The altitude of the pole equalls the latitude of the station.
The astronomical latitude is greater than the true latitude.
The astronomical latitude gives the position away from the mountains and towards the valleys.

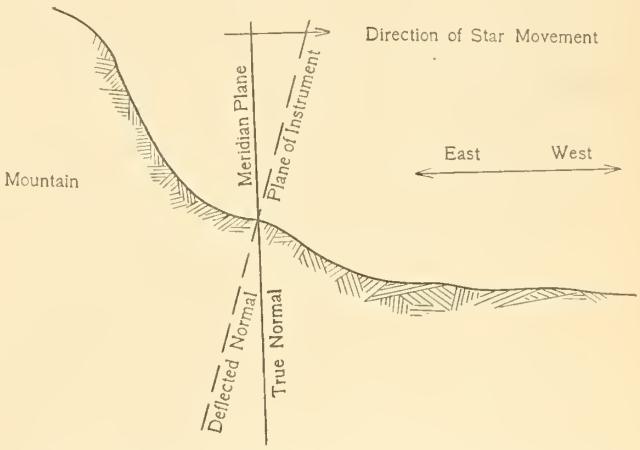


Figure No. 2.—Effect of Deflection of Plumb Line on Longitude.
The star crosses the meridian indicated by the instrument later than it crosses the true meridian. Hence the astronomical longitude is greater than the true longitude.
Astronomical longitude gives the position away from the mountains and towards the valleys.

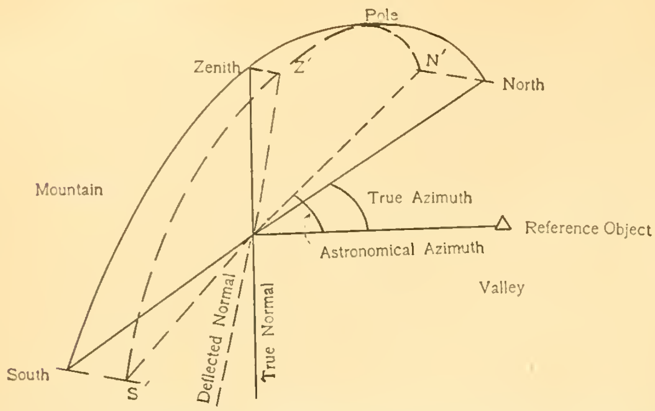


Figure No. 3.—Effect of Deflection of Plumb Line on Azimuth. East of a mountain range the astronomical azimuth is too great; west it is too small.

"These astronomical determinations serve a useful purpose in the correction of maps, when the scale of these is not too large. For the control and checking of topographical surveys they are deficient. This is due to the fact that the astronomical and geographical co-ordinates of the same point are not necessarily, nor usually, the same. The application of astronomy to topographical purposes proceeds on the assumption that the earth is a true spheroid and that the vertical line at a place, (the direction of which it is the part of latitude and longitude observations to determine), is a true normal to it. This assumption is only approximately true; the irregularities of the earth, both above and beneath the surface, by their attractions, cause 'local deviations of the plumb line, so that astronomical positions, though accurate in themselves within a few feet, may show a discrepancy in comparison with survey measurements of very considerable amounts.

"Thus astronomical positions are to be used with caution in the control, in testing the accuracy of surveys made with any degree of precision. Their utility has regard rather to general maps, based on a number of local surveys, in controlling compilation. These surveys, each accurate within limits prescribed by its immediate purpose, will yet in general, as experience shows, be subject to errors of scale or distortion. When a general map is compiled by building up these surveys the separate errors tend to accumulate until the aggregate becomes greater than the uncertainty from the cause mentioned of the astronomical observations. In such case these may be applied to correct the compilation.

"It has been thought well to emphasize this point, since the relation of astronomical observations to surveys is frequently misunderstood, and corrections often misapplied.

"There is still a wide field, (*1906*), for astronomical determinations in Canada, both in correcting general maps compiled from local surveys not co-ordinated, and in affording new points of departure for geographical surveys in unsurveyed regions. They cannot serve as control for topographical surveys of any degree of minuteness of detail. This is the function of the trigonometrical survey. (*Geodetic Survey*)."

The following table gives an idea of the errors which would be caused by inaccuracies of astronomical positions, when used as distance control for surveys:

Between stations	Distance miles	Combined error of astronomical stations expressed as ratio of intervening distance
Pacific Coast		
Oldfield to Klucksiwi.......	290	1/1, 270 or 4.2 ft. in 1 mile
Klucksiwi to Lazo..........	123	1/1, 380 3.8 " "
Lazo to Little Mountain....	95	1/ 415 12.7 " "
Southern Ontario		
Southwold to Collingwood...	157	1/2, 260 2.3 " "
Collingwood to Murray.....	130	1/ 900 5.9 " "
Murray to Ottawa..........	130	1/1, 800 2.9 " "
Ottawa to Vankleek........	54	1/ 385 13.7 " "
Lower St. Lawrence		
Tadoussac to Chicoutimi....	66	1/ 243 21.7 " "
Lake Edward to Tadoussac..	126	1/ 535 9.9 " "
Tadoussac to Father Point..	64	1/ 190 27.8 " "
Father Point to Cape Chat..	90	1/ 430 12.3 " "
Ste. Anne Des Monts to Anticosti...............	117	1/ 370 14.3 " "
Southern New Brunswick		
Chamcock to St. John......	52	1/ 370 14.3 " "
St. John to Moncton........	84	1/1, 260 4.2 " "
Moncton to Hall's Hill......	31	1/ 840 6.3 " "
Cape Breton Island		
Derby to Sydney...........	32	1/ 190 27.8 " "
Sydney to Sugar Loaf.......	59	1/ 200 26.4 " "

As the errors of chainage of modern block outline land surveys are less than 1 in 10,000 and of average modern subdivision surveys and chained traverses from 1 in 4,000 to 1 in 8,000, while the errors in distance in modern stadia traverses are seldom greater than 1 in 500, it will be appreciated that the statements extracted from the Chief Astronomer's Report, (pp. 3 to 4), are not overdrawn.

No information is yet available for the prairie provinces, but it is scarcely anticipated that the above remarks would apply to that area with as great force as the instances noted above.

Long before 1906, however, survey methods were being improved in Canada, the Dominion Lands Survey system in the prairie provinces being the most extended example of a logical survey, with its more accurate meridians and base lines, followed by less, but sufficiently, accurate subdivision, — in other words, working from the whole to the part rather than the reverse. Each survey of any magnitude throughout Canada has had to provide its own control, which was in general adequate only to its restricted needs.

In the realm of levelling, the necessary practice of detached operations on assumed datums brought the same confusion. Co-ordination presented tremendous difficulties and was frequently impossible on account of the lack of an accurate framework. In many of our larger centres the number of datums for levels of different periods was most confusing. Notable service in co-ordination was performed by James White, M.E.I.C., in the publication of successive issues of "Altitudes in the Dominion of Canada".

Establishment of the Geodetic Survey of Canada

The accumulative effect of the geographic confusion could not be longer delayed, and largely through the efforts of the late Dr. W. F. King, C.M.G., then chief astronomer and later first superintendent of the Geodetic Survey of Canada, the geodetic work mentioned above was commenced.

Three years after the commencement of the precise level and triangulation systems, the Geodetic Survey of Canada was organized in 1909 by order-in-council which describes its functions as follows:—

> "To determine with the highest attainable accuracy the positions of points throughout the country, and the lengths and directions of lines, which may form the basis of surveys for all purposes, topographical, engineering or cadastral, and thereby assist in the survey work carried on by other departments of the Dominion government, by the provincial governments, and by municipalities, private persons or corporations. The operations also include a considerable length of lines of precise levelling."

The establishment of the Geodetic Survey was then recommended for the following reasons:—

> "The operations so far carried on have shown that this accurate basis for surveys of all kinds can be provided for at a reasonable cost and .... the value of such work is universally admitted, being vouched for by world-wide experience."

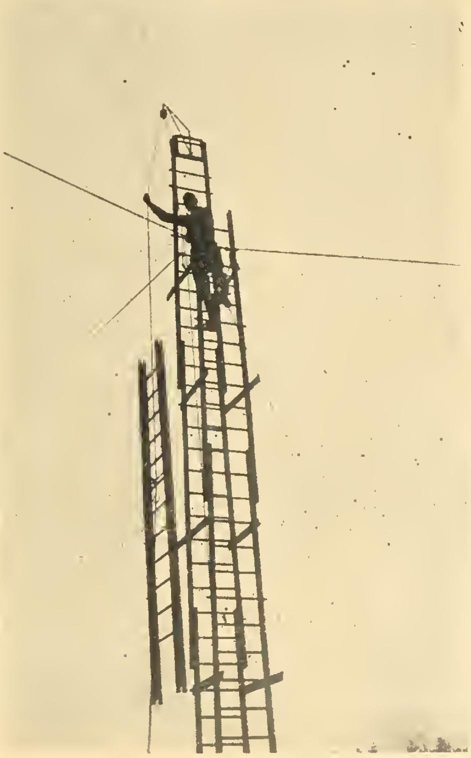
Precise Levelling

The two main functions of the Geodetic Survey of Canada are precise levelling and triangulation, together with the scientific work depending on the field investigations. Precise levelling differs from ordinary levelling in the accuracy attained, and hence in the instruments used, length of sights and, in general, the methods employed. It is generally run along railroads for convenience and consists of duplicate lines, run in opposite directions, the results of which must agree to less than $\pm$ 0.017 foot $\times$ $\sqrt{\text{distance in miles}}$. The instrument is provided with a very accurate bubble and has facilities for keeping the bubble centred at the instant of reading each of three crosshairs. The rod graduations are painted on a strip of invar to avoid error due to temperature changes. Many other precautions are observed to ensure the smallness of the errors, the success of the methods being shown by the fact that the error between Atlantic and Pacific is only about 0.6 foot. The datum for all the precise levelling of the Geodetic Survey is *Mean Sea Level* which has been provided at several points on both seaboards by the Tidal and Current Survey.

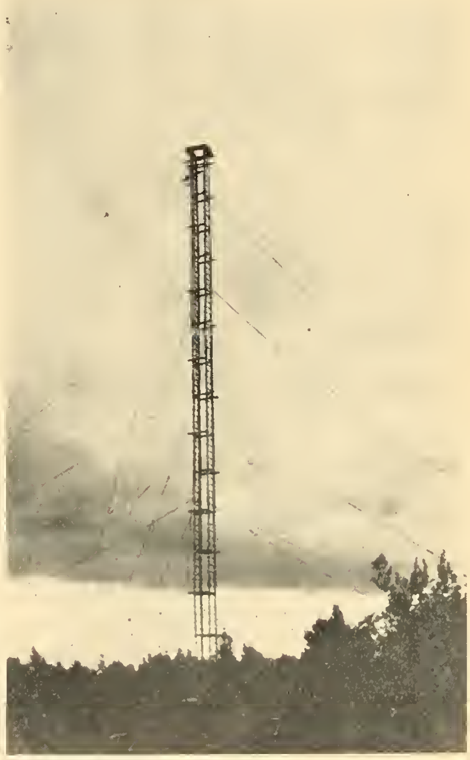
Level lines are run in loops and the adjustment of the instrumental errors in the 21,000 miles, (*1924*), of levels over Canada is a monumental task. One of the first requirements is permanency, hence an adjustment which is liable to change with the acquisition of new data is undesirable. This explains why publication of final elevations should be delayed until the net is strong enough so that new data will not materially change the existing structure.

Another factor of the greatest importance is the necessity of co-ordinating the results along the International boundary of Canadian and United States levels. Serious differences exist which affect both countries and which must be smoothed out before elevations can be published which can be held for years. The requirements of idealism and necessity will no doubt produce a policy which will soon evolve results of lasting benefit. In the meantime the direct instrumental results obtained in the field are filling a long felt want and have proved of great utility to engineers for a number of years past.

Permanent bench marks consisting of copper bolts or bronze tablets have been established at short intervals along and adjacent to all precise level lines, the bolts being set in public buildings, bridge masonry, solid rock



(a) In Course of Erection.



(b) Complete, 78 feet high.

Figures Nos. 4 and 5.—Portable Tower for Reconnaissance, Geodetic Survey of Canada, Modeled after the Dismountable Observation Ladder of the Geographic Service of the French Army.

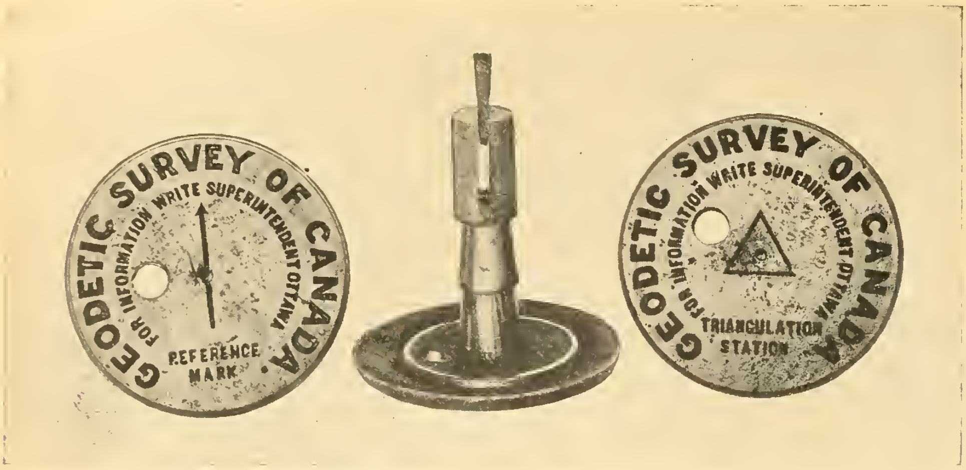


Figure No. 6.—Triangulation Station and Reference Tablets.

These tablets are leaded into solid rock or are set in concrete monuments to mark, and reference triangulation stations. The wedge spreads the embedded end of the shank when the tablet is driven down thus adding to its solidity. The hole in the top of the tablet allows the melted lead to enter and fill the space around the shank, to hold it in its place.

surfaces, etc., and in specially constructed concrete monuments. The elevations of these are listed to the nearest thousandth of a foot and anyone requiring control in detailed levelling operations may accept the differences of elevation between adjacent bench marks with the assurance that even though the absolute elevations above mean sea level will be revised at some future date by the general net adjustment the differences determined will be practically unaltered so far as it lies within the power of ordinary levelling operations to detect.

Bulletins, giving descriptions and provisional elevations of bench marks in various parts of Canada, have been issued from time to time by the Survey in order that the public may not have to wait for a state of finality to be attained before receiving the benefits of the field work accomplished.

Triangulation

Unlike the precise levelling the field work of the triangulation comprises a number of successive stages — reconnaissance or selection of stations, preparation of stations, angular measurement, base-line measurement and astronomical determinations.

The selection of stations is frequently an operation demanding the most painstaking ability. The selection of the site for a base-line, so situated topographically that it admits of being measured most accurately, is a first operation. New stations are selected on hills which are visible from the ends of the base and from each other, so situated as to form geometrical figures such as quadrilaterals with diagonals visible, pentagons or hexagons with an interior point visible from the exterior ones, and so on. Intervening hills, local timber, or houses and geometrical requirements necessitate the exercise of the greatest resource and ingenuity by the reconnaissance engineer. Frequently the instrument must be raised as high as 100 feet by towers to secure the necessary intervisibility of stations. Calculations of these heights require great versatility. Questions of accessibility and usefulness of stations obtrude themselves. The distance between stations averages 15 to 20 miles, but may vary from 6 to 100 miles.

The stations are permanently marked by bronze tablets set in stone or concrete. Permanence and reasonable conspicuousness is essential. Tower building requires special organization.

The angular measurements of primary triangulation are made at night to secure the benefit of air conditions most conducive to accuracy. Transits of special design and refinement, reading to single seconds, are employed, and the programme of observations permits angles to be read to less than half a second which is the angle subtended by one foot at a distance of about 80 miles. The lamps for sighting at night consist of automobile headlights with special bulbs, the electricity being supplied by dry cells. Frequently, time switches can be introduced into the circuits and these turn the light on and off automatically. When time clocks cannot be efficiently employed, a light-keeper is required for each light, a total of 5 or 6 being necessary. Hazy weather, fog, etc., is a very delaying factor where the lines are long.

Local accuracy of angular measurements may be partly judged from a criterion as to the *closure of triangles*, that is, the sum of the three angles of each triangle must come within one second, on the average, of the theoretical sum. This is only one superficial test; other more complicated ones are used.

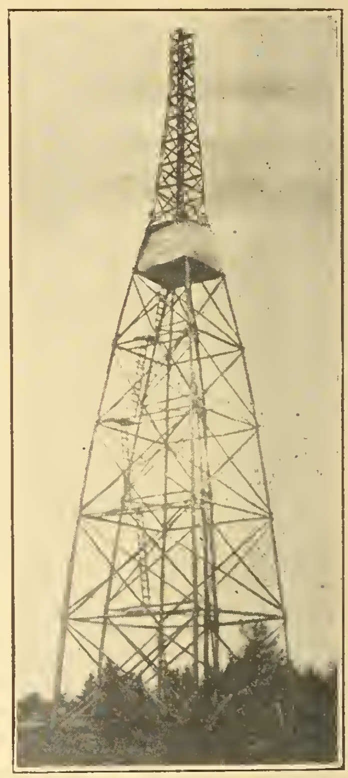


Figure No. 7.—70-foot Triangulation Tower in New Brunswick with 35-foot Extension for the Lamp Stand.

At all triangulation stations prominent, permanent objects are observed, such as church spires, water tanks, lighthouses, land survey corners, etc., since these are frequently as useful for geographic purposes as the triangulation stations themselves.

Base lines are located every 150 or 200 milesto check the calculated distances. They are measured with 50-meter tapes made of invar, — a nickel steel with a very low coefficient of thermal expansion, — suspended over posts with a constant tension provided by pulleys and weights. The tapes are standardized in the Geodetic Survey standards building before and after the measurement of each base. Corrections are applied to the measured length of the base for temperature and slope of tape, the final length being reduced to sea level. Base lines are measured with an accuracy greater than one tenth of an inch to one mile.

Laplace stations, — triangulation stations at which the astronomic longitude and azimuth are observed, — are located every 100 miles or so to obtain the true geodetic azimuth, free from the effect of deviation of the plumb line normal. The function of these observations is the same as that of azimuth observations in other survey work, — to check the twist or azimuth.

The next step is the adjustment of all of the small errors of the triangulation to obtain the most probable values of the observed angles. In the adjustment of triangulation and level nets the theory of least squares is constantly employed. Triangulation nets between base lines are adjusted as a whole and all errors in triangle closures and discrepancies between base-lines and laplace stations are adjusted to obtain the best set of results. With these results the final angles and distances between stations may be calculated.

The final operation required is the fitting of the net on the earth's surface, or the calculation of the latitudes and longitudes of stations and the azimuths of lines. These must start from a point at which there is no deviation of the vertical, in other words where the astronomical co-ordinates are not affected by the attraction of surface or subsurface dense masses, such as mountains. It frequently takes years and years to discover such a place; the United States connected some 600 astronomical stations with triangulation before they found one such place in Kansas. All of their triangulation is based on that one place and, when Canada and Mexico adopted this *datum*, it was named the North American Datum. Included in the definition of this datum is the proviso that all positions based on it shall be calculated on the Clarke spheroid of 1866.

Precise Traverse

In very flat, heavily wooded country, triangulation is difficult and expensive, on account of the necessity of short lines and high towers. In such cases it is sometimes necessary to resort to precise traverse methods in place of triangulation. This operation differs from the ordinary chain and transit traverse in the accuracy attained and hence in the methods employed. The chainage is made with invar tapes along railroad tracks, and for the angular measurements the large theodolites used for primary triangulation are employed. Every precaution is taken to ensure accuracy, but the method is scarcely as satisfactory as triangulation and is used only where triangulation is too expensive and difficult. At the same time it serves as a very useful substitute for triangulation in many cases.

Mathematical Research

The problems confronting the prosecution of geodetic work are very complicated and varied. While standardized methods of field and office work are possible with small systems, the mathematical problems increase rapidly in complexity and variety as the system increases in size.

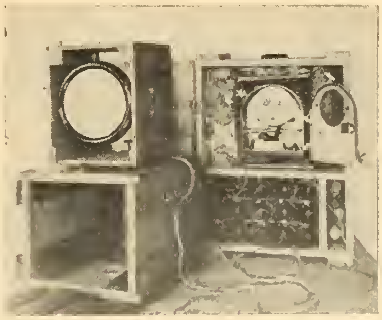


Figure No. 8.—Signal Lamp.

Triangulation Signal Lamp, with Batteries and Time Switches, whereby the lights are automatically switched on and off, and the size of party materially reduced.

In a country the size of Canada, the best solution of these problems constantly calls for extensive mathematical research and original investigation for new methods. It is no exaggeration to say that the high class work which is performed and is possible in the field will be of much less efficiency if the mathematical research end of the geodetic organization is neglected, or subversed to other branches in importance. In all countries mathematical research and methods of adjustments are engaging the attention of the brightest minds and occupy a conspicuous and vital place in geodetic organizations. Canada has reason to be proud of the men who are engaged on these problems, men who are making international names for themselves and for Canada.

Progress

Although the Geodetic Survey has been in existence only since 1906 notable progress has been made. While the needs of the work naturally are in proportion to our area this scale of operations has been impossible on account of our small population and financial difficulties. Over 21,000 miles of precise levels have been run with permanent bench marks scattered along many of our railways at average intervals of three miles. Most of our cities are well served. Primary triangulation some 100,000 square miles in extent serves as a basis of our coast surveys and those of more thickly populated areas.

The Geodetic Survey has co-operated with a number of our larger cities in providing special triangulation and precise level nets as a basis or framework for city engineering and maps. In these cases the survey provides the engineer and instruments, while the cities pay all other expenses. The provinces of British Columbia, Ontario and Quebec require geodetic control perhaps more than others on account of the great difficulty of making accurate surveys by ordinary methods over the large separated areas with their rough topography and forest cover, and of being able to co-ordinate and map those areas with requisite accuracy. Federal engineering and surveying departments, hydrographic, topographic and cadastral, quite naturally employ the geodetic levels and triangulation as the basis of their operations, while public services, private companies and individual engineers find the basic information supplied by the Geodetic Survey very useful.

THE

ENGINEERING JOURNAL

THE JOURNAL OF
THE ENGINEERING INSTITUTE
OF CANADA

VOL. VIII DECEMBER 1925 No. 12

Greetings

During the past eight months the Secretary has had the privilege of visiting nineteen of the Branches of the Institute and only regrets that there has not yet been time for him to meet and discuss Institute affairs with all of the twenty-four Branches.

Everywhere it has been encouraging to note activity and interest in both Branch and Institute matters, auguring well for the continued growth and development of the Institute. There are hopeful signs that the industrial and financial difficulties of the past few years in the Dominion are disappearing, giving way to a healthier condition.

The Secretary desires to convey to the membership of the Institute good wishes for a prosperous and successful year for every one in 1926.

Annual General and General Professional Meeting,

Toronto, January 27th, 28th and 29th, 1926

Extensive preparations for the annual meeting of *The Institute* to be held in Toronto, January 27th, 28th, and 29th, 1926, are under way. It is anticipated that there will be a very large attendance, more particularly by reason of the central location of the meeting and because there has not been an annual meeting held in Toronto since 1921. The local committee is putting forth every effort to make the coming meeting in every respect fully up to the standard set by the last annual meeting in that city.

A full programme of papers and discussions is being provided along with attractive trips to engineering works in progress. Arrangements are being made for entertainment for the ladies who will be attending the meeting.

The tentative programme is as follows:

WEDNESDAY, JANUARY 27TH.

Forenoon: Registration, annual business meeting and formal luncheon at which visiting members will be welcomed by civic and other officials.

Afternoon: Resumed business meeting, reports of scrutineers, inauguration of new president and formal reception at 5 o'clock.

Evening: Smoker for men. Ladies entertainment arranged for by ladies committee.

THURSDAY, JANUARY 28TH.

Forenoon: *Civil Engineering Section:* Deterioration of Concrete in Alkali Soils — Prof. C. J. MacKenzie, M.E.I.C., and Dr. Thorvaldsen, of the University of Saskatchewan.

Design of East York Sewers and Their Construction by Contract and Day Labour — R. O. Wynne-Roberts, M.E.I.C., and Grant R. Jack, A.M.E.I.C.

The Water Supply of the Border Cities — Wm. Gore, M.E.I.C., and J. B. Clark Keith, A.M.E.I.C.

Mechanical and Electrical Engineering Section: Steam Power Plant Design — Prof. A. G. Christie, Johns Hopkins University.

Generation of Explosive Gases in Electric Water Heaters and Boilers Operating on Alternating Current with Submerged Electrodes — Prof. J. W. Shipley and A. Blackie.

European Transmission Practice — A. E. Davison, Hydro-Electric Power Commission of Ontario.

Afternoon: Excursions and trips of inspection to engineering works.

Evening: Banquet.

FRIDAY, JANUARY 29th.

Forenoon: General session. Highways — W. A. McLean, M.E.I.C.

Industrial Relations and Personnel — Homer E. Niesz, manager, Industrial Relations Department, Commonwealth Edison Company, Chicago, and president, Western Society of Engineers.

Afternoon: General session.

The Fuel Problem in Canada — Lesslie R. Thomson, M.E.I.C.

Methods of Fuel Production — J. L. Landt.

Methods of Fuel Consumption — John Blizard.

Evening: Dinner dance.

In order to facilitate effective discussion, members interested in the subjects to be presented are requested to apply to the Secretary at Headquarters for advance copies or preprints of the papers to be delivered. It is particularly urged by the committee in charge that thorough preparation for discussion be made, since not only is this courtesy due those who are going to considerable trouble in preparing papers, but the effectiveness of the technical portion of the meeting will be greatly enhanced by contribution of the members generally to the subjects under review.

Forthcoming Conference of the Provincial Associations of Professional Engineers

Members of *The Institute* in all parts of the Dominion, are keenly interested in the movement for raising the status of the profession which has given rise to the various provincial associations of professional engineers. It will be recalled that although legislation regarding the registration of engineers and the control of professional practice was initiated in Canada nearly thirty years ago, it was not until 1920 that more than local accomplishment resulted.

Owing to the fact that in such matters the Dominion government has no jurisdiction, legislation was sought on a provincial basis, and there are now active associations of professional engineers in Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Alberta and British Columbia. Since its formation, each provincial association has been developing its organization, studying its own problems and the methods of operation rendered advisable by local conditions, and events have now reached the stage where it seems desirable to take stock of the situation and compare notes as to the progress made and the difficulties encountered, and discuss the possibility of the co-ordination of future efforts.

As is well known, the Acts incorporating associations of professional engineers in the various provinces are by no means uniform in their provisions, although they have a general similarity in outline. There is every reason to believe that the Acts have in fact been of substantial benefit to the profession, though in actual practice some have been more effective than others. Further development however should be directed along lines which will eventually result in a uniformly high standard for admission to the profession, and, if possible, Dominion-wide recognition of a professional engineer's qualification.

The aims and methods of the associations as they now exist would seem to require but little modification with this end in view, and it has been felt that a natural step to be taken as a first preliminary, would be to hold a meeting or conference at which delegates from all the existing associations might freely discuss problems of common interest.

The Council of *The Institute* has received several suggestions as to the desirability of calling such a conference together, and has been gratified to learn that an invitation to send delegates to a meeting of this kind would be generally welcomed. Communications have accordingly been addressed to the executives of the seven associations, proposing that a conference be held in Montreal during the first week in February, to be attended by two delegates from each association, who would be the guests of *The Institute* during their stay in the city.

Favourable responses have already been received, and engineers of all branches of the profession will welcome the prospect of the full discussion of association problems, which will no doubt take place during the meeting. The subjects to be dealt with will of course be selected by the delegates when they meet, but it is understood that such topics as uniformity in legislation and requirements for admission, arrangements for transfer from one province to another, and methods of co-ordinating the work of the various associations, are likely to come up. The conference will take up its work with the best wishes of all members of *The Institute.*

Ottawa Honours C. A. Magrath, M.E.I.C.

A fine tribute to a member of the profession who had won outstanding recognition was paid by members of the Ottawa Branch, *Engineering Institute of Canada,* at a luncheon in the Chateau Laurier on November 13th, when C. A. Magrath, M.E.I.C., new chairman of the Ontario Hydro-Electric Power Commission, was the guest of honour.

Sir Robert Borden, when introducing Mr. Magrath, spoke of the regret which the latter's departure from Ottawa occasioned, wished him God speed in his new work and assured him of the complete confidence of members of the engineering profession.

Mr. Magrath touched on a number of subjects of Canada's greatness and of its great possibilities, but he said little about Hydro or his new work.

"I have been with Hydro only long enough to appreciate the size of the work. When I am satisfied that I know something about Hydro I will talk of it. I take my new work too seriously at present to discuss it in a trivial way."

Later in his address Mr. Magrath remarked, "If it is not in the interest of the people for me to be at the head of Hydro, or if they consider it is not in their interest, I will be among the first to become aware of it. I have such a regard for the property of the people that I will not stay in any position when I think that another might fill it better." Such modesty could only be expected from an engineer, was later the comment of the chairman, City Commissioner A. F. Macallum, M.E.I.C.

In his witty and charming introduction of the guest of honour, Sir Robert Borden spoke of how well he had served his country in the highest posts. His wise administration had gone far in establishing friendly relations among members of the International Joint Commission, he had accomplished big things during the war, the highway policy of Ontario was modelled on his report. His work has been of great value to Canada.

As chairman of Ontario Hydro, Mr. Magrath filled an exceedingly important post, one worthy of his fine record. Sir Robert's only regret was that Mr. Magrath must henceforth reside in another city. He had supreme confidence that Mr. Magrath would again render excellent service to his country.

When Mr. Magrath rose to speak he was tendered an ovation by the 150 guests and members of *The Institute.*

Such an introduction as he had received he would have appreciated from no one in Canada more than he did when it came from Sir Robert. His only regret was that Col. J. S. Dennis, M.E.I.C., of the C.P.R., Montreal, had been detained through accident from attending the luncheon, for over forty years ago Col. Dennis had been his first chief.

He recalled his first trip west with Col. Dennis over forty years ago, contrasted the scene then with that witnessed on a recent trip and then reflected just what Canada meant. It had taken a month for his first trip to Saskatoon and recently that trip had been made in three days. Then the developed wealth of the three prairie provinces was about one million dollars, now it was near the eight billion mark or one-fortieth of the developed wealth of the whole United States.

"I do not think", said Mr. Magrath, "we Canadians really understand the heritage we possess. There are people on earth, aside from those living in America, that would be delighted to change positions with us."

Mr. Magrath spoke of the position which engineers and other professional men who were in the Government service found themselves. There was no competition between Governments therefore salaries were not high. Yet it was not the financial return for labour that brought happiness, it was the realization that they are of service. "Canada is worthy of the very best efforts we can all bring to it."

Mr. Magrath recalled that he had once refused to accept the responsibility of being a member of the International Joint Commission as he felt that he was unequal to the task. He was still in the same state regarding Hydro, but had hopes that in time light would come to him. He had found delightful company in his new work and was satisfied that all would work harmoniously.

His experience had taught him one sure thing, "you get what you give. Ask for fair play and then try and give it."

At the head table were City Commissioner, A. F. Macallum, M.E.I.C., chairman; His Lordship, Bishop J. C. Roper; Sir Robert Borden, Sir Henry Drayton, Col. O. M. Biggar, Gordon Gale, M.E.I.C., John Murphy, M.E.I.C., R. M. Motherwell, J. B. Challies, M.E.I.C., representing the president of *The Engineering Institute of Canada;* G. J. Desbarats, M.E.I.C., Col. W.P. Anderson, M.E.I.C., C. A. Bowman, A.M.E.I.C., Charles Cowan, President of the Canadian Club; P. B. Symes, Fred Anderson, M.E.I.C., E. W. Hubbell, James White, M.E.I.C., C. Coutlee, M.E.I.C., J. D. Craig, M.E.I.C.

The Annual General

and

General Professional Meeting

will be held in

Toronto

January 27th, 28th and 29th, 1926

The business session of the Annual Meeting will be held in Montreal on January 26th, and adjourned to Toronto.

Further details are published on page 488 of this issue.

OBITUARIES

Major William Tulloch Daniel, A.M.E.I.C.

It is with regret that we record the death of Major William Tulloch Daniel, A.M.E.I.C., which occurred on September 17th, 1925.

The late Major Daniel was born at Torquay, South Devon, England, on September 10th, 1882, and after securing his matriculation for Oxford or Cambridge he took his apprenticeship course with Messrs. Simpson, Strickland and Company Limited, Dartmouth, South Devon, England, between the years 1899 and 1902, subsequently being employed in the drawing office of the structural and naval department. During 1904-1905 he was at the School of Military Engineering, Chatham, England. On coming to Canada, he was assistant instructor in surveying at the Royal Military College, Kingston, Ont., from 1905 to 1908. Subsequently he joined the engineering staff of the Canadian Pacific Railway Company and was engaged on various works for that company until he enlisted for overseas service in September 1914. He went over as Lieutenant, being promoted to Captain and later Major, and subsequently Lieutenant-Colonel. He was wounded and gassed in May 1915, and was twice mentioned in despatches. Upon returning to Canada he again joined the staff of the Canadian Pacific Railway Company as divisional engineer at Regina, Sask.

Major Daniel was admitted to *The Institute* as an Associate Member on January 14th, 1911.

Frederic Ayshford Wise, M.E.I.C.

Frederic Ayshford Wise, M.E.I.C., died at Montreal on January 13th, 1925. The late Mr. Wise was born at Prescott, Ont., on August 2nd., 1872, and received his early education at Trinity College, Port Hope, Ont. Practically all his work has been in connection with river navigation improvement in Canada, having been connected with the Marine Department of the Federal Government for many years, during which time he was engaged on work on the Soulanges canal for ten years, from 1890-1900. Subsequently he was assistant engineer on the Trent Canal survey and more recently was connected with the St. Lawrence River Ship Channel.

Mr. Wise was admitted to *The Institute* as Student on April 12th, 1900, and was transferred to the grade of Member on June 12th, 1909.

Thomas Henry Tracy, M.E.I.C.

In the death of Thomas Henry Tracy, M.E.I.C., former city engineer of Vancouver, B.C., which occurred on October 30th, 1925, after a brief illness, *The Institute* has lost one of its early members.

The late Mr. Tracy was born in London, Ont., on June 25th, 1848, and on the completion of his primary education he was apprentice in 1864 to William Robinson, P.L.S., city engineer of the city of London, Ont. In 1869 he entered the provincial service in the Department of Public Works where he remained until 1872, at which time he moved to Chicago, Ill., and later to Albany, N.Y. In May 1873 he returned to London, Ont., and formed a partnership with Mr. William Robinson, at that time city engineer of London. Under this partnership arrangement he practised in London until 1878, when he was appointed city engineer succeeding his former chief and partner. About 35 years ago he moved to Vancouver and was for many years city engineer of that city. Mr. Tracy was elected Member of *The Institute* on October 11th, 1888, and was made a Life Member on January 8th, 1924.

Charles A. Magrath, M.E.I.C., Honoured by Engineers in Toronto

A notable tribute was paid to Charles A. Magrath, M.E.I.C., recently appointed chairman of the Hydro-Electric Power Commission of Ontario, at a dinner given in his honour by the engineers of Ontario, at the King Edward Hotel, Toronto, on Wednesday evening, November 18th. At the dinner which was held under the auspices of the Engineering Society, University of Toronto, The Ontario Land Surveyors Association, The Canadian Institute of Mining and Metallurgy, The Engineers' Club of Toronto, The American Institute of Electrical Engineers, Toronto Section, The American Society of Mechanical Engineers, Ontario Section, The Canadian Institute of Chemistry, The Association of Professional Engineers of the Province of Ontario, and *The Engineering Institute of Canada*, there assembled, upon a representative scale, probably never exceeded at such a function, over six hundred engineers and men of prominence in public affairs and the industrial life of the province of Ontario. From all parts of Ontario and Quebec, men outstanding in the profession and in other walks of life joined in an expression of the high regard in which Mr. Magrath is held by his fellow Canadian engineers.

Tributes were paid to Mr. Magrath by Premier Ferguson; by Dr. Arthur Surveyer, M.E.I.C.; by the Honourable Dr. Cody, and by Professor H. E. T. Haultain, M.E.I.C., who was chairman of the evening. Following them, Mr. Magrath declared simply that he realized that he had fallen heir to a great position through the genius of the late Sir Adam Beck.

His view was predominantly that it was an opportunity for public service and that his work upon the Hydro would simply be work in the development of that greater Canada which was the heritage of all Canadian citizens if only they would think upon it and work out the broader national vision. He declared his resolve to safeguard in every way the capital investment of the citizens by a policy of caution, but declared that faith in a great Hydro enterprise, growing and expanding, was simply the complement of faith in a great Canada awaiting development.

His address animated by the most loyal spirit of public ownership, service and responsibility promised the most cautious and conscientious administration of public funds and property.

It was a speech that did credit to Mr. Magrath's great qualities of heart and head. It justified to the full the preceding eulogy of his wisdom and personality, sagacity and urbanity, and left no doubt that the new chairman of the Hydro Commission is one of the most unique and dominating figures in the public life of the province, a calm and judicial temperament whose policy of suaviter in modo will do much to allay the friction inseparable from accelerated Hydro development.

CHARLES A. MAGRATH, M.E.I.C.

"I confess," said he, "that I do not know what I have done to entitle me to so much attention. I appreciate the compliment Dr. Surveyer has paid me in terming me the head of the engineering profession in Canada. I like to have the respect of engineers. The first thing I know I'll believe that I am a real engineer. I realize however, that I have fallen heir to a great position created by that great Canadian, Sir Adam Beck. I know that this tribute to me is really a tribute to him."

"I suppose," he went on, "that it is desirable that I should say something about the work of the Hydro. I have not been in a hurry to do so. When I assumed my duties I stated that I felt that the target at which to shoot should be the utilization of all waters capable of development, and the distribution at the cheapest possible figure of the power so obtained. That, I think, was Sir Adam Beck's own target. My policy, I felt, should be a safety first policy, like that of a great banking institution, a policy of safeguarding the resources and great capital expenditure of the people of Ontario. My effort has been to visualize what my predecessor would do under existing circumstances."

After dealing broadly with the question of future power supply he remarked: "I feel no alarm and I do not want to occasion any alarm about a power shortage. Still if we believe we have a country worth developing we have to face the issue of securing the maximum development of our resources. Let us lay plans not in an extravagant way but none the less in a big way to make Canada what it was intended to be."

"If we don't do things in a big way, some one else will come in and do the job for us."

"I am a firm believer in my own country and my own people", said Mr. Magrath.

"Canada is a land of big things, and there is not a country on earth which would not gladly exchange places with us. The days are gone in which we could live isolated and without neighbors. As we must have neighbors, where are there better neighbors to be found than those to the south of us?" he asked. His audience enthusiastically applauded this expression of international amity and understanding.

In closing Mr. Magrath said "I am deeply impressed with the magnitude of the trust imposed on me in this great enterprise. I thoroughly realize I have a country worth giving my best to. I hold back from loquacity because my caution tells me it is better not to say things that the next day I might have to withdraw. My one desire is to get by myself, and think long and earnestly of the problems before me."

He again paid a tribute to the late Hydro chieftain and the present Hydro staff, with special mention of Mr. Gaby and Mr. Acres, two of its outstanding engineers. "Sir Adam Beck," he said, "left me a great organization with the members of which and with my fellow Hydro commissioners, I wish to state publicly, it has been a great privilege to be associated. I can say the same of the staff and every employee. With that co-operation I have no fear for the future. My one desire is to see the work carried on in the interest of the people of Ontario with all due caution and conservatism in the management of their property. I must say again that I feel that this welcome you give me is really a tribute to the great man who created this organization.'

As he took his seat Mr. Magrath received a tumultuous ovation. The engineers rose to their feet and to the occasion with "He's a jolly good fellow" and repeated bursts of cheering. As very aptly stated in one of the press reports: "The profession that takes off its coat, took off its hat to a member who had reached the pinnacle of engineering and administrative success."

At the head table were: C. A. Magrath, Alexander Fraser, Premier G. H. Ferguson, Hon. J. E. Thompson, Hon. W. F. Nickle, Hon. W. H. Price, Hon. Forbes Godfrey, Hon. Lincoln Goldie, Hon. Charles MacCrea, Hon. James Lyons, Hon. R. J. Cooke, the Rev. Canon H. J. Cody, Mayor Thomas Foster, Sir William Hearst, Sir Joseph Flavelle, Bart., Sir John Willison, Hon. Wallace Nesbitt, Alfred Maguire, T. L. Church, K.C., M.P.-elect; George Wright; Senator C. D. Clark, chairman, International Joint Waterways Commission, Washington; Dr. Bruce Taylor, principal, Queen's University, Kingston; A. T. Thom, president, Canadian Manufacturers' Association; Sir John Aird, Canadian Bankers' Association; J. H. Spence, K.C., Ontario Bar Association; Dr. J. A. Macgregor, president, Ontario Medical Association Dr. Arthur Surveyer, president *Engineering Institute of Canada*, Montreal; D. C. Durland, president, Canadian General Electric Company; Paul Myler, President, Canadian Westinghouse Company; V. S. McIntyre, Association of Municipal Electric Utilities (of Ontario); Dr. T. C. Routley, secretary, Canadian Medical Association; W. W. Pope, T. S. Lyon, C. A. C. Jennings, J. E. Atkinson, Fred Paul, R. A. Bowman, A. E. Dyment, chairman, Board of Canadian General Electric Company; J. C. Kerr, K.C., Chatham; J. J. Turner, Mayor of Peterboro'; Major Gordon Ingram, London, Ont.; E. J. Dillon, Welland, Ont.; Francis H. Keefer, K.C., M.P.P.; Dr. A. C. Burt, Mayor of Simcoe; J. D. Jones, Sault Ste. Marie.

The enthusiastic expression of the high esteem in which Mr. Magrath is held, as manifested at the dinner, was further expressed in the editorial columns of the daily papers from one of which the following extract is taken:—

"Canada in general, and Ontario in particular, will share the satisfaction felt by the great audience of Ontario engineers and men of affairs on hearing the first public address on matters of policy by Mr. C. A. Magrath, chairman of the Hydro-Electric Commission for this Province. Sir Adam Beck, by his long and aggressive advocacy of Hydro causes, had become the embodiment of the system in the public mind. Now that he has passed away, the Province may feel gratified that a worthy successor has been found in Mr. Magrath. By his tempered zeal, moderation, modesty and constructive vision the new Chairman won his way at the Wednesday night banquet in his honour, and under his direction the vast system may be expected to broaden and extend its service to the public."

PERSONALS

Andrew Don Swan, M.E.I.C., consulting engineer, Montreal, has been awarded the Telford Premium of £25 by the Council of The Institution of Civil Engineers of Great Britain for his paper on the Vancouver Harbour presented before The Institution.

Hugh S. Bostock, S.E.I.C., is on the staff of the Department of Geology, University of Wisconsin, Madison Wisc. Mr. Bostock is a graduate of the Royal Military College of Canada of the year 1922, and subsequently completed his course in mining engineering at McGill University.

Robert Hogg, Jr.E.I.C., formerly Branch News Editor of the Niagara Peninsula Branch, is located at Jamaica, L.I., New York, where he is engaged in manufacture of concrete products. Mr. Hogg reports that conditions are very good in the building and allied trades, and that the work on which he is engaged gives great promise for the future.

J. H. Summerskill, A.M.E.I.C., who for the past winter has been assistant to the Vice-President of the Southern Phosphate Corporation in Florida, has been appointed chief engineer of the New Madison Square Garden in New York City. Mr. Summerskill graduated from McGill University in electrical engineering in 1914 and in mechanical engineering in 1915. He joined the head office staff of the Riordon Company in 1919 and was with that company until going to Florida last April.

Allan T. Bone, A.M.E.I.C., is assistant construction manager on the Metropolitan Life Insurance Building at Ottawa for the George A. Fuller Company. Mr. Bone, who is a graduate of McGill University of the year 1916, has had extensive experience in building construction and has been with the George A. Fuller Company Limited for a number of years. He was engineer for that company on the construction of the T. Eaton mail order building at Moncton, N.B., and on the construction of the Kipawa mills of the Riordon Company Limited at Temiskaming, Que., and later of the construction of the Canada Cement Building at Montreal.

Major A. H. Greenlees, A.M.E.I.C., O.L.S., sailed from New York on November 20th, to join the staff of Horace L. Seymour, M.E.I.C., who is chief engineer of the Lago Petroleum Corporation, Maracaibo, Venezuela. Mr. Seymour is also being retained as town planning consultant in the development of residential properties. Water supply, street railway, parks and parkways are included in a scheme now under consideration.

Mr. Seymour reports the renewed growth of the City of Maracaibo, famous in buccaneer days, now the centre of an important oil area. The Bago Petroleum Corporation now produces over 30,000 barrels of oil per day, an increase of 100 per cent in production within three months.

J. E. A. Warner, A.M.E.I.C., assistant engineer of the St. Maurice Paper Company at Cape Madeleine, P. Q., has been appointed chief engineer of the St. Regis Paper Company at Deferiet, Jefferson Co., N. Y. Mr. Warner who is a graduate of McGill University of the class of 1912, was for a short time connected with the Canadian Fairbanks-Morse Company, as assistant to the superintendent of the Toronto plant. He was later assistant engineer of the Dominion Water Power Branch from the end of 1914 to early in 1916, when he went overseas as Lieutenant, Canadian Engineers. Upon his return to Canada he joined the staff of the St. Maurice Paper Company.

C. K. McLeod, A.M.E.I.C., manager of the Chemical Engineering Equipment Company, Montreal, Quebec, announces that the company has been appointed sole agents for Ontario, Quebec, New Brunswick, Nova Scotia, and Prince Edward Island, for the Permutit Company, manufacturers of water softening and purification apparatus. Mr. McLeod who is the secretary-treasurer of the Montreal Branch of *The Institute*, is a graduate of McGill university of the year 1913. For two years following graduation he was assistant chemist for the Canada Cement Company. His other work included munitions inspection, and chemist for the Dominion Glass Company, Montreal. From 1921 until his appointment to his present position he was with the Phoenix Bridge and Iron Works, Limited, as assistant to the manager, and later with the Canadian Vickers Company.

Attend Radio Conference in Washington

Lt.-Commander C. P. Edwards, A.M.E.I.C., director of radio for the Dominion Government, accompanied by W. A. Rush, A.M.E.I.C., division superintendent of the Radio Branch, attended the fourth United States Radio Conference which opened in Washington on November 9th. Commander Edwards was the official representative of the Department of Marine and Fisheries.

The Conference was called by the United States Department of Commerce, primarily to discuss radio matters in the United States. Following the precedent of previous years, Canada, Mexico and Cuba were invited to send representatives in order that there might be co-ordination in the development of radio in North America.

At the Conference Commander Edwards made an appeal for the reservation of the 200 metre band for exclusive communication by Canadian tugs. He said that the tug boats on the Pacific coast line of the Dominion were now using this wave length and have found that they do not interfere with commercial or amateur stations because the 200 metre band comes in between the lower commercial and the upper amateur range.

Institute Members on Topographical Surveys

The Topographical Surveys, Department of the Interior, have had a very active season, the field work for the summer having been carried on at numerous points throughout Canada. Among the members of *The Institute* who have recently returned to Ottawa after completing their summer's work, are the following:—

B. W. Waugh, M.E.I.C., who has been on topographical mapping in the vicinity of Sussex, N.B.

P. M. H. LeBlanc, A.M.E.I.C., and C. B. C. Donnelly, A.M.E.I.C., who have completed control surveys for mapping the area covered by the Shawinigan sheet of the Topographical Map of Canada in Quebec.

B. H. Segre, A.M.E.I.C., who has been engaged on control surveys aerial photographic mapping in northwestern Ontario, which work took him into the new Red Lake mining area in the district of Patricia.

Wm. Christie, M.E.I.C., who has been on control surveys for aerial photographic mapping extending from Red Lake to Lake Winnipeg.

J. Carroll, A.M.E.I.C., who has been navigational officer with the Royal Canadian Air Force on flying operations for aerial photographic mapping carried out from the Victoria Beach base on Lake Winnipeg.

G. C. Cowper, A.M.E.I.C., and F. H. Wrong, A.M.E.I.C., who have completed the revision of the Touchwood sheet of the sectional map of Canada in Saskatchewan.

Jos. Hardouin, A.M.E.I.C., who has been engaged on miscellaneous legal surveys in Manitoba and Saskatchewan.

C. S. Macdonald, A.M.E.I.C., who has been engaged on control surveys for aerial photographic mapping in the vicinity of Sioux Lookout in northwestern Ontario.

Experiments on a Large Test Dam

Tentative Outline for Experiments on a Test Dam by a Committee of Engineering Foundation

General Description of Project

In 1922, on request from engineers in Pacific Coast and Rocky Mountain states, Engineering Foundation organized a committee for a study of arch dams. In December, 1923, W. A. Brackenridge, member, American Society of Civil Engineers, suggested building for experimental purposes a dam comparable in size to a number of existing dams. He also offered on behalf of the Southern California Edison Company a substantial contribution of funds and the use of remarkably suitable facilities about 60 miles east from Fresno, California, on Stevenson Creek, a tributary of San Joaquin River. A small gorge with strong granite walls affords a suitable site for the test dam, with very small reservoir capacity, in the wilderness but close to a large tunnel conduit of the Edison Company's extensive hydro-electric system. Here the dam may be safely tested to destruction, if possible.

This dam will be of the single-arch type with vertical up-stream face and constant up-stream radius of 100 feet. It is proposed to excavate the bedrock for the foundation of the dam in such a manner that the profile along the up-stream face of the dam will be symmetrical and of regular V-shape with a slight rounding at the bottom. The dam will first be built to a height of 60 feet and tested repeatedly under a variety of load and temperature conditions for about one year. After information from the tests on the 60-foot dam has been obtained, the dam will be raised in steps of 10 feet each to a height of about 100 feet.

In raising the dam to 100 feet, one abutment will be built on a tangent and will have a "gravity" cross-section. It will thus be possible to investigate during the second phase of the experiments the reactions of an arch dam upon a tangential abutment of gravity dimensions. Furthermore, the gravity tangent will decrease the length of the arch and, therefore, diminish the probability of buckling.

The plan, vertical section and general situation of the proposed dam are shown in accompanying illustration. Preliminary operations are in progress. Construction will probably be commenced late in November.

Design of Test Dam

The dam was designed according to the method of combined cantilever and arch action, allowing high unit stresses. This is thought to be justified for the purpose of the proposed tests. The cylinder formula is not considered sufficiently accurate for stress determination in such a dam. The cylinder theory fails to take account of the elastic deformations of the arches and the resulting rib-shortening stresses. It also does not include temperature stresses.

The thickness of the proposed test dam is 7 feet 6 inches at the base, and 2 feet above elevation 30. The span at the crest of the dam 60 feet high is about 125 feet.

In calculations the modulus of elasticity of the concrete was assumed to be 2,500,000 pounds per square inch for the arches and 2,000,000 for the vertical cantilever. It seems to be proper to assume a lower modulus of elasticity for the cantilever inasmuch as some portions of the cantilevers are in tension, and further, in order to make some allowance for the deflection of the cantilever due to shear. The stresses in the arches were determined by the elastic theory, taking into account rib-shortening and shear.

The maximum tensile stresses in the cantilever at the centre of the dam were computed to be about 400 pounds per square inch, at a point approximately 5 feet above the base; maximum compression in the cantilever is 455. For the arches, the maximum stresses for partial water load, including rib-shortening, were computed to be 341 pounds per square inch tension at the extrados near the abutment of the arch at elevation 20, and 915 compression at the intrados near the abutment of the arch at elevation 27.

Although the maximum arch compression for the load and temperature condition as assumed, is not excessive, considering the scope of the experiment, the tensile stresses in the cantilever would appear to be sufficiently high to produce cracks and therefore "initial failure". In order to avoid such a possibility in the early stages of the experiment, the water in the reservoir will not be permitted to rise to the crest of the dam unless measurements should indicate the tension to be much smaller than computed.

The effect of combined cantilever and arch action was also computed for the condition that the reservoir is full to the crest of the dam, and that the temperature of the arches has dropped 20 degrees Fahrenheit below the closing temperature. The effect of shrinkage of the concrete due to the setting of the cement may be considered as corresponding to a decrease of temperature.

There are innumerable combinations possible of depth of water in the reservoir, shrinkage of concrete, drop or rise of temperature, and other conditions. Each of these combinations corresponds to a definite proportion of the load to be carried by the vertical cantilevers and horizontal arches, respectively.

The influence of inclined arch action, the relative stiffness of the shorter cantilevers higher up on the side hills, and numerous other complications, make accurate determination of stresses in an arch dam at our present state of knowledge impossible.

Scope of Experiments

The committee in charge seeks information on the following subjects:

1. Proportion of water pressure supported by horizontal arching and by vertical cantilever, beam or other action.
2. Theory of elastic arch as applied to the horizontal arch elements of arch dams.
3. Secondary arching in interior of thick arches.
4. "Cylinder stresses" in thick arches are greater at intrados than at extrados.
5. Arching in inclined planes.
6. Variation from uniformity of stress on the horizontal arch elements between arch crowns and abutments.
7. Temperature changes in dam, both uniform and variable, from up-stream to down-stream face.
8. Relation between temperatures of air and water, and of concrete of dam.
9. Shrinkage due to setting of concrete.
10. Swelling due to moisture in concrete.
11. Flow of concrete under sustained load.
12. Effect of lateral deformation (Poisson's Law).
13. Wedge action near base.
14. Ordinary theory of flexure not strictly applicable to a triangular cantilever.
15. Vertical cantilevers or beams assumed to be contained between parallel instead of radial planes.
16. Deformation due to shear in cantilever or beams.
17. Effect of open construction joints or vertical cracks (three-hinged or multiple-hinged arches partially restrained).
18. Effect of horizontal cracks upon stress distribution in vertical cantilevers or beams.
19. Effect of water pressure in open horizontal cracks or construction joints (up-lift).
20. Yielding of foundation horizontally and vertically.
21. Yielding of arch abutments.
22. Effects of various minor influences.
23. Indications as to proper construction methods, especially uniformity of concrete, preparation of horizontal construction joints, arrangement of vertical construction joints, and difference of age of successive horizontal portions of dam due to interruptions in placing concrete.

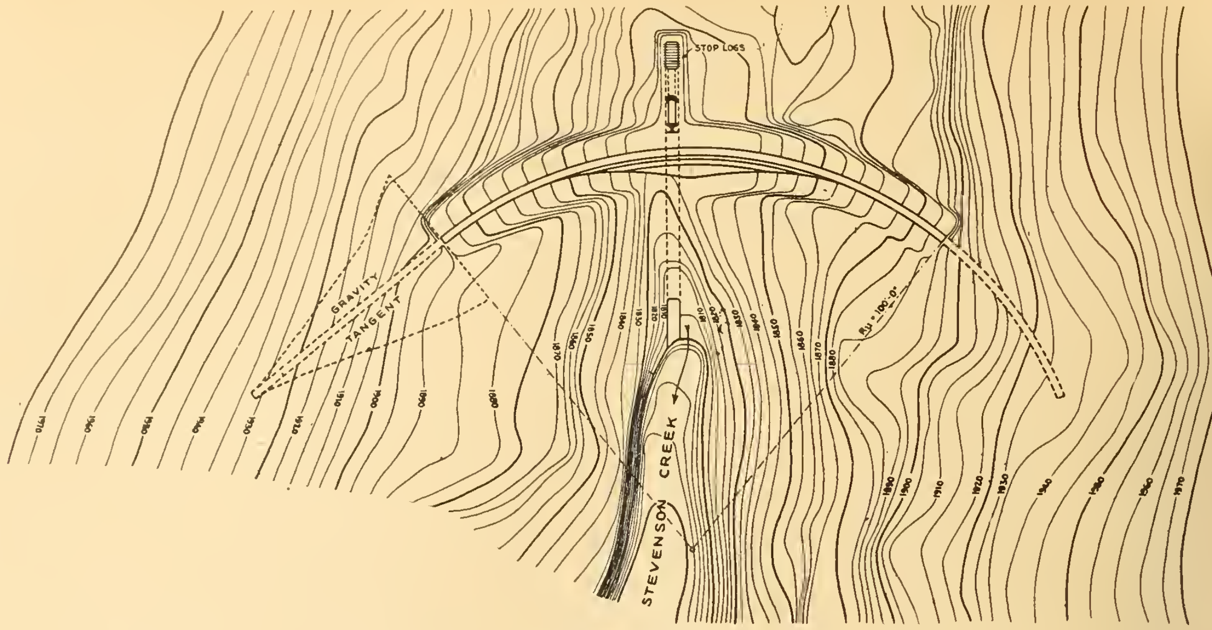
Extensive laboratory tests will also be made for determining the physical properties of the concrete used in the Test Dam:

1. Ultimate strength of concrete and strength at elastic limit in compression and in bending.
2. Coefficient of rigidity; shear modulus.
3. Relation of stress to longitudinal deformation, or modulus of elasticity.
4. Coefficient of thermal expansion.
5. Coefficient of moisture-absorption expansion.
6. Relation of lateral to longitudinal deformation under longitudinal load only (Poisson's ratio), and also biaxial loading.
7. Relation of plastic deformation (flow) to stress and to time.
8. Shrinkage due to setting of concrete, and to drying after having been wet following setting.

In order to determine the distribution of the stresses in the proposed test dam, special arrangements will be made for measuring the strains, deflections and temperature changes at as many points as practicable. The tests will be conducted under a great variety of conditions as to loads and temperatures. Many tests will be repeated for checking purposes.

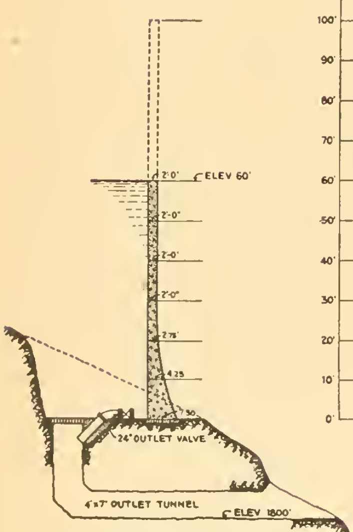
Measurements

At accessible positions the strains will be measured by a strain gages, or similar devices. On the up-stream face, below the water level, and in the interior of the concrete, electric tele-strain gages of the carbon resistor type, developed by the U. S. Bureau of Standards, will be used. It is believed, if the modulus of elasticity of the concrete is known, that the proposed arrangement will permit calculation of stresses in every direction on the surface and in the interior of the dam.

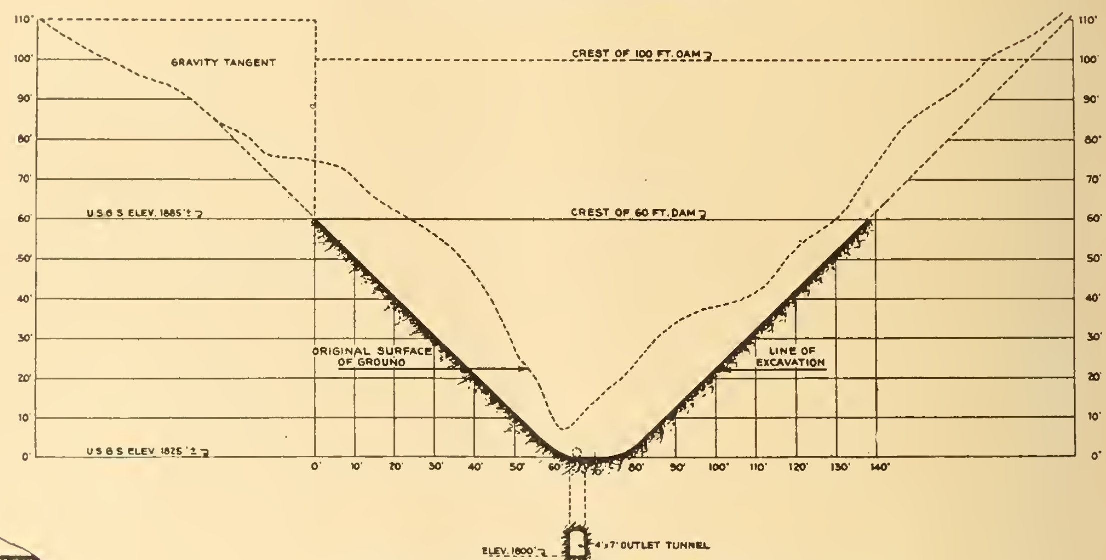


PLAN OF DAM

SCALE 0 10 20 30 40 50 60 70 80 FEET



CROSS SECTION OF DAM



PROFILE ALONG UP-STREAM FACE OF DAM

Temperature variations of the concrete will be measured at over 100 points in and on the dam.

Deflections will be measured in three vertical sections. Inasmuch as these deflections will be small, especially at points short distances above the foundations, special measuring towers are provided.

At suitable time intervals, the elevations of a number of points along the crest of the dam will be very accurately measured with a level in order to determine displacements in a vertical direction due to temperature or other changes.

Attempts will also be made to measure the elastic deformations of the bedrock which may result from the loads imposed by the dam and by the water in the reservoir.

General Programme of Tests

As soon as the dam is completed and the forms have been removed, a complete set of measurements on all instruments will be made. Similar measurements will be repeated once or twice so as to furnish a secure basis for comparison with conditions found during the later stages of the experiment.

After seven, twenty-eight, sixty and ninety days from the initial measurements, complete series of readings on all instruments will be taken. The thermometers will be read daily or at such intervals as may be found desirable.

About three months after completion of the dam, and when the concrete has attained considerable strength, the dam will gradually be put under pressure by partial filling of the reservoir from the power tunnel. On the occasion of the first loading tests, the "no-load" condition will first be carefully determined. Then water will be let to flow into the reservoir to a depth of 10 feet at the dam. Deflections and stresses due to this load will then be measured.

The next step will be to let the water rise to a depth of 20 feet at the dam, when a new series of observations will be made. The process will be repeated with the water surface at the 30-foot elevation, and so forth, until the instruments indicate the possibility of stresses dangerous for the green concrete. Then the water will be let out gradually, and new series of measurements will be taken when the water surface has reached the 20-foot, 10-foot and zero elevations. This will permit ascertaining whether the dam returns to the original position, or whether a permanent set has taken place.

Experiments will be repeated at thirty- or sixty-day intervals in the course of about one year, whereby especially the influence of summer and winter temperatures may be studied. Individual test series may be repeated for checking purposes as often as desired.

In order to determine the plastic "flow" of the concrete, the water will be permitted to rise in the reservoir at such a rate that the dam will come under full pressure in the course of one or two weeks.

The reservoir will then be kept full for a period of say, thirty days and deflection and stress measurements made at suitable time intervals to establish how much of the deformation is elastic and what percentage is permanent set.

At certain times during the testing period, the dam will remain empty to permit the concrete to dry out, and be subjected to the influence of the temperature alone. A number of strain and deflection measurements taken during this period will permit the investigation of the influence of temperature alone.

Many other combinations of load and temperature conditions may be made during the testing period, which is expected to last about one year.

After all the information that may be obtained from the 60-foot dam shall have been gotten, the dam will be raised in steps of 10 feet each and tested as before. The dam will ultimately be raised to a sufficient height to cause failure, if practicable.

Theoretical Interpretation of Test Results

If it is possible by means of the apparatus which will be placed on and in the dam to determine stresses and deflections at a great number of points with the necessary degree of accuracy, it should then be feasible to establish definitely what proportion of the water pressure and temperature loads acting on this dam is resisted by the weight of the dam, (gravity or cantilever or beam action), and what proportion is carried by the arch elements. Information should also be gained on the influence of temperature, shrinkage, and other phenomena affecting the stress distribution in an arch dam.

Comments are invited and may be sent to Mr. H. Hawgood Chairman of the Sub-committee on Test Dam, 722 H. W. Hellman Building, Los Angeles, California, or to Engineering Foundation, 29 West 39th Street, New York, or to the chairman or the secretary of the Committee.

BOOK REVIEWS

The Testing of High Speed Internal Combustion Engines

by Arthur W. Judge. Chapman & Hall, Ltd., London, 1924. 6 x 8½ in. 392 pp., illus. diagrams. $7.50.

While this book deals primarily with the methods and apparatus for the testing of gasoline engines such as are used in motorcars and aircraft, the bulk of its contents is applicable to all types of internal combustion engines.

The author assumes that the reader is familiar with the mechanical and thermodynamic principles of the engine and proceeds in chapter 1 to give a résumé of the results of experimental work as regards mixture strength, nature of fuel, compression, metal temperatures, etc.; the chapter closes with a description of the Ricardo variable compression engine together with some data on its performance.

The second chapter outlines the general arrangements and procedure for testing and includes some typical report forms. This chapter contains many useful suggestions and appears to be unduly condensed.

The subject matter of the following chapters is indicated by their headings: — Fuel Tests and Exhaust Gas Analysis, Measurement of Air Supply, Water Supply and Heat Measurements, Measurement of Brake Horse Power, Pressure Measurements, Indicator Diagrams, Temperature Measurements, Automobile Testing, Airçraft Engine Tests, Analysis of High Frequency Movements. Good descriptions are given of the general equipment, methods and instruments, particularly those developed for high speed gasoline engines. The examples chosen are well illustrated and numerous references are given to original sources.

Because of the variety of instruments and methods which are described the book should be extremely valuable to anyone engaged in engine testing.

A. R. Roberts, A.M.E.I.C.

Molesworth's Pocket Book of Useful Formulae and Memoranda for Civil, Mechanical and Electrical Engineers

F. N. Spon, London, 1925. Twenty-ninth Edition — 5 x 3 in. 938 pp. 6/- net.

For the past sixty years "Molesworth" has been the trusted companion of many British engineers and has always been remarkable for the concise form in which its information and data are presented.

The present edition maintains the high standard of the past and has been practically rearranged, with the inclusion of a large amount of new matter, particularly in connection with electrical work. To those who know "Molesworth" no further recommendation is necessary.

The History of the Telephone in the United Kingdom

by F. G. C. Baldwin. Chapman & Hall, London, 1925. 6 x 9 in. 728 pp., illus. £2/2/0

The History of the Telephone in the United Kingdom, by F. G. C. Baldwin, is an impressive example of British thoroughness. The author apologises for the incompleteness of his story, explaining that in many cases no adequate records were kept, but the need for such apology will not be evident to the reader. For some six hundred and ninety pages Mr. Baldwin guides us conscientiously and thoroughly through the vast bog of litigation, hostility, and wrangling dispute in which the telephone industry of Great Britain was submerged during the greater part of its infancy and early youth. He paints the picture both accurately and authoritatively, supporting his narrative by numerous references to and quotations from legal documents and well known authorities. The hostile conservatism of officialdom in England so hampered the development of the telephone industry there that the technical history consists largely of a record of importations from the United States, where the telephone had developed very rapidly, due to the warm welcome accorded it by a novelty loving people.

The book is in no sense a text-book on telephony. It is written as from one telephone engineer to another, and the author assumes that his readers are fairly familiar with the details of modern telephony. It is history pure and simple and the historian is very successful in taking his readers back into the past and making them live the old days over again. For the most part the book is very interesting. It not only affords the reader a clear insight into the early development of the telephone industry in all its phases, but also affords an equally clear insight into the mental reactions of the public towards the telephone, which is a matter of paramount importance as far as commercial success is concerned. It is a book that every telephone engineer can read with pleasure and with profit. It was not written for the general public.

G. A. Wallace, Jr.E.I.C.

Motorships

by A. C. Hardy. Chapman & Hall, Ltd., London, 1925. Cloth 6 x 8½ in. 317 pp., illus. diagrams. 15/-

The great changes which have occurred in marine engineering practice during the past twenty years include nothing more remarkable than the successful application of the Diesel and Semi-Diesel engine to ship propulsion. This has required not only the development of a reliable and economical marine propelling engine, but also the design of much novel auxiliary equipment, such as fuel pumps, injection air compressors, reversing gear and starting mechanism. While progress has been slow, the internal combustion engine has now definitely taken its place as a rival of the steam driven turbine or reciprocating engine for marine propulsion. Changes in engine design have made it possible to change the hull arrangement, and Mr. Hardy's book gives a timely general presentation of the subject. It is of course largely descriptive, dealing successively with the construction, arrangement and operation of marine internal combustion engines and motorships. The various types of arrangement possible in the machinery space, and the possibilities of the electric drive are treated in two interesting chapters, and the book concludes with a description of many of the most recent types of motor driven vessels.

C. E. S. A. Standard Specification for Stove Bolts

1925 Paper 6 x 9 in. 25 cents.

The Canadian Engineering Standards Association in their latest publication give the dimensions of standard sizes of stove bolts, as agreed upon by a Committee of Canadian Manufacturers and users. Standardization of components like these, the annual consumption of which runs into the millions, is particularly desirable. It is to be hoped that the C.E.S.A., will continue their work on screw threads, and will succeed in obtaining recognition in Canada of some one definite form of thread, as a general Canadian standard. The American (National) Form has been adopted in this publication, no doubt from the fact that it is already used by the majority of Canadian manufacturers of stove bolts, and because it has been so thoroughly defined and studied by the American Engineering Standard Committee and other bodies in the United States.

Machinery's Handbook for Machine Shop and Drafting Room

The Industrial Press, New York. 1924. Sixth Edition — 4½ x 7 in. 1592 pp. $6.00 net.

This standard work of reference for the machinery industries has been brought up to date and contains much valuable material not found in the 1917 edition. For example, the American work of the past few years in connection with the standardization of U. S. screw threads, their fits and tolerances. A convenient thumb index adds to the convenience of the volume, which is indespensible to engineers connected with machine shop operation or management.

The Metallurgy of Aluminium and Aluminium Alloys

by Robert J. Anderson, A.M.E.I.C. H. C. Baird and Co., New York, 1925 Cloth, 6½ x 9¼ in. 910 pp. illus. $10.00.

The classical text-book on the Metallurgy of Aluminium was written by the late well known metallurgist, Professor J. W. Richards. The first edition was printed in 1887 when aluminum was a new and costly metal, and the latest edition came out in 1896. Professor Richards evidently shrank from the task of bringing out fresh editions to keep pace with the newer developments and his recent untimely death had left the field open to others.

Mr. Anderson has made a specialty of aluminum for a number of years. He contributed the article on that metal in the Mineral Industry since 1921 and he is well qualified for writing on the metallurgy of aluminum and its alloys.

The book includes an account of the methods in use for obtaining this metal from its ores, but it is devoted mostly to describing the properties and uses of aluminum and its alloys, and in consequence will be particularly useful for mechanical engineers and others who employ this metal in any form.

The subject matter includes the properties of aluminum and its alloys, their uses and applications, foundry practice, casting losses and defects, die castings, rolling and other mechanical treatment, heat treatment, soldering and welding. Special attention is given to aluminum alloys, their production properties and uses; while their theoretical constitution and metallography is adequately described. Other sections are devoted to the recovery of aluminum from scrap, the corrosion of aluminum, and drawing and other fabricating operations.

The metal aluminum was originally christened aluminium and the extra "i" is still used in Europe and by chemists and other scientists generally. The simpler spelling (and pronunciation) "aluminum" has been adopted generally on this continent both by technical journals and in the trade. Professor Richards, however, retained the "i" and Mr. Anderson has followed his example. It appears that Mr. Anderson missed a very valuable opportunity of advocating this simplification in scientific circles and generally throughout the world. The longer word is needlessly difficult to write and pronounce and incidentally it appears that the thousands of additional "i's" in this book must occupy some three or four pages of print.

The book has been published just too soon to enable it to contain any reference to a very important development in the metallurgy of aluminum. A method has now been devised by which this metal can for the first time be refined electrolytically. This makes possible the economic production of aluminum of 99.98 per cent purity whilst the purest metal usually obtained in the past was about 99.7 per cent. Pure aluminum, so produced, has been found to differ very considerably from the commercial metal hitherto known. A description of this process and of the properties of pure aluminum will be found in papers by C. F. Frary and J. D. Edwards, presented at the April meeting of the American Electro-Chemical Society.

In conclusion it must be recognized that Mr. Anderson has done a monumental piece of work in collecting in one book such a large amount of information regarding all aspects of the production and use of this metal which is destined no doubt to have a continually increasing application in industry. The book must remain for a number of years a standard work of reference on this subject.

ALFRED STANSFIELD, M.E.I.C.

Reinforced Concrete Bridges

by W. L. Scott.

Crosby Lockwood & Son, London, 1925. Illus. 202 pages. 42/-net.

The author is chief engineer of Considère Constructions Limited. The book develops, in logical order, the principles which govern the design of reinforced concrete bridges, and the material is arranged so that anyone familiar with fundamental engineering principles may follow clearly the various stages in the design of such structures. The first four chapters are devoted to general assumptions, loading, temperature and shrinkage effects, and to an exposition of the use of influence lines. Then follow chapters on arch bridges of various types, girder bridges, bowstring girder bridges, and an interesting discussion on temporary and permanent hinges. The remaining chapters are devoted to foundations and abutments, and a description of several typical bridges representing English and European practice. The illustrations, both photographic and line drawings, are very good, and concise calculations are given in each chapter on design, to illustrate the principles under discussion. Suitable acknowledgement is made to authors of standard works of reference listed in the preface, and to many who have furnished data for the various chapters.

The author states that the book is not intended to displace such standard works, but rather to explain in one volume a method of treatment of the problem sufficiently comprehensive for the use of the student and of the engineer in practice. The book can be recommended as one which fulfils that purpose. The reader is expected to be familiar with the methods of design of the structure to enable it to resist the effects of the loads, and is referred to standard textbooks for such data. The author limits himself to consideration of the *effects* of the loads, and detail drawings of structures are not included, being outside the scope of such a treatise. The general clauses of a typical specification for a reinforced concrete bridge, following British standards, are given in an appendix.

ERNEST BROWN, M.E.I.C.

Management's Handbook

by L. P. Alford

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Those engaged in the conduct of industrial and business operations will find in this volume a collection of well selected articles, data, and information on such topics as industrial plant construction and layout, office management, equipment, and forms, purchasing and storekeeping, production control, wage payment, packing and shipping, and cost accounting. Mathematical and statistical tables are included. The various subjects are handled in considerable detail, and some sections might perhaps be somewhat condensed; the utility of the work however is unquestioned.

Merger of Engineering Companies

Of interest to engineers in Canada is the recent announcement of the formation of a company to be known as Affiliated Engineering Companies, Limited, the executive officers of which are all members of *The Institute.* The new company is, in effect, the merging of the interests of the Taylor Stoker Company Limited, of Canada, and the Cleaton Company, (Canada) Limited, both of which concerns are well known, having been engaged in business in the country for over ten years. The merger has been effected with a view to creating an organization of broad scope in both general sales and engineering service in steam, hydraulic and industrial plant equipment.

The president and managing director of the new company is F. S. B. Heward, A.M.E.I.C., formerly Director of Combustion Engineering Corporation, Limited. Mr. Heward was born and educated in Montreal at the Lower Canada College and McGill University. On graduation as a B.Sc., from the Department of Mechanical Engineering, McGill University, he joined the firm of James Howden and Company Limited of Glasgow, Scotland, builders of steam turbines, high speed engines, combustion equipment, etc., and except for a period during the war, when in the technical service of the British Admiralty, Mr. Heward has travelled extensively for Messrs. Howden and latterly has been vice-president and managing director of their American works. Mr. Heward is a member of *The Institute* of Engineers and Shipbuilders in Scotland.

R. E. Cleaton, M.E.I.C., who is vice-president of the new company, will continue to give his personal attention to the specialty sales end of the business. Born in England, Mr. Cleaton served his apprenticeship with the well known firm of John I. Thorneycroft, and on coming to Canada was successively engaged in engineering service by the Canadian Pacific Railway Company, Messrs. Babcock-Wilcox, also the sales department of Messrs. Canadian Fairbanks-Morse, up to the time when he instituted the Cleaton Company (Canada) Limited. Mr. Cleaton is a member of the American Society of Mechanical Engineers.

F. A. Combe, M.E.I.C., is advisory engineer of the company. Mr. Combe, who, in his practice as a consulting engineer, has been responsible for numerous Canadian power plant developments, has had the honour of being retained by the Dominion Government to conduct its recent investigation into the possibilities of central steam heating in Canada. Mr. Combe was formerly the chief engineer of the Babcock-Wilcox Company in Canada. He is chairman of the Fuel Committee of *The Engineering Institute of Canada,* and is also a member of the American Society of Mechanical Engineers.

On the staff of the company are three members of *The Institute:* N. Bannatyne, A.M.E.I.C., Fred. Irvine, A.M.E.I.C., and H. G. Thompson, Jr.E.I.C.

The headquarters of the Affiliated Engineering Companies, Limited, are on the seventh floor of the Southam Building, Montreal, with branches in Toronto and Vancouver.

Lectures on Ice Engineering

A short course of four lectures on the Technical Development of the Physical Problems of Ice Engineering will be given by Dr. Howard T. Barnes, M.E.I.C., at McGill University. Dr. Barnes has been engaged in the study of ice problems for a number of years and is recognized as one of the leading authorities on this subject. Lectures will be given in the Physics Building McGill University, between the hours of five and six in the afternoon of March 4th, 11th, 18th, and 25th, 1926, and will be open to anyone outside the University as well as Students.

ELECTIONS AND TRANSFERS

At the meeting of Council held on November 17th 1925, the following elections and transfers were effected:—

Members

MILLIKEN, Humphreys, B.S. (Mass.Inst.Tech.), chief elect'l engr., Montreal Light, Heat & Power Cons., Montreal, Que.

ROSS, Charles Cathmer, B.Sc. (McGill Univ.), i/c Western Staff, administering departmental regulations, Dept. of the Interior, Calgary, Alta.

Associate Members

BATES, Neville, res. engr. at Bridgeburg, Ont., for Messrs. James, Proctor & Redfern, of Toronto, Ont.

CROSS, Edgar Algernon, B.Sc. (Birmingham Univ.), struct'l. engr., for Albert Kahn, architect, Detroit, Mich.

DONALDSON, Christopher Storrar, owner, C. S. Donaldson Coal Co., Lethbridge, Alta.

HENSHAW, Frederick Robert, Major, R.C.E., (Grad. R.M.C.), chief instructor, School of Military Engineering, Halifax, N.S.

POPE, Maurice Arthur, Major R.C.E., B.Sc. (McGill Univ.), Camberley, Surrey, England.

PRINTZ, Carl J., M.E. (Gottenburg Univ.), steel inspr., H.E.P.C. of Ontario, Toronto, Ont.

STEIN, Charles Ramsay Stirling, Capt., R.C.E., (Grad. R.M.C.), dist. engr. officer, Military District No. 10, Winnipeg, Man.

VANDERVOORT, Gerald Addison, supt. of operation, New Brunswick Electric Power Commission, St. John, N.B.

Juniors

FINLAY, Allan Hunter, M.C., B.A.Sc. (Univ. of B.C.), res. engr., C.P.R., Crystal Garden Amusement Centre, Victoria, B.C.

GORDON, Charles Howard, (Grad. R.M.C.), B.Sc. (McGill Univ.), Atlas Construction Company, Montreal, Que.

Transferred from the class of Associate Member to that of Member

CAMPBELL, John George William, C.E. (Ohio Northern Univ.) town engr., Truro, N.S.

HAY, Alexander Loudon, supervision of all underground engrg., Dominion Coal Company, Glace Bay, N.S.

ICKE, Henry Arthur, 2100 Brighton Avenue, Oak Bay, Victoria, B.C.

McDOUGALL, John J., dist. supt., Nova Scotia Steel & Coal Co., Sydney Mines, N.S.

SCHEMAN, Carl Henry, B.S. in C.E. (Iowa State Coll.), vice-president and managing director, Horton Steel Works, Ltd., Bridgeburg, Ont.

SEAMAN, Lee Norton, B.Sc. (Acadia Univ.), officer i/c timber testing, Forest Research Institute, Dehra Dun, U.P., India.

TERREAULT, Joseph Henri Auguste, C.E. (Ecole Polytech.), chief engr. and director of Public Works, City of Montreal.

Transferred from the class of Junior to that of Associate Member

KUHRING, Paul Ludwig, junior engr., River St. Lawrence Ship Channel, Dept. of Marine, Sorel, Que.

PAYZANT, Samuel Kempton, B.S. in C.E. (N.S. Tech. Coll.), engr. and dftsman., International Petroleum Co., Talara Refinery, Peru.

RUSSELL, John Hartley, engr., Russell Construction Company, Toronto, Ont.

THORTON, Henry Edgar, asst. to divn. engr., mtce. of way, C.N.R., Prince Rupert, B.C.

WALLACE, George Arthur, B.Sc., M.Sc., (McGill Univ.), asst. professor of elect'l. engrg. McGill University, Montreal, Que.

Transferred from the class of Student to that of Associate Member

BALTZER, Edwin, B.Sc. (Queen's Univ.), asst. engr., i/c domestic furnace lab., fuel testing station, Mines Branch, Ottawa, Ont.

DAWSON, William Ash, B.Sc. (Queen's Univ.), machine designer, Ford Motor Company, Ford, Ont.

EATON, Milton, B.Sc. (McGill Univ.), elect'l. engr., Electro Products Co. Ltd., Shawinigan Falls, Que.

HARVEY, John P., B.Sc. (Queen's Univ.), asst. engr., Dept. Railways and Canals, Cornwall, Ont.

LOVELL, William Edward, B.Sc. (Univ. of Man.), asst. professor of elect'l. engrg., University of Saskatchewan, Saskatoon, Sask.

McNICOLL, Arthur Edward, local contracting office, Dominion Bridge Company, Montreal, Que.

NORWICH, Harry Ben, B.A.Sc. (Univ. of Tor.), designing and checking engr., City Architect's Dept., City of Toronto.

RIEHL, William Henry, B.A.Sc. (Univ. of Tor.), engr., Town of Brampton, Ont.

ROCHESTER, Lloyd Baillie, B.Sc. (McGill Univ.), 145 St. James Street, Ottawa, Ont.

WILSON, Selwyn Hamilton, B.Sc. (McGill Univ.), mill or mtce. engr., Riordon Pulp Corporation, Hawkesbury, Ont.

Transferred from the class of Student to that of Junior

ANDERSON, Dan, B.Sc. (McGill Univ.), elect'l. engr. with H. S. Taylor, Consltg. Engr., Montreal, Que.

BENNETT, George Clifford, B.A.Sc. (Univ. of Tor.), vice-pres. and mgr., Burk Investments Ltd., Gen. Contractors, Real Estate and Insurance, Toronto, Ont.

BLEAU, Alphonse, B.Sc. (McGill Univ.), builder and real estate administrator, Montreal, Que.

CLARK, George Silas, B.Sc., (McGill Univ.), steam control engr., Newfoundland Power & Paper Co., Ltd., Corner Brook, Nfld.

CORNEIL, Frederick Maurice, B.Sc. (Queen's Univ.), field engr., Shawinigan Engineering Co. Ltd., St. Narcisse, Que.

FINLAYSON, Harold Musgrave, B.Sc. (McGill Univ.), junior engr., Dept. of Railways and Canals, Cornwall, Ont.

KELSEY, Ernest Starkey, B.Sc. (Univ. of Man.), engrg. dept., Northern Electric Co. Ltd., Montreal, Que.

KESTEVEN-BALSHAW, Humphrey, B.A.Sc. (Univ. of Tor.), industrial sales engr., Consumers Gas Company, Toronto, Ont.

McLEISH, Robert Graham Hamilton, plant supt., Imperial Radiator Co. Ltd., St. Catharines, Ont.

McLENNAN, Gordon Roderick, B.Sc. (McGill Univ.), asst. transformer engr., Can. Gen. Elec. Co., Davenport Works, Toronto, Ont.

MORIN, Charles Auguste, B.Sc. (McGill Univ.), elect'l. apparatus dftsman., Northern Electric Co., Ltd., Montreal, Que.

NATTRESS, David Irving, B.A.Sc. (Univ. of Tor.), asst. in meter dept., Ontario Power Generating Station, H.E.P.C. of Ontario, Niagara Falls, Ont.

PHILLIPS, Richard Darrell, B.Sc. (Univ. of N.B.), illuminating engr., Can. Gen. Elec. Co., Toronto, Ont.

ROBITAILLE, Jean M., gen. engrg. work, Messrs. Beaubien, Busfield & Co., Montreal, Que.

The following students were admitted:—

ADAMS, George Ronald, 215, Division Street, Kingston, Ont.

BENNETT, Arthur Joseph, 810, University Street, Montreal, Que.

CREIGHTON, James Allen, 544, Sherbrooke Street, W., Montreal, Que.

JUSTICE, Claude Wellington, 321, Bartlet Avenue, Winnipeg, Man.

KURTZ, Harold John, Queens University, Kingston, Ont.

LEMMON, Cyril Cooper, B.Sc., E.M. (Michigan College of Mines), 14, Wilkinson Lane, Sandwich, Ont.

McCLORY, Frank Cyril, 391, Earl Street, Kingston, Ont.

MOFFAT, Thomas Stuart, 756, University Street, Montreal, Que.

NEILSON, Charles Shibley, 58, Union Street, Kingston, Ont.

RONEY, Gerald V., 320, University Avenue, Kingston, Ont.

SANDILANDS, Donald George, dftsman., C.N.R., Calgary, Alta.

SCOTT, Clarence Whiting, 240, Frontenac Street, Kingston, Ont.

WRIGHT, William Edward, 82, Lower Union Street, Kingston, Ont.

Studies of Curing Concrete in a Semi-Arid Climate

"Studies of Methods of Curing Concrete in a Semi-Arid Climate", by Harrison F. Gonnerman and C. L. McKesson has just been published as Bulletin 15 of the Structural Materials Research Laboratory, Lewis Institute, Chicago.

This investigation was conducted at Sacramento, Calif., as a co-operative research by the California Highway Commission and the Structural Materials Research Laboratory. The climatic conditions were quite unfavorable for the proper curing of unprotected concrete, but are typical of those encountered in semi-arid regions.

The experiments were carried out on 7- by 10- by 38-inch Portland cement concrete beams made out-of-doors and cured in the open. Curing methods included: (1) Covering of wet earth; (2) Covering of asphaltic paper; (3) Surface application of flake calcium chloride; (4) Surface application of sodium silicate; (5) Air exposure.

In all 518 beams were tested in cross-breaking with the cured surface in tension at ages of 3 to 90 days. The hardness of the cured surfaces of the beams was measured by a ball-indentation test. Compression tests were made on 175 6- by 12-inch cylinders and prisms in order to secure a measure of the quality of the concrete in a standard test.

Abstracts of Papers read before the Branches

Rate Making-Public Carriers

Dr. S. J. McLean, Assistant Chief Commissioner

Board of Railway Commissioners for Canada

Montreal Branch, November 5th, 1925.

Various reasons why freight rates cannot be held rigidly to the cost of service, or a mileage cost basis, and some of the problems which confront railways in the matter of freight rates, formed the subject of a paper read by Dr. S. J. McLean, assistant chief commissioner of the Board of Railway Commissioners for Canada in addressing the Montreal Branch on November 5th, 1925. The chair was taken by Dr. Arthur Surveyer, M.E.I.C.

Dr. McLean made it clear that in speaking of rates and factors affecting them he was not justifying the rates resulting from these factors. After a brief review of transportation in the history of Canada, he pointed out that fundamental in the matter of rates was the question of classification, a complicated matter, he admitted, which roughly divided articles in ten classes.

The speaker dealt with the standard rates which must be approved of by the Commission, and then the prevailing rates, pointing out that the necessity of preserving industry made it necessary that rates should be lowered on goods which had to be sold at low cost in the market if they were to be sold at all. For this and other reasons it was impossible to arbitrarily fix rigid rates according to mileage.

Another factor which had to be taken into account was the matter of export business, since a uniform rate would work against the development of foreign trade. In England it had been recognized that rigid mileage rates would interfere with export trade, and in Germany, before the war, under a railway system applying German scientific methods as far as they could go, there was a much lower basis on export goods moving through Hamburg to the German colonies in Africa than applied from common points of production in Germany to Hamburg for local consumption.

Dr. McLean said he was not suggesting that cost of service should be disregarded in rate fixing, but there should be considered also the limitations that attach to the application of the principle. He illustrated this by referring to two railways, competing with each other, one of which has a higher capitalization.

Rates based on Value

"While cost of service, subject to the limitations, I have suggested, might work out an average return, this means an average return for the whole railway, and it leaves unsettled the question of how the return is to be sub-divided between the different articles that are moving. Some of you have heard suggestions that the method of rate fixing spoken of is charging what the traffic will bear. The words might be given a construction that the very last mill per ton mile was to be exacted, but in reality the somewhat empirical rule of what the traffic will bear is simply a recognition of the fact that the ability of the articles to stand a transportation charge is affected by the price at which they sell in the market, and that the rates must bear some proportion to these if the articles are to move."

Competition with water transportation was another factor which had to be borne in mind in rate fixing, said Dr. McLean, and he instanced a number of cases in point where the railways had to meet all water competition, and part water and part rail transportation. Competition between Canada and the United States in the matter of hard wheat will soon be negligible, and the competition will be between Argentine and Canada. Argentine wheat is grown within 13 miles of tide water, the bulk within 130 miles, so there was a short rail haul to the sea, and water haul at a relatively low cost, one-fifth or one-sixth the cost of rail haul.

Dr. McLean pointed out that all changes in tariffs filed by the railway companies with the Board were not for increases, but in recent batch of notices of changes received be had noticed 50 per cent were voluntary reductions, and that did not mean that all the other 50 per cent were increases. He gave some of the reasons for these voluntary reductions, they being summed up as the necessity to meet competition of the foreigner.

Truck Competition

Dr. McLean dealt with the competition of the motor truck on the short hauls, placing the short haul at from 50 to 60 miles. This had a bearing upon the competition which railways are subjected to and the consequent effect on the rates.

"In short haul movements," said Dr. McLean, "railways are being subjected to competition not only by motors but also by teams. This is a subject which is in the air at present. The subject of motor truck competition is a very important one, and would warrant a special study in itself. Much discussion has taken place regarding the competition between railways and motor trucks, it being urged by the railways that while they have to maintain their own rights of way, the truck is, in reality, subsidized, in that it has the use of a highway paid for out of general taxation and does not contribute its proper proportion to the maintenance of the highways. It is claimed that the truck is being subsidized to compete with the railway, which itself is paying, through taxation to maintain the highways which are used as a basis of competition. Just how far motor truck competition will be carried and what its effect on the railway will be it is not yet safe to generalize. It would seem that there might be a system of co-operation between the railways and the motor trucks whereby in these short hauls in which railway terminal charges bulk large, a more economical method of carriage might be used."

Sculpture and Architecture, Ancient and Modern

J. W. McCallum,

Kingston Branch, October 28th, 1925.

The student of sculpture who wishes to find the origin of that art will find that the religion of the early Egyptians was to a large extent the thing which prompted men to model in clay and to carve wooden statues. Then, as now, men sought for the assurance of a peaceful and happy state after death. Sculpture and drawings aided materially in making the ancient Egyptians feel that their Eternity was to be one of contentment. When statues or statuettes, meant to be a likeness of this or that wife, body-guard, servant or favorite horse, were put in a dead monarch's tomb, it meant that the monarch, though dead and in the spirit world, could, on demand, bring to him the souls of the people whose features were modelled in the statues. Thus he held their souls in his power and, if on entering the spirit world, he found himself lonely, he could be assured of available companions.

Some of the statues of the ancient Egyptians are worthy of note because they form an authentic likeness of someone. Many can hardly be called beautiful.

When we seek sculpture at its best, we turn to Greece. The people of that country brought sculpture to an unsurpassed point of excellence during the third and fourth centuries before Christ. Phidias, generally regarded as the greatest artist of his time, perhaps of all time, lived at this period. Not only did he give to the Greek people the likeness of the father of the Gods, Zeus, but he was also the master architect in the building of the famous Parthenon. This building was the temple of the patron Goddess of Athens. Time and money were lavished in its building. The Grecian sculptors of that period gloried in the beauty of the human form. Because their ideals were high, their sculpture and architecture were as nearly perfect as the world has known.

The Roman artists were more intent on making portraits of their emperors and conquering generals than they were on creating ideal figures. They borrowed their architecture from Greece. Thus we have columnar styles known as Grecian Doric, Roman Doric, etc.

Two great types or styles of architecture were developed after the classic period. These were the Byzantine, which began in Byzantium, now Constantinople, and the Romanesque, the latter spreading over Europe. These styles flourished between the sixth and twelth centuties. In Northern Europe the Romanesque gave way to Gothic, and this in turn to the Renaissance efforts. Some of the finest works of sculpture and architecture were done by early Renaissance artists. Michael Angelo did the "Great David", a colossal statue of marble, now to be seen in Florence, Italy, also the famous tombs of the Medici and many others. He designed, as well, the great dome of St. Peters, in Rome.

Sir Christopher Wrem was the builder of St. Paul's in London, it also being a Renaissance structure. France has contributed very largely to famous sculptures, and also to famous buildings. Sculptors like Rude and Rodin have given sculpture a force which is vital.

The United States and Canada can now point with pride to men who are making present day sculptures and works of architecture objects of merit and acknowledged worth. The now famous Lincoln National Memorial in Washington, built by Henry Bacon, is regarded as one of the finest works of modern times. The colossal statue of the "Great Emancipator", which is placed inside the building, has added more lustre to the already famous name of Daniel Chester French, it's creator.

Water S. Allward, the Canadian Sculptor, who designed the Vimy Ridge Memorial, is an artist of whom the country may well be proud. The future of architecture and sculpture in this country should be secure, since the best of our artists show an originality, tempered with judgment, which augurs well for works of merit.

BRANCH NEWS

Border Cities Branch

F. Jas. Bridges, A.M.E.I.C., Secretary-Treasurer.

An acceptable departure was made at the regular monthly meeting of the Border Cities Branch held Friday evening November 13th in the Prince Edward hotel, Windsor, when instead of having an engineering talk, Chas. P. McTague, local barrister, gave a most interesting talk on "Some Phases of Company Law". The speaker explained the differences between an incorporated company and just a plain partnership and the liabilities of the members of each. From this phase the speaker branched off into the different kinds of shares and then expanding on common and preferred stocks. The speaker also went on to some length on private, quasi private and public companies. The whole talk proved most interesting and this was proven by the number of questions that were asked the speaker after his talk. The questioning promised to go on indefinitely if the speaker had not looked so appealing at the Chairman, Mr. J. Clark Keith, A.M.E.I.C., to call the meeting to a close. In thanking the speaker a Toronto-Varsity yell was given.

Calgary Branch

G. P. F. Boese, A.M.E.I.C., Secretary-Treasurer.
W. St. J. Miller, A.M.E.I.C., Branch News-Editor.

This branch was fortunate in securing Dan McCowan, of Banff, as the speaker for the opening evening of the winter session. Mr. McCowan is a man of modest disposition, but his words are full of refreshing charm and pathos, and in an almost inexplainable manner he drives home his story into the hearts of his hearers.

October 15th will be remembered by the members and lady friends as an occasion when their eyes were opened to the wonders of the plant and animal life in our Western National parks in particular. The speaker interspersed his talk with items of historic interest from the time when Sir James Hector, as a pioneer in the year 1857, proceeded to discover a passage through to the coast without the necessity of travelling south by way of the United States.

Mr. McCowan is a naturalist first, last and all the time, but he is also a clever photographer and a writer of animallore stories. He referred to the great changes and advances that had taken place during the last seventy years in Alberta, and his pictures of Old Bow Fort coupled with those showing the banks of the river of Jumping Pound were most interesting. It was at the latter spot that the Indians drove many thousands of buffalo into a V-shaped stone-walled corral and thence over the precipices to their death. He spoke of the naming of many of the mountains and quoted passages from the diary of Sir James Hector, one of which related to the fact that he set out with a small party of men from the fort with only two or three pounds of tea for provisions. The great botanist Bourgeau was in this party. It was during this expedition that the well known Kicking Horse pass received its name from the fact that Sir James was badly kicked in the chest by a horse. Mr. McCowan's pictures of the Bow valley, Vermillion valley, and Lake Louise were indeed works of art, as also those showing the fauna of the Rockies, many of which were delicately and realistically tinted, the work of Mrs. McCowan.

Some wonderful pictures of mountain sheep and goats were thrown upon the screen, as also amusing scenes of bears and cubs in the vicinity of Marble canyon on the Banff-Windermere road.

At the conclusion of the address Chairman A. L. Ford, M.E.I.C., sincerely congratulated the speaker on his interesting lecture, and on the motion of R. M. Dingwall, A.M.E.I.C., a very hearty vote of thanks and round of applause were extended. Mr. Dingwall emphasized the educational value of the lecture and referred to Mr. McCowan as a poet and an artist of no little merit. Some ninety members and friends were present, and the serving of light refreshments concluded a very pleasant first night.

Alberta Tar Sands

Dr. S. C. Ells, M.E.I.C., delivered an address on "Alberta Tar Sands" to a large gathering of members and their friends on November 6th. The subject of his address was one of considerable interest at this time especially, as Alberta in general is undergoing a severe test in the probability of becoming a proven oil producing centre to compete with its oil products in the world's markets. In the Branch News of a late issue of *The Journal* we outlined in a few words the history and conditions pertaining to the oil and gasoline production in the province, and now we have an opportunity of reviewing a subject that according to those with such optimistic views as Dr. Ells, would appear to have a future of equal importance to that of the oil industry.

The fields he spoke of as containing vast deposits of tar sands lie in the vicinity of Fort McMurray. He referred to the amount of work that the federal government had performed in the investigations, and assured his hearers that this was a natural resource that was bound sooner or later to be developed profitably. It was evident that big expenditures of money would be necessary as such deposits had to be mined on a very large scale. In this connection he referred to the various low grade ores being mined in the southwestern states, notably those of the Utah Consolidated which so successfully mined and treated extraordinarily low grade copper deposits on a tremendous scale. The tar sands of the United States are mined in large quantities, transferred over long hauls, treated and distributed in the form of bitumen for many uses, principally road surfacing, and are successfully facing competition with tar produced by other methods. Most of these however are deposits of some 25 feet, more or less, in thickness, whereas in our fields the deposits occur in thicknesses of several hundred feet in places.

Transportation is the most difficult factor in the problem of development. He claimed there was a wide market for a product that had proven entirely successful as a road material, and stated that a stretch of road laid with these sands in Edmonton ten years ago was still in excellent condition to-day, which is more than could be said of many asphalt roads he had seen in the province.

During the discussion which followed the speaker was asked whether this tar product could compete successfully with other imported asphalt which was purchased at Winnipeg for $11. per ton. In reply he suggested that the product of the north could be supplied at Winnipeg for $8. per ton, or at Calgary for $5. per ton. Another point raised was whether oil refineries producing tar as a by-product would hinder the profitable sale of northern tar. As an instance the Imperial Oil Refineries at Calgary could readily produce tar in place of the petroleum coke that they were now turning out. His strong point was that large output would mean very low mining costs and consequently they could succeed in competition, also that transportation difficulties would no doubt be overcome. In answering a query as to why separation could not take place on the spot he claimed that it would be cheaper to pay freight on the raw product as is done elsewhere.

The colored slides were interesting and clearly showed views of the workable deposits with light overburden, also the banded unworkable deposits of very large extent. Methods of mining similar deposits with steam shovels were also shown on the screen.

Dr. Ells and his staff have completed hundreds of cross-sections of this particular country together with topographical and relief maps. In this way one can gain a clear idea of the extent and value of the deposits, the nature of the land, and other facts necessary for a preliminary investigation without having to visit the scene.

Earlier in the day Dr. Ells had spoken to a crowded assembly of Board of Trade members and appealed to the business men of this city to interest themselves more in this wonderful resource, one that most of us have known something about but have not perhaps had an opportunity of investigating closely. He certainly achieved an object if it was merely to enlighten his hearers on the wonderful possibilities in the development of the tar sands of Northern Alberta.

Edmonton Branch

W. R. Mount, A.M.E.I.C., Secretary-Treasurer.

The first general meeting for the season of 1925-26 was held on November 2nd, in the Macdonald hotel, with Chairman A. G. Stewart, A.M.E.I.C., in the chair.

The speaker for the evening was S. C. Ells, M.E.I.C., field engineer, Mineral Resources Branch of the Mines Department, Ottawa, whose subject was "The Bituminous Sands of Northern Alberta".

The Bituminous Sands of Northern Alberta

Mr. Ells commenced by pointing out how analagous is the bituminous sand situation of the McMurray district with that of the oil shale fields of the United States, and quoted American experts who promised great things for the industry, in support of his theory.

To-day, he said, Alberta stands on the threshold of a new industry that stretches over a long road, which may lead to the development of the McMurray sands, but is beset with many difficulties. He declared that it was not a poor man's game, but a rich man's business, which must be worked on an extensive scale.

He thought that trunk roads and branch roads, — not railways, — were the solution of the transportation problems of the West, and said that for their construction the McMurray sands constituted an ideal material.

Concerted action on the part of large and small municipalities, together with other bodies, was required to get the sands on the market. Mining costs, he estimated, would be around 25 cents per ton, and experts had said that 80,000 barrels would be produced per acre, based on two tons of bituminous sand per barrel of petroleum.

The four factors governing the development of the sands were: Mining cost, marketing, shipping, and paving.

Mr. Ells thought that if the municipalities of the West could get together and guarantee to take a certain tonnage, then an operator would soon be found to go in with the requisite machinery to dig the sands at a low cost. Municipal quarries were also advocated.

If a "sand and gravel" classification could be obtained, then the sands could be laid down in Winnipeg at $8.00 per ton, a price which would compete with American imported material. Paving costs did not present many difficulties.

Mr. Ells said he had always regarded the McMurray deposits as a great potential source of petroleum and also pointed out how many of the best roads in the United States are constructed with a material similar to the bituminous sands of northern Alberta.

Reference was made to the experimental stretch of paving laid down in Edmonton approximately ten years ago, and the satisfactory condition of same was there for any one to see to-day.

Much spade work has been done and data collected, maps constructed and analyses made, "but", he said, "we do not yet know the true commercial value of these sands from analyses. Next year we shall be able to state the commercial value of petroleum obtained".

Mr. Ells showed many excellent slides after his address, and then invited discussion. A. W. Haddow, A.M.E.I.C., city engineer, lead the discussion, and many interesting points were brought out. The interest shown by the large attendance was obvious and on the motion of F. B. Tapley, M.E.I.C., and E. Stansfield, M.E.I.C., a very hearty vote of thanks was accorded.

Montreal Branch

C. K. McLeod, A.M.E.I.C., Secretary-Treasurer.
Stanley A. Neilson, A.M.E.I.C., Branch News Editor.

High Voltage Phenomena

On the evening of October 22nd, 1925, F. W. Peek, Jr., consulting engineer to the General Electric Company, read a paper before the Montreal Branch on the above subject. He covered the subject very thoroughly, dealing both with high voltage systems and with lightning effects. His paper was illustrated with moving pictures.

In the course of his paper, Mr. Peek, pointed out the extremely high voltages that occurred in thunder clouds, and also called attention to the value of the ground wire on transmission systems. The lightning rods as used on buildings were also shown to be well worth while provided they were properly installed and well grounded.

In the discussion which followed, George M. Hudson, A.M.E.I.C., asked the speaker as to the effects of lightning on telephone lines.

P. S. Gregory, M.E.I.C., moved the vote of thanks, which was tendered to the speaker by Prof. C. V. Christie, M.E.I.C., who occupied the chair.

Steel Construction

Lee H. Miller, chief engineer of the American Institute of Steel Construction was the speaker on October 28th, 1925. Mr. Miller reviewed the history of the iron and steel industry from the earliest times, pointing out that steel, as we know it to-day, is a comparatively new material, when the ages for which iron have been known are considered.

The activities of the A.I.S.C., were also dealt with, and some of the work leading up to their adopting of a new specification was discussed. Various column formulae also came in for some criticism and the question of the general use of a higher unit stress than the time-honoured 16,000 pounds per square inch was raised.

After the paper had been read, the chairman, C. J. DesBaillets, M.E.I.C. threw the meeting open for discussion. Those taking part included:—F. P. Shearwood, M.E.I.C., Lesslie R. Thomson, M.E.I.C., P. B. Motley, M.E.I.C., J. W. Seens, A.M.E.I.C., J. F. Brett, A.M.E.I.C., B. W. Seton, Jr.E.I.C., D. C. Tennant, M.E.I.C., and Dean H. M. Mackay who moved the vote of thanks.

Rate Making-Public Carriers

The subject of rate making with particular reference to railway freight rates was dealt with very fully by Dr. S. V. McLean, assistant chief commissioner, of the Board of Railway Commissioners for Canada, at a meeting of the Branch on November 5th, 1925. An abstract of Dr. McLean's paper appears on another page of this *Journal*.

Rock Ballasting on Eastern Lines, Canadian Pacific Railway

On November 12th, 1925, A. C. Mackenzie, M.E.I.C., engineer of maintenance of way, of the Canadian Pacific Railway Company, presented a paper on the subject of Rock Ballasting on Eastern Lines of the Canadian Pacific Railway. A brief abstract of Mr. Mackenzie's paper appears on another page of this *Journal*.

Kingston Branch

Gordon J. Smith, A.M.E.I.C., Secretary-Treasurer.

Report of Annual Meeting

The annual meeting of the Kingston Branch was held in Carruthers Hall, Queen's University on the evening of November 17th, with the chairman of the branch, Major L. F. Grant, A.M.E.I.C. in the chair.

After the regular business of the meeting was finished, nominations for the officers of the branch for the ensuing year were called for and the following members were elected to the positions as noted:—

Chairman	R. J. McClelland, A.M.E.I.C.
Vice-Chairman	Prof. L. T. Rutledge, M.E.I.C.
Secretary-Treasurer	G. J. Smith, A.M.E.I.C.
Executive Committee	Prof. D. S. Ellis, A.M.E.I.C.
" "	Prof. D. M. Jemmett, A.M.E.I.C.
" "	J. M. Campbell, M.E.I.C.
" "	Major L. F. Grant, A.M.E.I.C.
" "	Prof. W. P. Wilgar, M.E.I.C.
Programme Committee	Major L. F. Grant., A.M.E.I.C.
" "	Prof. A. Jackson, A.M.E.I.C.
" "	G. MacLachlin.

The retiring chairman then gave a short address in which he thanked the retiring officers and various committees for their efforts during the past year and then called upon the Chairman-elect, R. J. McClelland to take the chair.

Mr. McClelland in a few well chosen words thanked the members for the honour done him and then threw the meeting open for general discussion and suggestions towards the betterment of the branch.

Sculpture and Architecture, Ancient and Modern

The first meeting of the Kingston Branch for the fall of 1925 was held in Carruthers Hall, Queen's University on Wednesday evening October 28th, when the members had the pleasure of hearing an address by J. W. McCallum of the McCallum Granite Company, Kingston, on "Sculpture and Architecture, Ancient and Modern".

Mr. McCallum is himself a designer of extensive memorial works, has made a thorough study of sculpture and decorated architecture of ancient and modern times and has this most interesting subject completely at his finger tips. The lecture was illustrated with about sixty lantern slides showing many of the most famous works that the world has known.

The address of which an abstract appears in this issue of *The Journal* was very much enjoyed by the members, students and guests present and a heartily endorsed vote of thanks was moved by Col. A. Macphail, M.E.I.C. and seconded by Prof. L. T. Rutledge, M.E.I.C.

Lethbridge Branch

N. H. Bradley, A.M.E.I.C., Secretary-Treasurer.

The Lethbridge Branch became active again on October 9th, when Dan McCowan, naturalist and traveller, was brought to Lethbridge for a public lecture at the Majestic theatre.

This was an educational effort and school children were admitted free. The Lethbridge Rotary Club combined with the engineers in this and shared the expense.

The lecture, while it did not come strictly within the scope of engineering, gave Lethbridge people a splendid idea of the Rockies and the difficulties confronting engineers in railway and survey work in that region.

The programme for the season has been announced and will be found under the column for "Announcements of Meetings" in this issue of *The Journal*.

On October 24th the first of our bi-monthly dinners was held. The attendance was large, about 40 members and affiliates being present to hear Stanley J. Davies, A.M.E.I.C., petroleum engineer of the Department of the Interior.

As usual, the musical part of the programme was well handled. Bob Lawrence, A.M.E.I.C., chairman of the Entertainment Committee, was on the job with an orchestra and two soloists. Bob certainly has a way with him, but it is when he leads the community singing that he shows real genius. There is nothing that "peps" up a dinner so much as a good, rollicking song with every one present in full cry, and the Lethbridge Branch has always prided itself upon this part of its programme. But Bob has a habit of showing us up as singers by bringing on some high class soloist. At this particular dinner he produced Messrs. Parsons and Peat, who were greatly enjoyed.

The Oil Industry of Alberta*

The pièce de résistance, was the address by Mr. Davies. Declaring that Alberta has at least emerged from the experimental state in oil development, Mr. Davies emphasized the importance of the work being done by the Dominion Government, the Imperial Oil Company and others in the Turner Valley field and elsewhere in Alberta.

**An abstract of this paper appears on another page of this issue of the Journal.*

Mr. Davies made a wonderful impression on his audience. His very evident sincerity coupled with his really extraordinary grasp of the technical side of his subject and the simplicity of his delivery, combined in conveying a graphic picture of one of Alberta's greatest actual and potential resources.

Peterborough Branch

P. Manning, A.M.E.I.C., Secretary-Treasurer.
W. E. Ross, A.M.E.I.C., Branch News Editor.

At a regular meeting of the branch, the third meeting of the season, held on Thursday October 22nd, in the Chamber of Commerce, J. B. Carswell, A.M.E.I.C., addressed the members on the subject of "Rail Steel for Concrete Reinforcement".

Rail Steel for Concrete Reinforcement

Geo. Coutts, A.M.E.I.C., was the chairman for the evening and introduced the speaker, who prefaced his remarks with the statement that the original material for his paper was collected about four years ago, and at that time the use of rail steel for this purpose was such a debatable point that he had been constrained to defend this usage, but that at the present time it has been so generally accepted that no defense is necessary.

Mr. Carswell then gave a brief survey of the general characteristics of discarded rails, giving extracts from specifications governing the rolling of rails at various periods both in the United States and in England, which indicated that, considering the discarded rail as a bloom it had been rolled to specifications and tests at least the equal of present day requirements.

The speaker then described the various processes in a modern steel rail mill emphasizing the careful checking and inspection that is maintained and illustrated his remarks with some very excellent lantern slides and moving pictures showing the actual operations in the mill from the unloading of the discarded rails to the final bending of the finished rods.

The final portion of Mr. Carswell's address was devoted to a discussion of the advantages of hard steel in place of mild steel, and brought out some very interesting points in regard to specifications as now written, the bending of steel rods on the site and the cost of hard steel as compared with mild steel.

The paper was much appreciated by those present and resulted in considerable discussion at the conclusion, after which Mr. Carswell was warmly thanked by the chairman, on behalf of the branch, and the meeting adjourned.

Annual Banquet

The annual banquet is scheduled for Tuesday, November 24th, and no doubt by the time that these notes appear in print, will be an accomplished fact. The various committees are hard at work on their several tasks, everyone concerned being eager to maintain, or if possible surpass, the standard set at previous banquets.

Sault Ste. Marie Branch

A. H. Russell, Jr.E.I.C., Secretary-Treasurer.

A trip was made by the members of the Sault Ste. Marie Branch through the hydro-electric power plant of The Great Lakes Power Company, Limited.

The Great Lakes Power Company's Hydro-Electric Plant

This plant is located on the St. Mary's river and operates under an average head of 18 feet. Water is diverted from the St. Mary's river from a point above the Canadian ship canal at the head of the rapids and carried through a canal about 2,000 feet long to the power station. This canal has a capacity to deliver approximately 20,000 cubic feet per second. The water is returned to the river through the tailrace from the power plant to a point below the ship canal and rapids.

The main portion of this plant was completed in 1916-17. It consists of twelve penstocks of the open flume type. There are two vertical turbines in each penstock each connected to a generator having a capacity of about 850 h.p., which makes a total installed capacity in this portion of the plant of approximately 20,000 h.p. An extension was made in 1920-21 which consists of three 2,400 h.p., vertical units, the design in this case being changed to scroll case type of penstock which gives somewhat better efficiency. All turbine units are controlled by governors operated by oil pressure and connections are made to the operating switchboard so that any unit can be started up, regulated or shut down by the operator at the control board.

The oiling system is complete in each unit. The main bearing supporting the rotating parts, consisting of the rotor of the generator, the turbine runner and shaft, is located at top of the generator and runs in oil which is continuously circulated through it, and the lower guide bearings by a small pump. Piping is also arranged to all the units so that oil can be taken to a storage tank, filtered and changed whenever necessary.

The main portion of the plant is served by a 15-ton travelling crane and the extension by a 40-ton travelling crane. Each can be operated entirely from the generator floor.

All the electric power is generated at approximately 2,300 volts, 3-phase, 25 cycles, and sold to large industries with the exception of three of the 850-h.p. units which generate power at 60 cycles for the purpose of the city electric light distribution system. The two systems are tied together through a 900-h.p., frequency changer which increases the flexibility by permitting power to be interchanged as the load conditions may require.

The generator and feeder circuits are connected through oil switches to a common busbar which is located in a gallery which runs the length of the building. This arrangement enables short connections to be made from generators, and as the feeders are taken off at different points along the busbar the load is so distributed that the amount of copper required in the busbar is minimized.

Distribution of the oil switches throughout the length of the gallery does not cause any difficulty from an operating standpoint as they are all remote electrically controlled from the operator's switchboard. To insure a supply of power at all times for the operation of switches and signals, in the event of a shut down, a storage battery is provided which supplies 110 volts, direct current energy.

The operating switchboard is very compactly arranged and fully equipped with indicating and recording instruments that show the load conditions on all generators and outgoing circuits. Indicators consisting of red and green lights are placed on each panel to show the operation of all oil switches. Automatic voltage regulators are installed on the switchboard which control the exciting system of the plant so as to maintain a constant voltage under all load conditions.

All outgoing circuits are protected at point of entrance to the building by lightning arresters located on a special gallery.

To operate the local street railway system, which requires d.c., power at 500 volts, a rotary converter with a spare motor generator set is operated in the plant, each having a capacity of about 750 h.p.

On the upstream side of the building there is an operating platform on which there is a travelling derrick which serves a double purpose. It can be moved along a track on the platform to operate large gates which can be raised or lowered to open or close each penstock; it also has an attachment which is operated by motor driven hoist for mechanically cleaning the trash racks of any floating debris. Another interesting feature of these trash racks is they are specially designed so that portions can be raised during any periods that there may be ice trouble. On account of the open canal considerable frazil ice forms at times and it has been found that by raising portions of the racks the trouble has been apparently overcome. At such periods that ice is forming there is very little, if any, other floating debris which would cause harm to the turbines.

C. G. Cline, A.M.E.I.C., an engineer of the Water Power Branch of the Department of Interior who has been conducting a test of the power canal was present and gave a very interesting talk on current meters and measurement of flow. He described the different meters, the Gurly, the Haskell and the Price, that he was using in his work, showing the method of operation and calculation of each.

A hearty vote of thanks was extended to Mr. Pickering, manager of the Great Lakes Power Company, and his staff, for the courtesy shown to the members during the trip through the power plant, and also to Mr. Cline for his interesting remarks.

Ottawa Branch

F. C. C. Lynch, A.M.E.I.C., Secretary-Treasurer.

In honour of C. A. Magrath, M.E.I.C., the new chairman of the Hydro-Electric Power Commission of Ontario, the Ottawa Branch held a luncheon meeting at the Chateau Laurier, on November 13th, details of which appear in another column of this issue of *The Journal.*

At this meeting J. D. Craig, M.E.I.C., announced that on November 19th, C. J. DesBaillets, M.E.I.C., chief engineer, Montreal Water Board, would lecture at the University Club under the auspices of *The Institute,* and that on November 21st, the guest of honour at a luncheon would be C. E. Brooks, C.N.R. engineer, who invented the oil-electric train which had just made such a sensational trip to the coast.

Winnipeg Branch

James Quail, A.M.E.I.C., Secretary-Treasurer.

A regular meeting of Winnipeg Branch was held in the Engineering Building of the University of Manitoba on the evening of Thursday October 1st. In the absence of the chairman the chair was taken by E. P. Fetherstonhaugh, M.E.I.C.

A letter from Mr. W. T. Ryan, President of the Minnesota Federation of Architectural and Engineering Societies, was read by the secretary. The letter, addressed to C. H. Attwood, A.M.E.I.C., chairman, Winnipeg Branch, expressed appreciation of the cordiality of the reception of the visiting Minnesota Societies during the convention held in Winnipeg in August.

The chairman referred to the good time enjoyed by those who had participated with the visitors in the activities and the festivities of the convention. He mentioned the suggested Joint Meeting tentatively arranged to be held in Duluth during August 1926, the final decision regarding the meeting being left until a later date.

W. G. Chace, M.E.I.C., was introduced as the speaker of the evening; the subject of his address being "The Reinforcement of the Concrete Weir at Pointe du Bois".

Before dealing with his subject, Mr. Chace acknowledged his indebtedness to J. W. Sanger, A.M.E.I.C., chief engineer of the Winnipeg Hydro-Electric Power System, and to Mr. Sanger's staff for their assistance in gathering data and in the preparation of the slides.

The paper described in detail the method of construction adopted to reinforce the concrete weir of the Winnipeg Hydro-Electric System's plant at Pointe du Bois on the Winnipeg River. The plant was constructed between the years 1908 and 1911, and the natural fall of the river of 32 feet was augmented to 47 feet by means of walls, weirs and rock fill dam. The total spill weir length is 1806 feet, the easterly weir having a crest length of 550 feet and westerly section 468 feet; some 500 feet of weir forming parts of the forebay and canal walls, while the other discharge sections are of native rock trimmed to the weir elevation. The weir was designed to safely resist hydrostatic pressures, corresponding to a flood elevation of 5.4 feet above the crest but none of the structures were designed to resist any horizontal thrust from ice sheets, as it was contemplated that the water would flow over the weir continuously. During the winter of 1924-5 due to the increased power load the entire flow of the river was required, resulting in the water level dropping below the crest of the weir, with the subsequent formation of an ice sheet which seriously damaged the structure necessitating its reconstruction.

Mr. Chace describes the construction of an 8-foot wall against the upper face of the weir, the top of this reinforcing wall being built with a slope of 30 degrees from the horizontal, thus providing relief from the ice pressure.

Mr. Chace's paper, which will be published in a later issue of *The Journal*, also deals with the methods adopted in sealing the old rock fill dam section.

The audience of fifty members and visitors listened with interest to Mr. Chace. His address was illustrated with slides, and an active discussion was taken part in by Messrs. Porter, Clendening, Fox, Burke-Gaffney, Finlayson, Smith, Morton, Sanger, Ross.

The regular meeting of Winnipeg Branch was held on the evening of Thursday, October 15th; the chairman, C. H. Attwood, A.M.E.I.C., occupied the chair.

The Death of Brig-General H. N. Ruttan, Hon. M.E.I.C.

In opening the meeting, the chairman referred to the death, during the past week, of Brig.-General H. N. Ruttan, Hon.M.E.I.C. He said that it was fitting, in view of the fact that Brig.-General Ruttan had been a Charter Member of *The Institute* and of the Branch, to call upon two other Charter Members of the Branch, namely Messrs. H. A. Bowman, A.M.E.I.C., and C. A. Millican, A.M.E.I.C., to speak.

Mr. Bowman said, in part, — "To-day was buried, not only a gallant soldier, but, as well, an eminent member of the engineering profession. To have worked with him was to have had the pleasure of working with a whole souled, steadfast citizen. He was a Charter Member of *The Institute* and of the Winnipeg Branch, and a past-president of *The Institute*, — a man without fear and without reproach.

Mr. Bowman suggested that the meeting should record a vote of condolence to the family of Brig.-General Ruttan, and officially note his services to the profession.

Mr. Millican said that he would try to summarize Brig.-General Ruttan's military career from the time he first knew him, in the year 1883, in connection with the formation of a company in the Winnipeg Rifles. Reference was made to Brig.-General Ruttan's activities in connection with the Riel Rebellion, with the South African war, and the Great War. In the last war he had taken over the position of General Officer Commanding Military District No. 10 from 1914 to 1918. Since that time he had retired to quiet life.

Mr. Millican agreed with Mr. Bowman that the Winnipeg Branch should place itself on record as noting the passing of a gentleman and a gallant soldier.

The meeting rose in unanimous acknowledgment and assent.

Some Problems in Railway Transportation

The speaker of the evening was H. J. Symington, K.C., whose subject was "Some Problems in Railway Transportation.

In introducing his subject, Mr. Symington noted that there was no science in the determination of freight rates, and that he would not endeavour to present a solution to the problems into which rates entered as a factor; he would endeavour to refrain from presenting his own views. If he failed in his endeavour it would be because of the habit of advocacy and not through intent.

The correlation of the history of Canada and the United States and the effects on the railroads of the various historical phases was shown. With the increase in population came prosperity for the railroads. The possible effect on Winnipeg of the Panama canal and of the Hudson's Bay railroad was considered.

The history of the evolution of the present freight rates structure was reviewed, attention being drawn to the fact that water competition had much to do with rate making.

The discussion that followed Mr. Symington's address was taken part in by Messrs. J. G. Sullivan, M.E.I.C., T. R. Deacon, M.E.I.C., and E. V. Caton, M.E.I.C.

Saskatchewan Branch

J. W. D. Farrell, A.M.E.I.C., Secretary-Treasurer.

The season's activities of the branch commenced with a dinner and meeting at the Kitchener hotel on October 14th, R. N. Blackburn M.E.I.C., in the chair.

E. W. Bull, chairman of the newly formed Saskatchewan Branch American Institute of Electrical Engineers, was present and spoke briefly expressing the desire for co-operation and good will between the American Institute and *The Engineering Institute*. A report from the Executive Committee outlining definite means of co-operation between the two bodies was adopted unanimously by the meeting.

The programme was under the direction of L. A. Thornton, M.E.I.C., city commissioner, and was the first of a series of meetings to be given by different occupational groups of the membership.

The Duties of a Municipal Engineer

R. W. Allen, A.M.E.I.C., assistant city engineer, was first called on for his paper on "The Duties of a Municipal Engineer." Mr. Allen gave a very comprehensive paper showing the extent to which the duties of a municipal engineer vary with the size and location of the town or city. The speaker laid particular stress on the relationship between the engineer and his fellow citizens and the engineer and the municipal council, showing the need at all times for tact, forbearance and scrupulous care in details of his work. A brief outline was then given of the city engineer's duties in Regina, relating to roadways and streets, subways, bridges, storm and domestic sewers and sewage disposal, both as regards maintenance and planning of new works. The speaker pointed out the need for complete and accurate records of all works. L. A. Thornton, M.E.I.C., city commissioner and formerly the city engineer, lead the discussion and brought out some further interesting facts.

Features of Light and Power Supply

The chairman then called on E. W. Bull, superintendent of light and power. Mr. Bull gave an interesting talk on "Features of Supply in the Light and Power Business". Mr. Bull traced the supply of current from the bus bars at the power house down to the point of delivery at service meters. The system comprises supply lines to different parts of the city at higher voltages than used on services, the higher voltage permitting more efficient transmission. Transformers installed at various points in the system step down the current to service voltage. The location and action of protecting features such as circuit breakers and fuses was described. The speaker also mentioned the losses occurring in distribution such as line losses, transformer losses, service wire and service meter losses. In conclusion Mr. Bull pointed out that his department was always ready to assist consumers in their choice and use of electrical apparatus. A general discussion took place in which Messrs. King, of the General Electric, and Stainton, of the Western Canada Fire Underwriters' Association, assisted.

The Retail Business of a Waterworks Department

The chairman then called on J. W. D. Farrell, A.M.E.I.C., acting superintendent of waterworks, for his paper on "The Retail Business of a Waterworks Department". The speaker confined himself to the

Regina system showing it to be one of the large retail businesses in the city, with an annual revenue of $250,000. Figures were presented showing the distribution of capital funds and an analysis of current revenue and expenditures. Other points dealt with were the monopoly feature, quantities delivered to different classes of customers, selling price, advertising and the many features occurring in giving service to the consumer. There followed some discussion on hydrant rentals and lifetime of different pipe materials.

The time being somewhat late L. A. Thornton, M.E.I.C., who was to have given a paper on "Municipal Finance" suggested that his paper be postponed to a future meeting. After some discussion the suggestion was accepted.

Toronto Branch

C. B. Ferris, A.M.E.I.C., Secretary-Treasurer.
J. W. Falkner, A.M.E.I.C., Branch News-Editor.

The Toronto Branch opened its winter programme on October 15th, with a well attended luncheon meeting at the King Edward hotel, some 125 members being present. C. A. Magrath, M.E.I.C., chairman of the Hydro-Electric Power Commission of Ontario was the guest of the meeting and in his address dealt with the railway problem of Canada, first explaining the conditions which had led up to the present situation, and then making the practical suggestion that if a committee of four men were appointed, composed of two men from each road, to sit down at a table and approach their problem with fairness and sincerity, what good results might not follow, such as operating economies and the abolition of unnecessary competition? Such a committee, Mr. Magrath said, had been in operation between the United States and Canada in the matter of international waterways, and had never failed to result in benefit. Both Mr. Magrath and Mr. C. A. Maguire, one of the commission members, paid warm tribute to the life and work of Sir Adam Beck.

Relativity

Engineers deal so frequently with matter in the concrete, that a journey into the realms of the abstract, with Mr. William Gore, F.G.C.I., M.E.I.C., as guide and counsellor, came as a pleasant diversion on October 22nd, when he addressed the branch on "Speculations on Mechanisms along the lines of Relativity".

Mr. Gore first explained the fundamental postulates on which our conception of relativity is built, and then compared their development by Newton and Einstein, afterwards dealing with theories of the gravitational field, and illustrating the principles of the subject with lantern slides. Members present felt that Mr. Gore had dealt with a very difficult subject in a most lucid and interesting manner.

The Winds of the Globe

On Thursday October 29th, "election night," the branch was favoured with an address by Sir Frederick Stupart, director of Dominion Meteorological Service, Toronto, on "The Winds of the Globe". Sir Frederick dealt in an extremely interesting manner with the thermal construction of the air, the thermo-spheres, influence of the sun, transfer of energy, prevailing winds, rainfall, weather forecasts and how obtained, and illustrated his address by weather charts, and specially prepared maps. He also explained how recent investigation in all parts of the world had caused many theories found in test books to be discarded. That the weather is a subject of perennial interest was shown by the numerous questions that were put to Sir Frederick Stupart at the close of his address.

Mexico City

At the monthly luncheon meeting on November 5th, Mr. Norman D. Wilson, M.E.I.C., who recently spent several months in Mexico, gave an address on "Mexico City", illustrated throughout with numerous lantern slides. Mr. Wilson dealt first with the chequered past of this densely populated city of contrasts, still redolent of Aztecs and Spanish domination; and then, with the present day social and economic life of the people, and the continuing state of political unrest. The city has some fine buildings, but the streets are badly congested, making operation of the street railway service very difficult. Being located on an old swamp, the construction of building foundations is a most difficult undertaking, since solid bottom is 1,000 feet or more below the ground level. Slides were shown of pretentious modern buildings slowly sinking foot by foot below the street level.

Nipigon Region Hydro-Electric Developments

O. Holden, A.M.E.I.C., assistant hydraulic engineer of the Hydro-Electric Power Commission of Ontario, addressed the branch on November 12th, on the Nipigon Region development. With its high banks and its 248 feet of fall in 10 miles the Nipigon river offered the Canadian people a most efficient power development, said Mr. Holden, and of that 248 feet, only 4 feet could not be utilized. Excellent water storage was provided in lake Nipigon, which has an area of about 1,500 square miles. With lantern slides, Mr. Holden went into the technical details of the generating station at Cameron falls, and described power sites for other stations on the Nipigon river that under full head would develop an aggregate of 200,000 horse power. Although, according to original adverse criticisms, the Cameron Falls development would never dispose of half its developed power, they were now faced with the prospect of a possible need for still further development.

Recent Additions to the Library

Proceedings, Transactions, etc.

Presented by the Societies:

Transactions of the American Institute of Electrical Engineers, volume 43, 1924.
Year Book, 1925, of the Society of Naval Architects and Marine Engineers.
List of Members of the Association of Professional Engineers of Alberta, 1925-26.
List of Members of the Institute of Metals, England, 1924-25.
List of Members of the Cleveland Engineering Society, 1925-26
Tentative Standards of the American Society for Testing Materials, 1925.
Minutes of Proceedings of the Institution of Civil Engineers, England, 1925.
Proceedings of the New Zealand Society of Civil Engineers volume XI, 1924-25.
Transactions of the Canadian Institute of Mining and Metallurgy and of the Mining Society of Nova Scotia 1924.
Calendar of the University of London, 1925-26.
Calendar of the University of Sheffield, 1925-26.

Technical Books

Presented by E. and F. N. Spon & Company, London, England:
Pocket-book of Engineering Formulae and Memoranda, by Sir Guilford L. Molesworth.

Presented by Gauthier-Villars & Cie., Paris:
Théorie Générale et Formulaire Pratique du ciment armé, par Charles Amar.

Presented by Chapman and Hall:
The Erection of Engineering Structures and Plant, by H. Atkin.

Presented by Richard Pflaum, Publisher, Munich, Germany:
Wasser-Kraft-Jahrbuch, 1924.

Reports, etc.

Presented by the Structural Materials Research Laboratory, of the Lewis Institute, Chicago:
Bulletin 15, "Studies of Curing Concrete in a Semi-Arid Climate", by H. F. Gonnerman and C. L. McKesson.

EMPLOYMENT BUREAU

Situations Vacant

Transitman

Wanted transitman for logging operations, technical graduate, single, under thirty, healthy, a worker. willing to learn bush operations and French. Experience on bush surveys desirable. For such a man a well known company offers fine future. Apply box No. 149-V.

Electrical Engineer

Public utility has an opening for a graduate of one to three years experience. Probable location Toronto or vicinity. Good opportunities for advancement to right man. Apply box No. 150-V.

Hydro-electric Designer

First class draughtsman experienced in the designing of hydro-electric power plants. Must be qualified to take charge of two or three draughtsmen and instruct as to details, etc. Apply box No. 152-V.

Draughtsman and Designer

An industrial company in western Ontario requires an experienced draughtsman and designer. One who has had experience in structural steel designing, principally of mill construction. Apply box No. 153-V.

City Engineer — Kingston, Jamaica, B.W.I.

The corporation of Kingston and St. Andrews, Jamaica, B.W.I., are inviting applications for the position of city engineer, and have announced their intention of giving consideration to applications from Canadian engineers. While the terms given in the present announcement require that candidates must be either associate members or members of the institute of Civil Engineers of Great Britain, an effort is being made to have these terms altered to include members of the Engineering Institute of Canada. Applications in connection with this position should be addressed to Mr. W. J Walker, Town Clerk, Kingston, Jamaica, B.W.I., and should be in his hands not later than December fifteenth.

British Industries Fair, England, 1926.

In view of the representations made by the exhibitors and buyers at previous British Industries Fairs, the British Government has decided to revive next year the London Section of the British Industries Fair, which was not held in 1925 owing to the continuance of the British Empire Exhibition. The British Industries Fair will, therefore, be held in London and in Birmingham February 15th, to 26th, 1926, the London Section being organized by the Department of Overseas Trade, and the Birmingham Section by the Birmingham Chamber of Commerce.

The fair will take place under particularly favourable auspices for in view of the urgent need for taking all possible steps to stimulate the sale of British goods, both abroad and at home, the government has taken special measures to ensure the success of both sections of the fair.

All goods of the same class will be displayed at the fair, side by side, and the buyer will therefore see the articles in which he is interested at a minimum of time and trouble. Another advantage of the fair to the exhibitor and buyer which is being more and more appreciated, is the fact that every exhibitor at the fair is the actual manufacturer of the goods displayed. With the object of making participation as cheap as possible to exhibitors, the charge for space has been reduced this year at both London and Birmingham.

The Fair is essentially a trade Fair, and, as on previous occasions, will be confined to actual manufacturers producing within the British Empire, and during business hours only buyers will be admitted. At the request of the great majority of the exhibitors a new feature, however, is to be introduced next year. After 5 p. m. each day, and from 1 to 8 p. m. on Saturday, February 20th, the public is to be admitted, which will afford the general public a unique opportunity of seeing the many products of British Empire manufacturers. It is impossible to give here the full lists of trades eligible to participate in the Fair, but, briefly the London list comprises the lighter trades, such as cutlery, clothing, chemicals, jewellery, food-stuffs, pottery and toys, etc., while the Birmingham list comprises general machinery, hardware, metals, and kindred trades. Full particulars and invitation tickets can be obtained from G. F. Braddock, British Government Trade Commissioner, at Bank of Hamilton Building, Toronto.

Trade Publications

An interesting booklet known as Catalogue B containing a discussion of the design and applications of centrifugal pumps has been issued by the De Laval Steam Turbine Company, of Trenton, N.J. This company manufactures centrifugal pumps of the single stage and multistage types for power plant, water works, drainage, hydraulic pressure and other services. The booklet is well illustrated and contains 72 pages describing various types of pumps and their uses.

Addresses Wanted

Any information regarding the present addresses of members on the list printed below will be greatly appreciated by the Secretary.

Members

D. Anderson
A. Angstrom
C. H. Ellacott
H. B. Fergusson
J. H. Holliday
A. E. Johnson
A. E. Sharpe
A. H. Smith
Miles Walker
J. S. Whyte

Associate Members

S. Amiot
A. P. Augustine
C. R. Avery
J. R. Black
W. H. Blanchet
V. J. Borland
S. Bourgoing
H. Victor Brayley
J. K. Butler
J. W. Calder
Neil Campbell
Fred. Clarke
H. E. Como
J. W. Crashley
F. J. DiBenga
A. Drowley
W. H. Eassie
G. R. Elliott
H. F. J. Estrup
R. J. Fisher
E. C. Girouard
E. D. A. Gray
J. H. Hooper
V. J. Hvidt
W. J. Ireland
W. H. Jones
T. Kearney
L. N. Ledger
J. S. Lepage
L. W. Lester
R. S. B. Lillico
H. Luscombe
R. G. Lye
C. M. MacKenzie
F. E. Matthews
J. E. McKenzie
J. P. Menard
C. J. Murphy
C. A. Newton
J. F. O'Connor
A. Pepin
H. H. Pinch
Geo. J. Rayner
J. F. Rhodes
H. H. Robertson
B. T. Rodd
F. A. Rose
W. L. Saunders
D. A. Scarnegie
K. R. Schuster
F. R. Shenstone
H. D. St. A. Smith
H. G. Starr
C. V. Stout
J. P. Suttie
C. F. Szammers
W. E. Tidy
J. A. Tom
L. G. Van Tuyl
N. J. Wallis
F. E. Weir
C. S. Whitney
S. Wilkins
W. G. Wilson
A. G. Willson
J. Zverina

Juniors

E. F. Abraham
J. S. Arbuckle
F. D. Austin
J. N. Betourney
J. M. Bishop
R. A. Campbell
F. L. Code
W. S. Cole
N. S. Devenny
J. C. Ells
I. M. Fraser
C. A. Grupp
J. H. Hewson
F. J. Igoe
N. MacKenzie
F. L. Mayes
H. K. Morrison
C. Pearson
L. A. Perry
H. A. Roberts
J. H. Ryan
F. R. Sherlock
H. S. Smith

Students

W. W. Abernethy
A. J. Allen
W. Allen
A. G. Anderson
P. E. Bauman
A. E. Beaman
W. T. A. Bell
H. A. Blake
E. G. Bishop
S. Bonneville
W. N. Bostock
C. M. Bowyer
J. C. Brodeur
S. Bronstein
E. C. Brown
L. B. Brown
G. F. Bryant
E. J. Buckingham
B. S. W. Buffam
H. Carignan
M. Carp
W. L. Churchill
J. Circle
W. J. Clark
J. L. Clifford
J. R. Cooper
E. V. Deamude
H. G. S. deCarteret
W. V. Delaney
J. A. deLorimier
J. B. Durham
C. D. Evans
J. W. Fagan
H. A. Fair
R. W. Farmer
R. E. Petter
A. E. Ford
R. H. Foss
M G. Foster
L. J. Gannon
L. Gareau
A. R. Garrett
R. Gauthier
R. C. Gegg
A. L. Gnaedinger
J. E. Goldie
H. J. Graham
B. W. Haines
J. P. Haley
E. S. Heurtley
S. Jacobs
S. H. Johnson
G. L. Jones
W. Kennedy
G. E. Kerr
T. B. Kerr
A. R. Kirby
L. Larin
A. Leger
R. LeGron
B. W. Lewis
W. J. Lewis
R. E. Lindsay
L. W. Lockett
R. St. C. Low
B. H. T. Mackenzie
C. H. MacLean
J. MacLellan
C. H. MacLeod
B. E. Martin
F. L. McCallum
J. B. McCaw
J. B. McClure
R. J. McMillan
D. S. Mellett
G. C. Monture
J. W. Noyes
R. D. Oakley
E. M. O'Brien
E. P. O'Neil
A. H. Palmer
H. A. Pearse
H. J. Pearson
W. J. Porter
J. B. Porter
R. J. Rainnie
L. J. Scott
T. G. Sillers
T. A. Sims
M. G. Stewart
J. A. Tallon
F. J. Toole
D. M. Vye
F. M. Waddell
W. H. Whitlock
S. W. Williams
R. Woffenden
D. Wyatt
J. P. Young

Preliminary Notice

of Applications for Admission and for Transfer

November 19th, 1925

The By-laws now provide that the Council of the Institute shall approve, classify and elect candidates to membership and transfer from one grade of membership to a higher.

It is also provided that there shall be issued to all corporate members a list of the new applicants for admission and for transfer, containing a concise statement of the record of each applicant and the names of his references.

In order that the Council may determine justly the eligibility of each candidate, every member is asked to read carefully the list submitted herewith and to report promptly to the Secretary any facts which may affect the classification and election of any of the candidates. In cases where the professional career of an applicant is known to any member, such member is specially invited to make a definite recommendation as to the proper classification of the candidate.*

If to your knowledge facts exist which are derogatory to the personal reputation of any applicant, should be promptly communicated.

Communications relating to applicants are considered by the Council as strictly confidential.

The Council will consider the applications herein described in December, 1925.

R. J. DURLEY, Secretary.

*The professional requirements are as follows:—

A Member shall be at least thirty-five years of age, and shall have been engaged in some branch of engineering for at least twelve years, which period may include apprenticeship or pupilage in a qualified engineer's office, or a term of instruction in a school of engineering recognized by the council. The term of twelve years may, at the discretion of the council, be reduced to ten years in the case of a candidate for election who has graduated from a school of engineering recognized by the council. In every case the candidate shall have held a position in which he had responsible charge for at least five years as an engineer qualified to design, direct or report on engineering projects. The occupancy of a chair as a professor in a faculty of applied science or engineering, after the candidate has attained the age of thirty years, shall be considered as responsible charge.

An Associate Member shall be at least twenty-seven years of age, and shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility, in charge of work as principal or assistant, for at least two years. The occupancy of a chair as an assistant professor or associate professor in a faculty of applied science of engineering, after the candidate has attained the age of twenty-seven years, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council, shall be required to pass an examination before a board of examiners appointed by the council. The candidate shall be examined on the theory and practice of engineering with special reference to the branch of engineering in which he has been engaged. This examination may be waived at the discretion of the council if the candidate has held a position of professional responsibility for five or more years.

A Junior shall be at least twenty-one years of age, and shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, at the discretion of the council, if the candidate for election has graduated from a school of engineering recognized by the council. He shall not remain in the class of Junior after he has attained the age of thirty-three years.

Every candidate who has not graduated from a school of engineering recognized by the council, or has not passed the examinations of the first year in such a course, shall be required to pass an examination in the following subjects: geography, history, (that of Canada in particular), arithmetic, geometry, euclid (books I, IV and VI), trigonometry, algebra up to and including quadratic equations.

A Student shall be at least seventeen years of age, and shall present a certificate of having passed successfully an examination equivalent to the final examination of a high school or the matriculation of an arts or science course. He shall either be pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall not remain in the class of student for more than two years after graduation; or he shall be receiving a practical training in the profession, in which case he shall pass an examination equal to that prescribed for admission to the grade of Junior in the foregoing section and he shall not remain in the class of Student after he has attained the age of twenty-seven years.

An Affiliate shall be one who is not an engineer by profession but whose pursuits, scientific attainments or practical experience, qualify him to co-operate with engineers in the advancement of professional knowledge.

The fact that candidates give the names of certain members as reference does not necessarily mean that their applications are endorsed by such members.

FOR ADMISSION

ASHWORTH—JOHN KERSHAW, of 55, Duverger Ave., Outremont, Que. Born at Hebden Bridge, Yorkshire, Eng., Oct. 18th, 1885. Educ., special course, Manchester Univ., 1909-10; 1903-06, fitting, turning and erection of machinery; Associated with manufacture of steel driving chains and gears for 9 or 10 yrs., first, 1910-11, with Hans Renold, Ltd., Manchester, Eng.; then to Canada, 1911-12, design'ng and sales engr. for Canada, for Coventry Chain Co.; 1913-14, mech. engr., constrn. H.E.P.C. power plant, Head and Tail Race on Trent Valley Canal at Healey's Falls, Ont.; 1914-16, overseas; 1916-18, efficiency engr., shell production, Steel Co. of Canada; 1920 to date, design'g. and sales engr. for Canada, with Jones & Glassco Regd., (for the Coventry Chain Co., Ltd., of Coventry, England) St. Nicholas Bldg., Montreal, Que.

References: H. M. Jaquays, I. Leonard, J. B. Goodwin, deG. Beaubien, E. C. Kirkpatrick, J. T. Farmer.

BOWLEY—ALBERT EDWARD, of 646 Beresford Avenue, Winnipeg, Man. Born at West Ham, London, England, May 9th, 1886; Grad. I.C.S. Elect'l. Engrg. 1917; 1902-07, scientific instrument making, ap'ticeship; 1907-11, journeyman, Edison & Swans, Marconi's, British Insulated & Helsby Co., Stirling Telephone Co.; 1911-17, laboratory attendant, elect'l. engrg. dept., Univ. of Man.; 1917-19, electrn., McGillivray Creek Coal & Coke Co., Coleman, Alta.; 1919-20, ignition work, Lion's Auto Garage; 1920 to date, electrn., Univ. of Manitoba, Winnipeg, Man.

References: E. P. Fetherstonhaugh, J. W. Dorsey, N. M. Hall, R. W. Moffatt, G. J. Brown.

CARR—DAVID LEONARD, of 116, Vendome Ave., N.D.G., Montreal. Born at Devizes, Wiltshire, England, Oct. 20th, 1884; Educ., 1st class Cert. Elec. Engr'g., Central Tech. Coll., London, 1907; 1908-10, testing wire and cables, inspectn. dept., Wire & Cable Co., Montreal; 1910-14, chief inspector, Imperial Wire & Cable Co.; 1914-19, overseas, officer, Royal Artillery; 1919 to date, cable sales specialist, Northern Electric Co., Ltd., Montreal.

References: P. S. Gregory, J. S. Cameron, W. C. Adams, C. V. Christie, J. L. Busfield.

COULTIS—SAMUEL GEORGE, of Black Diamond, Alta. Born at Forest, Ont., Mar. 9th, 1887. Educ., Ph. C., Univ. of Michigan, 1909; 1909-13, mng., chemist, Smith & Leisenring, Pontiac, Mich.; 1913-17, asst. city chemist, Calgary; 1917-20, supt., Southern Alberta Refineries; 1920 to date, supt., design'g. and erect'g. absorption, compression and desulphurizing plant and operation, with Royalite Oil Co., Black Diamond, Alta.

References: S. Stockett, S. J. Davies, B. L. Thorne, J. J. Hanna, J. H. Rose.

GUTHRIE—KENNETH MACGREGOR, of Ottawa, Ont. Born at Guelph, Ont., Aug. 9th, 1900. Educ., 3 yrs. Ottawa Collegiate Institute; 1917-18, 2nd Lieut. Pilot, Royal Flying Corps.; 1918-19, Pilot Officer, pilot on service aircraft; Dec. 1920 to Jan. 1923, i/c stores, Canadian Air Board, various stations, and as pilot also; 1923 to date, Flying Officer, Pilot and Administrative Officer, Royal Canadian Air Force, Ottawa, Ont.

References: J. S. Scott, E. W. Stedman, J. L. Gordon, L. S. Breadner, B. D. Hobbs, A. Ferrier, J. A. Wilson, A. M. Narraway.

HATFIELD—HUBERT A., of New Glasgow, N.S. Born at Parrsboro, N.S., Dec. 31st, 1884; Educ., High school and private studies; 4½ years, shops and drawing office, Robb Engineering; 1908-11, shop inspr., Hart Otis Car Co., Montreal; 1911-15, gen. foreman, Dominion works, Canadian Car & Foundry; 1915-19, overseas; 1919-20, engrg. dept., Howard Smith Paper Mills; 1920-22, engrg. dept., Babcock-Wilcox; 1922 to date, maritime representative, Babcock-Wilcox & Goldie McCulloch, New Glasgow, N.S.

References: A. R. Chambers, S. C. Mifflen, H. C. Chipman, A. R. Roberts, P. A. Freeman.

JAMES—DAVID HARRIES, of 2285, Hutchison Street, Montreal, Que. Born at Blaenffos, South Wales, Oct. 9th, 1891. Educ., Evening Tech. Classes, Ebbw Vale; 1905-14; 1905-11, app'ticeship, (shops 3½ yrs., drawing office 3½ yrs.) with the Ocean Coal Co., Ltd., Treharris, South Wales; 1911-14, dftsman., Ebbw Vale Steel, Iron & Coal Co., Ltd., Monmouthshire; 1914-15, dftsman., Hollinger Gold Mines Ltd., Ontario; 1915-19, overseas; 1919 (Apr.-Oct.) dftsman., McIntyre Porcupine Gold Mines, Ltd., Ontario; 1919-22, dftsman. and works engr., Baldwins Canadian Steel Corpn., Toronto; 1922 to date, dftsman. i/c boiler and plate work, Canadian Vickers Ltd., Montreal.

References: J. L. Brower, R. Ramsay, G. Agar, C. O. Thomas, K. K. Pearce.

JOHNSTON—HARRY LLOYD, Jr., of 851 University Street, Montreal, Que. Born at Vancouver, B.C., Oct. 2nd, 1896; Educ., B.C. Land Surveyor, 1924. At present 3rd year student, Civil, McGill Univ.; 1912-15 (summers), rodman on constrn., Can. Nor. Pac. Ry.; 1915-19, overseas. Can. Engrs. and R.G.A., Lieut.; 1919-20 (8 mos.), instr'man. and dftsman., divn. engr's. office, on constrn. of Onanagan Branch, C.N.R.; 1920-25, instr'man. and asst. land surveyor, land surveys dept., Can. National Rlys., Vancouver, B.C.

References: T. H. White, P. Philip, S. H. Sykes, C. M. McKergow, W. H. Powell.

McILQUHAM—WALTER SCOTT, of 29, 34th Avenue, Lachine, Que. Born at Lanark, Ont., Apr. 4th, 1896; Educ., B.Sc., Queens Univ., 23; 1922 (summer) asst. on Dominion survey party; 1924 (summer), engaged on inventory work, Bell Telephone Co. of Canada; June 1925 to date, mech. and hydraulic design'g., Dominion Engineering Co., Ltd., Montreal.

References: W. P. Wilgar, Alex. Macphail, D. S. Ellis, C. E. Herd, F. M. Wood, H. S. Van Patter.

MINVILLE—GEORGE ED., of 510 Drolet Street, Montreal, Que. Born at Montmagny, Que., Feb. 8th, 1879; Educ., 1903-06, I.C.S. Civil Engrg.; 1906, rodman, N.T.C.Rly.; 1907-14, instr'man., N.T.C.Rly.; 1914, built regional road, St. Casimir, Portneuf Co.; 1915, built regional road, Three Rivers to Les Forges; 1916-18, production engr., General Car and Machinery Works (Munition Plant), Montmagny Que.; 1920, surveyed forest fire for the Wayagamack Pulp & Paper Co., Three Rivers; At present, asst. to Mr. N. J. A. Vermette, in charge of Montreal City cadastre tech. services dept., under Mr. Geo. R. MacLeod.

References: R. L. Fairbanks, G. E. LaMothe, L. H. Lippé, W. Dickson, J. Dumont, C. A. Buchanan.

McQUEEN—NEIL, of 56, Church Street, Toronto, Ont. Born at Petrolia, Ont., Nov. 16th, 1899, Educ., Univ. of Pittsburgh, 1920-24; 1920 (6 mos.) geological work at Fort Norman, and 1921 (6 mos.) same in Western Canada, under direction T. A. Link; 1922 (6 mos.) geological work in Western Canada and 1923 (6 mos.) in Alaska, under direction O.B. Hopkins and A. L. Stewart; 1923 (winter) in Toronto, future production work Peruvian Oil Fields; 1924 (summer) i/c geological work, drilling wells and current development in Western Canada; 1924-25, future production work in Peru; 1925 (summer) geologic mapping and charge geological work in connection with drilling wells and current development in Alberta; all work described above in employ of Imperial Oil Co.; to date, geologist with Imperial Oil Limited, Toronto, Ont.

References: B. L. Thorne, S. J. Davies, J. H. Ross, F. M. Steele, P. J. Jennings.

ROSE—ALEXANDER ANDREW, of Sault Ste Marie, Ont. Born at Ailsa Craig, Ont., Apr. 14th, 1894; Educ., B.A.Sc., Univ. of Toronto, 1923; 1922 (summer) dftsman., with Code and Code, civil engrs., Windsor; June 1923 to date, instructor in mechanical drawing and mathematics, Sault Ste Marie Technical School, Sault Ste Marie, Ont.

References: J. W. B. LeB. Ross, J. H. Jenkinson, F. S. Rutherford, C. H. Speer, W. S. Wilson.

SPENCE—JOHN JAMES, of 63, Stibbard Ave., Toronto, Ont. Born at Toronto, Ont., Oct. 6th, 1885; Educ., Diploma, Univ. of Toronto, 1909; 1909-12, design and charge of substation constrn., and design of generating station at Auburn, Healy Falls, Trenton, Stirling and Desoronto substation, with Smith, Kerry and Chace, Consltg., engrs., Toronto; 1912-23, plant mgr., Woodturning Products, Limited; at present, demonstrator, Faculty of Applied Science, University of Toronto, Toronto, Ont.

References: T. R. Loudon, C. R. Young, J. R. Cockburn, W. J. Smither, P. Gillespie, F. M. Byam.

TEAZE—MOSES HAY, of 31 Clarendon Place, Bloomfield, N.J. Born at Newport, R.I., Jan. 26th, 1889; Educ., B.Sc. Worcester Polytech. Institute, 1917; 1906-12, gen. engr. office and field work before going to college; including dftsman., inspr., asst. to res. engrs., etc., Westinghouse Church Kerr & Co., Stone & Webster, Walter J. Jones, Great Northern Paper Co.; 1917 (June-Dec.), designer, paper mill and hydro-electric development with H. S. Ferguson, consltg. engr.; 1917-19, expert aide — U. S. Navy, Bureau of Yards and Docks, i/c of mech. and elec. equipment install'ns. and gen. navy yard mtce work, Philadelphia Navy Yard; 1919-20, power design specialist, E. I. Dupont de Nemours & Company; March 1920 to date, project engr., with H. S. Ferguson, consltg. engr., New York.

References: H. S. Ferguson, F. O. White, C. E. Fraser, R. E. Chadwick, H. G. Acres, E. H. Hussey, C. A. Waterous, W. S. Lea.

FOR TRANSFER FROM CLASS OF ASSOCIATE MEMBER TO MEMBER

COCHRANE—MORTON FARRER of Ottawa, Ont. Born at Galashields, Scotland, Feb. 25th, 1882; Educ., mech. and elec. engr'g. diploma, Heriot Watt Coll., Edinburgh, 1900; D.L.S., 1908; 1900-03, pupil with Kyle & Frew, Civil Engrs., Glasgow; 1903-05, asst. with Kyle & Frew on water supply and sewage disposal works, including chg. of design and constrn., water supply system for town of Kilsyth; 1905 to date, with Dept. of Interior as follows — 1905, tech. asst., Topographical Surveys Branch; 1905-07, tech. asst., Rly. Lands Branch i/c. map. production; 1907-17, surveyor, International Boundary surveys; 1907-08, i/c. precise levelling parties, Quebec and Maine-New Brunswick Boundary; 1909, Canadian Attache with U.S. party on Montana-Alberta Boundary; 1910-17, field inspn. of boundaries, and compiling photo-topographical map of South-Eastern Alaska; 1917-19, chief dftsman., Dominion Water Power Branch; 1919-25, office engr., Dominion Water Power Branch; administration of Dom. Water Power Act.; supervisn. water rights administratn., under Rly. Belt Water Act.; investigatn. water power and boundary water questions; supervisn. engr'g. work carried out on behalf of Dept. of Indian Affairs, including power development water supply, sewerage and irrigation; at present, hydro-elec. engr., Dominion Water Power and Reclamation Service, Dept. of the Interior, Ottawa, Ont.

References: J. B. Challies, J. D. Craig, J. T. Johnston, S. S. Scovil, G. B. Dodge, K. M. Cameron.

LUMSDEN—JAMES FREEMAN, of Halifax, N.S. Born at Trinity, Nfld., June 8th, 1890; Educ., B.Sc. (E.E.) Nova Scotia Tech. Coll., '11; 1906-11, engr.'g. course Mt. Allison Univ., and N.S. Tech. Coll.; 1911-13, student ap'tice course and asst. engr., Canadian General Elec. Co., and 1913-15, constrn. engr., same company; 1915-16, power house operator, Winnipeg Elec. Rly. Co.; 1916-19, overseas; 1919 (Mar. Oct.) elec'l. instructor, Dept. of Soldiers' Civil Re-establishment; 1919-21, Professor of elec'l. engr'g., N.S. Tech. Coll.; 1921 to date, elec'l. engr., i/c elec'l. dept., Nova Scotia Power Commn., Halifax, N.S.

References: K. H. Smith, W. A. Bucke, C. H. Wright, H. S. Johnston, P. A. Freeman, R. G. Gage, F. R. Faulkner.

MacDIARMID—ARCHIBALD ALEXANDER, of Kenogami, Que. Born at Covey Hill, Que., May 13th, 1885; Educ., B.Sc., McGill Univ., '10; prior to 1910, with various companies on machine shop work, elec. and telephone work, drafting and surveying; 1910-11, engr'g. dept., Mtl. Light, Heat & Power Co.; 1912-14, i/c engr'g. dept., M.L.H. & P. Co.; 1914-16, chief engr., design, constrn. and operation, pulp and paper mills, Bathurst Co., Ltd., Bathurst, N.B.; 1916-17, chief engr., design and constrn., pulp and paper mills, Mattagami Pulp & Paper Co., Smooth Rock Falls, Ont.; 1918, mgr. of manufacturing, Publishers Paper Co., at newsprint mills of Anglo Newfoundland Development Co., Grand Falls, Nfld.; 1919-21, chief engr., Ironside Board Corpn., Norwich, Conn. U.S.A.; 1922 to date, chief engr., Price Bros & Co., Ltd., Kenogami, Que.

References: C. R. McCort, W. G. Mitchell, W. S. Lea, Harry Kay, W. G. MacNaughton.

MORRISON—GEORGE, of Sydney, N.S. Born at Aberdeen, Scotland, Sept. 30th, 1879; Educ., Diploma, City and Guilds of London Tech. Coll., London, Eng., dept. of elec'l. engr'g., 1897; 1897-1902, ap'tice. engr., Wm. McKinnon & Son, mech. engrs., Aberdeen, Scotland; 1902-03, engr. i/c, erection of elec'l. generating and converting machinery and switch gear, Witting Bros., London, Eng.; 1903-05, engr. i/c erection, testing and operation of complete generating and substation plants for lighting street traction and rly. systems, and elec'l. equipm't., rly., and street tramway vehicles, with same firm; 1905-10, supt. erection dept., supervising staff, on erection of large steam turbine generating plants for municipalities, power supply companies, iron and steel works, and mines, with Brown, Boveri & Co., London, Eng.; 1910-12, i/c. contract dept., same firm; 1913-23, special engr., Canadian Crocker-Wheeler Co., (later the English Electric Co. of Canada, Ltd., St. Catharines, Ont.); at present, district mgr., Maritime Provinces, English Electric Co. of Canada, Ltd.

References: H. A. Moore, E. G. Cameron, E. L. Martheleur, Geo. D. Macdougall, A. L. Hay, S. C. Mifflin, J. S. Whyte.

WYNN—GUY MONTAGUE, of Montreal, Que. Born at Niagara Falls, Ont., Nov. 5th, 1876. Educ., Matric., Toronto Univ., and private study; 1897, entered employ of C. H. Mitchell, M.E.I.C.; 1897-02, on surveys and drafting in connection with hydraulic work; 1902 (Mar-July) engr. i/c of surveys, Ont. Power Co., Niagara Falls; 1902-04, field engr. and asst. supt. of constrn., Aluminum Co. of America at Massena, N.Y., under Wm. I. Bishop, M.E.I.C.; 1904-05, gen'l. engr'g. work with T. Pringle & Son, Montreal; 1905 (Mar-Aug.) supt. of constrn., John Quinlan & Co., Montreal; 1905-08, in responsible charge surveys and reports on hydro-elec. projects, and design and constrn. numerous water power and industrial plants; 1908-09, (Sept.-Jan.) supt. constrn., Rexford Bishop, Ltd., Montreal; Jan. 1909 to date, responsible charge design and constrn., large number steel and concrete industrial structures, paper mills, warehouses, cotton mills, etc., also dams and hydro-elec. developments; at present 2nd Vice-Pres., and Director of T. Pringle & Son, Ltd., Industrial Engineers, Montreal, Que.

References: J. S. Costigan, F. B. Brown, R. E. Chadwick, W. I. Bishop, J. T. Farmer, A. F. Byers.

FOR TRANSFER FROM CLASS OF JUNIOR TO HIGHER GRADE

ARDAGH—SYDNEY VERNON, of Empalme, Sonora, Mexico. Born at Metla Katla, B.C., July 14th, 1891; Educ., 1st class honours with distinctions, Science and Maths., Senior Cambridge Local Exam., 1907; 1908-11, articled pupil, Midland Electric Light & Power Co.; 1911-14, chainman, rodman and instr'man, Grand Trunk Pac. Rly.; 1914-15, instr'man., Pacific Great Eastern Rly.; 1915-19, overseas, Can. Engrs.; 1920-23, instr'man. and inspr., various betterment work, C.N.Rlys., Smithers Division; 1924, dftsman, computer and chief of party, various subdivn. engrs., Los Angeles, Calif., also asst. to city engr., Arcadia, Calif.; 1924-25, consult'g. engr., Los Angeles, retained by General Petroleum Corpn., on track layouts, by W. E. Elliot & Co., of Hollywood, on subdivn. etc.; at present, asst. engr., under C.E. Cate, asst. chief engr., S.P.R.R.Co. of Mexico, Empalme, Sonora, Mexico.

References: H. A. Dixon, J. A. Heaman, W. S. Fetherstonhaugh, W. H. Tobey, M. A. Burbank, F. R. Purvis.

NEWLAND—SAMUEL GEORGE, of 1153 Pellissier Street, Windsor, Ont. Born at Toronto, Ont., Nov. 30th, 1890; Educ., 1st year University, general course; 1909-11, rodman, instr'man., C.N.R.; 1911-13, res. engr. on constrn., C.N.R.; 1914-16, asst. engr., Eugenia Falls development and Queenston-Chippewa Development; 1916-17, asst. engr., paper mill constrn., Messrs. Morrow & Beatty; 1917 (May-Oct.), hydrographic work, H.E.P.C.; 1917-18, asst. engr., Can. Steel Corpn., Ojibway, Ont.; 1918-20, engr. for Great Lakes Dredging Co., Ojibway, Ont.; 1920-22, engr. in charge power development, Smoky Falls, M.E.A.D. Co., Dayton & S.R.P. & P. Mills, Sault Ste Marie, Ont.; 1922-23, preparation of plans, Ford Motor Co., New docks and design and detail, Fargo Engrg. Co., Jackson, Mich.; April 1923 to date, engr. for Considine-Reid Limited, Windsor, Ont.

References: J. J. Newman, J. C. Keith, F. P. Flett, J. E. Porter, A. J. M. Bowman.

ROY—EUGENE, of Outremont, Que. Born at St. Michel, Que., June 3rd, 1893; Educ., B.Sc., C.E., Ecole Polytechnique, Montreal; 1920; B.A., Séminaire de Québec, 1915; M.C.P.E. of Quebec, 1922; 1917-18-19 (summers), chainman, levelman, hydrographic work, Quebec Streams Commn.; 1920 (summer) hydrographic work, Chicoutimi Pulp & Paper Co.; 1920-24, junior engr., hydraulic service, Dept. of Lands & Forests, Que.; at present, asst. city engr., City of Outremont, Que.

References: E. Lacroix, O. O. Lefebvre, A. B. Normandin, J. P. P. Joncas, H. Cimon, A. Amos, H. B. Pelletier, A. R. Décary.

WEATHERHEAD—ALBERT VICTOR, of 159 Broad Street, St. John, N.B. Born at Leicester, England, July 3rd, 1894; Educ., 4 years, Toronto Technical College; 3 years, dftsman., including survey and instrument work, for C. E. Good & Co., Civil Engrs., Toronto; 1914-15, survey dftsman., Can. Govt. Rlys. Surveys, under H. S. Clarke, Toronto, Ont.; 1916-18, overseas, Can. Engrs.; 1919-20, engr. i/c of constrn. of concrete bridges and structures in Cumberland County for N.S. Prov. Highway Board; 1920-22, private practice in Amherst, N.S.; 1922-24, constrn. engr. for Messrs. Parsons-Ed. & Co. Ltd., engrs. and contractors, Moncton, N.B.; At present private practice, arch'ture, and struct'l. engrg., specializing in reinforced concrete constrn. and design, St. John, N. B.

References: J. F. Wightman, H. F. Donkin, W. L. Ball, D. W. Robb.

FOR TRANSFER FROM CLASS OF STUDENT TO HIGHER GRADE

ASKIN—ROBERT JAMES, of 408 N. Harold Street, Fort William, Ont. Born at Arcola, Sask., June 29th, 1898; Educ., B.Sc. (Mech.), Queen's Univ. 1923; 1914-19, engrg. dfting., designing, machine shop and foreman erector, Canadian Car & Foundry Co.; 1922 (June-Sept.), field engr., paper mill constrn., Fort William Paper Co.; 1923 (May-Aug.), engrg. estimates and design, Dominion Engineering Works, Lachine; Sept. 1923 to date, engr. in charge of mill efficiency, boiler house tests, quality of products, mill tests, and operating engrg. problems, Fort William Paper Co., Fort William, Ont.

References: D. G. Calvert, M. W. Turner, F. Y. Harcourt, H. M. Lewis, L. T. Rutledge, W. T. Moodie, C. B. Symes.

BISSELL—HAROLD RUDOLPH, of Bisbee, Arizona, U.S.A. Born at Trenton, Ont., Aug. 11th, 1896; Educ., B.Sc., '22, MSc., '23, McGill Univ.; 1917 (May-Aug.) cyanide milling, McIntyre Gold Mines; 1919 (Jan.-Aug.), mining, McIntyre Gold Mines and Hollinger Cons. Gold Mines; 1920 (June-Oct.) i/c topogr. survey party, City of Toronto; 1921 (July-Sept.), mining, Dominion Coal Co., N.S., and Aug.-Oct., transitman, Toronto Transportation Commn.; 1922 (June-Nov.), i/c prospect'g., and exploration party for developm't. dept., C.P.R., in North Western Quebec, prospecting for minerals; 1923-24, asst. supt., mining and milling copper ore, Eustis Mining Co., Eustis, Que.; 1924-25, gen'l. engr'g. asst., geological dept.; May 1925 to date, divisn'l. engr., Copper Queen Branch, Phelps Dodge Corporation, Arizona, U.S.A.

References: J. B. Porter, G. G. Ommanney, C. M. McKergow, A. J. Kelly, H. W. Tate.

BUCKMANN—KARL EMIL, of 101, Caroline Ave., Toronto, Ont. Born at Vesterburg, Denmark, Oct. 5th, 1896; Educ., B.A.Sc., Univ. of Toronto, 1925; 1913-25 (summers) millwright work and band saw filing in planing mills and sawmills in Eastern Quebec and New Brunswick; May 1925 to date, with Kent McClain, Ltd., Toronto Show Case Co., Toronto, Ont.

References: R. W. Angus, C. H. Mitchell, C. R. Young, T. R. Loudon, C. B. Ferris, H. W. McKiel.

CAMPBELL—AMOS JOHN GLADSON, of 306 Jarvis Street, Toronto, Ont. Born at Rochester, N.Y., Nov. 22nd, 1899; Educ., B.Sc. (Honours), Queen's Univ. 1924; 1923-24, asst. engr. on waterworks, sewers, pavements and sidewalks, also bridge constrn.; At present sales engr. for the Riley Engineering & Supply Co. Ltd., Toronto, Ont.

References: L. M. Arkley, L. T. Rutledge, E. M. Proctor, E. A. James.

CHISHOLM—ALEXANDER HAROLD, of Grand Mere, Que. Born at Blue Mountain, N.S., May 7th, 1896; Educ., B.Sc. McGill Univ. 1920; 1914-15 (summers), dfting. and shop work, Eastern Car Co.; 1916-18, overseas; 1918-19, instructor, N.S. Tech. Coll.; 1919 (May-Sept.), field engr. on concrete highway constrn.; 1920 (May-Oct.), dftsman., Eastern Car Co.; Sessions, 1920-21, 1921-22, demonstrator, McGill Univ.; 1921 (May-Oct.), jr. engr., McDougall Pease & Friedman, Montreal; 1922-23, on design, constrn. and operation of steam power plant, for St. Lawrence Paper Mills, Three Rivers; 1923-24, dftsman., and from April 1924 to date, chief dftsman., Laurentide Company, Grand Mere, Que.

References: H. O. Keay, A. R. Roberts, G. K. McDougall, F. O. White, R. L. Weldon, C. M. McKergow.

CLIMO—CECIL, of 1969 Culp Street, Niagara Falls, Ont. Born at Cobourg, Ont. Sept. 22nd, 1898; Educ., B.Sc., Queen's Univ. 1923; 1921 (summer), instr'man., Queenston-Chippewa power canal; 1922 (summer), concrete inspr. on road paving, Cobourg; May 1923 to date, asst. constrn. engr., Carborundum Co., Niagara Falls, N. Y.

References: L. M. Arkley, L. T. Rutledge, D. M. Jemmett, W. S. Orr, D. S. Ellis, A. Macphail, A. Jackson.

DIONNE—JOSEPH ALEXANDRE, of Montreal, Que. Born at Montreal, July 26th, 1896. Educ., B.Sc., McGill Univ., 1918; 1916 to date with Bell Telephone Co., as follows:—1916-17, construction gangs; 1918-21, general plant office; 1921-22, transmission engr's. office; 1922-24, outside plant engr's. office; 1924 to date, engr. of construction methods, Bell Telephone Co. of Canada, Montreal, Que.

References: J. L. Clarke, A. M. Mackenzie, W. C. Adams, G. M. Hudson, C. V. Christie, L. A. Herdt.

DUBUC—ANTONIO E., of 326a St. Zotique St., Montreal. Born at Nicolet, P. Q., Aug. 12th, 1896; Educ., Montreal Tech. School, 1917; I.C.S. course; 1910-12, ap'tice. machinist, Ames Holden & United Shoe Machinery; 1913-14, asst. foreman, gen'l. constrn. work, Special Construction Co.; 1915-17, dftsman., Canadian Car & Foundry Co.; 1918, designer, Caron Bros., and gen. mgr., Garage Dubuc; 1919-20, designer, Eugene F. Phillips Elec. Works; 1921-22, designer, constrn. inspr., level and transitman, Montreal Water Board; 1923-24, designer, Dominion Engineering Works, Lachine, Que.; at present, dftsman., inspr., levelman, Electrical Commission of the City of Montreal.

References: C. J. Desbaillets, G. E. Templeman, J. F. Brett, Charles E. Herd, W. A. B. Hicks, J. A. Jetté, J. A. Lacouture.

HOLDCROFT—WILLIAM P. R., of 1 Mack Street, Kingston, Ont. Born at Merrickville, Ont., Jan. 4th, 1897; Educ., B. A. 1921, B.Sc. 1923, Queen's Univ.; 1914-16, overseas, Can. Engrs., 1916-19, officer, Royal Engrs.; 1920 (summer), instr'man., C.N.R. rly. constrn.; 1921 (summer), inspr. of concrete, Prov. Highways, Ontario; 1922-23 (summers), contracting, Ont. Prov. Highways, concrete structures; 1924, contracting as above, also for York Township, concrete structures. Constructed breakwater for Dominion Govt. at Collingwood; 1925, contracting, concrete bridges for Ont. Prov. Highways and town of Smiths Falls, sewers for township of York. At present president and gen. mgr., Holdcroft Construction Co. Ltd., Kingston, Ont.

References: W. P. Wilgar, A. Macphail, D. S. Ellis, W. L. Malcolm, L. T. Rutledge.

HOLMES—GEORGE RAYMOND, of Hamilton, Bermuda. Born at Halifax, N.S. August 11th, 1896; Educ., Engrg. Course, Dalhousie Univ. 1913-16. B.Sc. (Mech.), N.S. Tech. Coll. 1921; 1916 (summer), rodman., plant constrn., N.S. Tramways & Power Co.; 1916-19, overseas; 1919 (summer), foreman, gang of stevedores, Hamilton, Bermuda; 1920 (summer), asst. to R. P. Donkin, Halifax, on design and constrn. of patent fish machinery for National Fish Co., Halifax; 1921-23, dftsman., Eagar Coombs, Ltd., Halifax; Sessions, 1921-22, and 1922-23, instructor in mech'l. drawing and machine design, N.S. Tech. Schools, evening classes; 1923-24, design'r and dftsman., and last year, as asst. to chief engr., Dominion Coal Co. Ltd., Glace Bay, N.S.; Oct. 1924, to date, foreman stevedore, Holmes Stevedoring Co., Hamilton, Bermuda, and at present, junior partner of firm.

References: J. S. Whyte, H. C. Chipman, F. R. Faulkner, A. Dawes, W. J. Ripley, J. P. Freeman.

JONES—VERNON C., of 260, Prince Arthur Street, Montreal, Que. Born at Hope, N.D., Apr. 19th, 1894. Educ., B.Sc., Queen's Univ., '23; one summer, telephone lineman; 1915-19, overseas, C.F.A.; 1919 (summer) with Niagara Plant of H.E.P.C. of Ont.; 1920, drafting elec. machinery, and 1921, (summer) erecting elec. generators, Canadian Westinghouse Co.; 1922, (summer) building electro-nickel system for Internat. Nickel Co.; 1923-24, asst. field engr.; Feb. 1924 to date, supervising engr., Bell Telephone Co. of Canada, Montreal, Que.

References: A. M. Mackenzie, W. C. Adams, F. M. Wood, F. H. Farmer, L. T. Rutledge, W. F. McLaren.

LANGLOIS—WILLIAM LAWRENCE, of 542, Dovercourt Rd., Toronto, Ont. Born at Toronto, Ont., Dec. 14th, 1900; Educ., B.Sc., Univ. of Toronto, '23; 1921 (summer), rodman, H.E.P.C. on Chippawa Canal; 1922 (summer) levelman, Dept. Colonization Roads, Prov. of Ont., and junr. res. engr., road constrn. in Frontenac County, same dept.; 1923, with Archt. in China, on reinf. concrete design, foundation and general bldgs. for American Church Mission; 1924-25, i/c., sidewalk constrn., and installn. of water mains, reinf. concrete culvert design and sewer work, etc., Etchicoke Township; at present estimating, drafting and junr. design work on hydro-elec. power developments with H. G. Acres, M.E.I.C., Niagara Falls, Ont.

References: P. Gillespie, R. L. Hearn, H. P. Heywood, H. G. Acres, C. R. Young, N. MacNicol, A. H. Harkness.

LAURENDEAU—CAMILLE THOMAS JOSEPH, of 2160, Waverley Street, Montreal, Que. Born at Ste. Anne de Bellevue, Que., Mar. 31st, 1896. Educ., C.E., B.A.Sc., Univ. of Montreal, 1918; 1918-19, chemist Canadian Explosives Co., Montreal; 1919 (Jan.-Aug.), salesman, General Supply Co. of Canada; 1919-21, engr. in state highway work with Quinlan Robertson, Inc., in Pennsylvania, U.S.A.; 1921-22, commer. studies at Eastman Gaines School, Poughkeepsie, N.Y.; 1922 (1 month) salesman in Montreal with Mackinnon Steel Co., Sherbrooke, Que.; May 1922 to date, valuator and supervisor of tech. dept., Title Guarantee & Trust Corpn. of Canada, Montreal, Que.

References: G. D. Mackinnon, A. Frigon, J. Barcelo.

McLELLAND—WILLIAM JAMES, of 99, East Ave., S., Hamilton, Ont. Born at Hamilton, Ont., May 25th, 1896. Educ., B.A.Sc., Univ. of Toronto, '23; 1911-14, dftsman. and instr'man., J. J. Mackay & Co., Hamilton; 1916-17, dftsman., gauge design dept., Ministry of Munitions, Ottawa; 1917-19, overseas, Lieut. R.A.F.; 1919-23 (summers), erection engr., supervising installn. Zeolite water softening and filtration plants, and 1923 to date, i/c engr'g. dept., design'g. gen'l. water purification equipm't., particularly Zeolite water softeners for domestic and commercial installns., also filtration and aeration equipm't., W. J. Westaway Co., Ltd., Hamilton, Ont.

References: P. Gillespie, C. R. Young, J. J. Mackay, R. J. Durley, F. A. Dallyn, P. M. Smith.

MOORE—REGINALD ARTHUR, of 1065, Cote des Neiges Rd., Montreal, Que. Born at South Moulton, Eng., Feb. 23, 1897; Educ., B.Sc., McGill Univ., '23; 1923 (June-Aug.) shops English Electric Co.; 1923-24, drft'ng. room substation design and layout, Toronto H. E. System; Mar. 1924 to date, asst. in power house and substation design and layout, acceptance tests, valuations etc., Herdt & Burr, Consulting Engrs.; Sept. 1925 to date, demonstrator, dept. elec'l. engr'g., McGill University, Montreal, Que.

References: E. G. Burr, C. V. Christie, E. Brown, C. M. McKergow, L. H. Marrotte.

MOTT—HAROLD EDGAR, of 614, Wilson Ave. Montreal, Que. Born at Winnipeg, Man., Dec. 4th, 1897; Educ., B.Sc. (E.E.) McGill Univ., '22; 1922, May-Sept., test engr., Canadian Marconi Co.; 1922-23, engr. i/c., test room, Canadian Marconi Co.; 1923, May-Oct., supt. of works, sole chg. of factory, and 1923 to date, works engr., i/c test depts., drafting office and factory designs, Canadian Marconi Co., Montreal.

References: J. H. Thompson, L. A. Herdt, C. V. Christie, Ernest Brown, R. K. Robertson.

PARKER—JOHN BRUCE, of 2066, Retallack Str., Regina, Sask. Born at St. Paul, Minnesota, Jan. 3rd, 1898. Educ., B.Sc., McGill Univ., 1925; 1916-19, overseas, 28th, Can. Inf. Battn.; 1919 to date, with Saskatchewan Government Telephones — 1919-20, first class automatic telephone switchman; 1920-21, asst. to toll supervisor; 1922 (summer) chief inspr.; Sept. 1923, installn. of P. A. X. Weyburn Hospital; 1924 (summer) app'tice, lineman and district helper; 1925 (June-Oct.) relief wire chief; July 1925, installn. 5 composite telegraph groups throughout Saskatchewan; at present, asst. to head of engr'g. dept., Saskatchewan Govt. Telephones, Regina, Sask.

References: H. M. MacKay, C. V. Christie, C. M. McKergow, E. Brown, W. R. Warren, H. B. Sherman, S. R. Parker.

REYNOLDS—WILLIAM MELVILLE, of Kenora, Ont. Born at Aurora, Ont., July 25th, 1898; Educ., B.Sc., Queens Univ., '23; 1918-19 (summers) Hydro-Elec. Power Commn.; 1920 (summer) instr'man, Toronto Harbour Commnrs.; 1920-21, asst. city engr , Stratford; 1922 (summer) res. engr., for F. N. Rutherford on Grimsby water works; 1923-24, checker and foreman, Morrow & Beatty, Quinze River Power Development; at present field engr., on power house constrn., Backus-Brooks Co., Kenora, Ont.

References: N. D. Wilson, A. B. Manson, F. N. Rutherford, J. A. Beatty, W. P. Wilgar, Alex. Macphail.

SCHURMANN—HULBERT HARTT, of Thetford Mines, Que. Born at Summerside, P.E.I., April 11th, 1900. Educ., B.Sc. (E.E.) Nova Scotia Tech. Coll., 1924, 1924-25, (June-Apr.) electrician, maintenance and repair at power house Shawinigan Falls, for Shawinigan Water & Power Co.; April 1925 to date, meter engr., St. Francis Water Power Co., Thetford Mines, Que.

References: F. S. Keith, W. F. McKnight, H. R. Lynn, R. H. Mather, F. R. Faulkner, I. P. MacNab,

SMITH—SANFORD ARNOLD, of Hartford, Conn., U.S.A. Born at East Village, Colchester Co., N.S., Oct. 8th, 1897; Educ., B.A., Dalhousie Univ., '22, B.Sc. (M.E.) Nova Scotia Tech. Coll., '23; 1916-19 overseas; 1922 (summer) local survey work; 1923 (June-Sept.) assembly and testing dept., Whitlock Coil Pipe Co., Hartford, Conn.; 1923-24, running performance tests on heat exchange apparatus in laboratory same company; 1924 to date, asst. to chief engr., Whitlock Coil Pipe Co., Hartford, Conn.

References: F. R. Faulkner, H. F. Donkin, W. P. Copp, W. F. McKnight, K. L. Dawson.

SOMERVILLE—ARCHIBALD LAURENCE HAROLD, of 605, Metropolitan Bldg., Vancouver, B.C., Born at Winnipeg, Man., Aug. 30th, 1898; Educ., B.A.Sc., Univ. of B.C., '23; 1918, fireman in gold mine in Cariboo District; 1919, timekeeper and asst. mgr., sawmill in Fraser Valley, B.C.; 1920-21, logging engr., Vancouver Island, Courtenay; 1922, steel rigger, S.E. Junkins Co., Ltd , on Connaught Tunnel at Glacier, B.C.; 1923, 6 mos. installation with Western Union Telegraph; 18 mos. to date, dftsman., reinforced concrete, Sydney E. Junkins Co., Ltd., Vancouver, B.C.

References: E. G. Matheson, W. H. Powell, J. R. Grant, J. B. Riddall, A. Lighthall, W. E. Jenkins, G. A. Walkem, C. C. Ryan.

VILLENEUVE—JOSEPH ARTHUR, of 565, Berri Street, Montreal. Born at Montreal, December 20th, 1894; Educ., B.A.Sc., and C.E., Laval Univ., '17; 1917, surveying in Cap de la Madeleine for proposed water works; 1917 to date, Prof. i/c elec. laboratories at l'Ecole Polytechnique, Montreal, Que.; (1922, summer, surveying for Quebec Streams Comm.; since March 1925, designer of elec. part of plans for Gatineau River Power Co's. hydro-elec. power plant at Maniwaki, Que., work done in connection with Ernest Loignon's office, hydraulic engr.)

References: O. O. Lefebvre, A. Frigon, A. Boyer, A. Surveyer, F. C. Laberge.

WAIT—ERIC HOLLOWAY, of Ottawa, Ont. Born at Montreal, Que. Feb. 23rd, 1894; B.Sc. (Met.), McGill Univ. 1922; 1920 (3 mos.), Ford Motor Co., Dearborn, Mich.; 1922 (6 mos.), chemical lab., Can. Steel Foundries, Montreal; 1923 (3 mos), dfting office, Dominion Bridge Co., Montreal; 1923 to date, engr., Divn. of Mineral Resources, Mines Branch, Dept. of Mines, Ottawa.

References: F. B. Brown, A. Stansfield, J. McLeish, A. W. G. Wilson, L. H. Cole.

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ABRASIVES

Garnet. Recent Developments in the Production and Consumption of Abrasive Garnet, W. M. Meyers and C. O. Anderson. Pit and Quarry, vol. 10, no. 8, July 15, 1925, pp. 69-76. Chemical and physical properties, occurrence, utilization; notes on the different deposits; production; manufacture of garnet abrasives, and their utilization; future development of garnet industry.

AIR COMPRESSORS

Clearance, Effect of. Effect of Clearance on Air-Compressor Operation. Power, vol. 62, no. 16, Oct. 20, 1925, pp. 598-599, 4 figs. Charts enable one to find volumetric efficiency and mean effective pressure of compressor without computation; by adjusting clearance, load may be changed at will.

Turbo. Rotary Machinery for Handling Air and Gas, F. Johnstone Taylor. Colliery Guardian, vol. 130, no. 3377, Sept. 18, 1925, pp. 675-677, 8 figs. Deals with machines for high pressures, including turbo compressors, and centrifugal blowers and displacements machines.

AIRCRAFT CONSTRUCTION MATERIALS

Dopes. Aviation Dopes or Varnishes, M. Deschines. Chem. and Industry, vol. 44, no. 37, Sept. 11, 1925, pp. 902-907. Modern dopes and their constitution; cellulose acetate; solvents and diluents; manufacturing methods; doping; characters of doped fabrics.

AIRPLANE ENGINES

Generator Problems. Generator Problems Due to Crankshaft Vibration, J. W. Allen. Mech. Eng., vol. 47, no. 10, Oct. 1925, pp. 793-794, 2 figs. It is considered desirable to have generator built that will withstand 500 hours on Liberty 12 engine; problem is complicated due to fact that weight has to be minimum; design of protective coupling.

Sleeve-Valve. Sleeve Valve Aircraft Engine Passes French Endurance Test, W. F. Bradley. Automotive Industries, vol. 53, no. 15, Oct. 8, 1925, pp. 632-633, 1 fig. 450-hp. engine built by Panhard-Levassor Co. is first of Knight type to prove successful in public competition; it is 12-cylinder V at 60 deg.; carburetors on outside.

Starters. The Aeromarine Starter. Aviation, vol. 19, no. 13, Sept. 28, 1925, pp. 391-392, 1 fig. Device stores energy in flywheel which in turn is applied to crankshaft.

AIRPLANES

Air-Resistance Brake. Magni Air Resistance Brake. Aviation, vol. 19, no. 15, Oct. 12, 1925, p. 494, 2 figs. Further attempts at reducing landing run of airplanes; new Italian sport plane constructed by Laboratoire Costruzioni Aeronautiche Piero Magni of Milan, used for testing out air-brake device.

Anti-Stall Gear. The Savage-Bramson Anti-Stall Gear. Flight, vol. 17, no. 33, Aug. 13, 1925, pp. 526-527, 3 figs. Particulars of new device with great possibilities; mechanism consists essentially of a cylinder and piston with rigid connecting rod attached to joy-stick, and a double-acting pneumatic relay mechanism, in principle similar to that employed in organs, etc., while a small release valve, operated by a vane, completes equipment. See also Aeroplane, vol. 29, nos. 8 and 9, Aug. 19 and 26, 1925, pp. 234 and 268, 1 fig.; and Aviation, vol. 19, no. 15, Oct. 12, 1925, pp. 495-496, 2 figs.

Engine Installations. Power Installations on Aircraft, A. H. Tiltman. Automobile Engr., vol. 15, no. 206, Sept. 1925, pp. 286-291, 8 figs. Deals in detail with types and arrangements of engine installations; single- vs. multi-engine machines; single-engine airplanes and seaplanes; single-engine flying boat; twin-engine airplanes and flying boats; 3- and 4-engine machines; other types.

Light. Notes on the Flying Qualities of the Light Aeroplane Compared with Larger Types, R. A. De H. Haig. Roy. Aeronautical Soc.—Jl., vol. 29, no. 177, Sept. 1925, pp. 459-464. Deals with starting, take-off, control, landing, forced landings, and uses of light airplanes.

Propelling Apparatus for. Propulseur Trompe for Aeroplanes. Engineer, vol. 140, no. 3638, Sept. 18, 1925, p. 301, 1 fig. Improved device, developed by H. F. Mélot, consists of horizontal cylinder, inside which there are two walls forming chamber; in each wall is sparking plug for starting engine with gas injected under pressure; arrangement constitutes simple type of 2-cycle engine working with high compression; by this system it is possible to suppress engine and propeller and to replace gasoline by crude oil.

Static Tests. Static Tests and Calculation of Resistance of Airplanes (Les essais statiques et les calculs de résistance des avions), J. Sabatier. Aéronautique, vol. 7, no. 76, Sept. 1925, pp. 335-339. Discusses French static tests and formulas for determining useful load, as result of new investigation; coefficient of security; acceleration in flight.

AIRSHIPS

Full-Scale Experiments. The Rigid Airship in Relation to Full-Scale Experiment, R. A. Frazer. Roy. Aeronautical Soc.—Jl., vol. 29, no. 177, Sept. 1925, pp. 404-458, 38 figs. Scope of comprehensive full-scale experimental program. Synopsis of experimental methods and results; measurements of normal pressure; turning and steering trials; measurements of resistance and air speed; measurements of normal force and pitching moment; experimental conditions and organization; conjectures as to future. Bibliography.

ALLOY STEELS

Metallurgy of. Principles of Metallurgy of Ferrous Metals for Mechanical Engineers, L. Cammen. Mech. Eng., vol. 47, no. 10, Oct. 1925, pp. 832-836, 1 fig. Deals with alloy steels, including nickel, vanadium, manganese, chromium, chrome-nickel, molybdenum, uranium, boron, cerium and high-speed tool steel. Bibliography.

ALLOYS

Aluminum. *See Aluminum Alloys.*
Aluminum Bronze. *See Aluminum Bronze.*
Magnesium. *See Magnesium Alloys.*

ALUMINUM

Soldering. Soldering Aluminum Castings. Foundry Trade Jl., vol. 32, no. 472, Sept. 3, 1925, p. 207, 2 figs. Solder developed by W. V. Neal for repair of every description of aluminum, which eliminates whole of troubles incidental to welding process and places repair within scope of village plumber.

Welding. "Job Welding of Aluminum," D. H. Miller. Am. Welding Soc.—Jl., vol. 4, no. 7, July 1925, pp. 31-34. Problems in connection with welding of the different breaks that occur in aluminum; discusses puddling and flux systems.

ALUMINUM ALLOYS

Aluminum-Chromium. Properties and Structure of Some Alloys of Aluminum-Chromium, F. T. Sisco and M. R. Whitmore. Indus. & Eng. Chem., vol. 17, no. 9, Sept. 1925, pp. 956-958, 5 figs. Chromium can be alloyed with aluminum with comparative case; solidification point of alloy increases rapidly as proportion of chromium increases from 1 to 5 per cent; chromium increases shrinkage of aluminum to marked extent; it would be difficult to pour sound castings of thin and intricate sections with these alloys; apparently, chromium cannot be used as substitute for copper in casting of aluminum with high strength.

Castings. A Method of Improving the Properties of Aluminum Alloy Castings, S. L. Archbutt. Aeronautical Research Committee—Reports and Memoranda, no. 959, Dec. 1924, 10 pp., 5 figs. and 1 table on supp. plates.

Developments and Applications. Recent Developments in Light Aluminum Alloys and Their Application, R. J. Anderson. Am. Metal Market—Monthly Rev. Section, vol. 32, no. 183, Sept. 19, 1925, pp. 10, 12 and 47-48.

Properties. The Properties of Some Aluminum Alloys, H. Hyman. Inst. Metals—advance paper, no. 12, for mtg. Sept. 1-4, 1925, 21 pp., 8 figs. Aluminum alloy was prepared containing copper, nickel, iron, and magnesium, which can be adopted for general use in foundry for manufacture of castings for engineering purposes; fatigue tests show metal to be very reliable under alternating conditions of stress; corrosion tests extending over period of 6 months show that it can be readily used for castings exposed to air or sea-spray conditions without serious deterioration; by increasing magnesium to 0.5 per cent, alloy readily responding to heat treatment was obtained; higher temperatures than those usually employed for aluminum alloys can be used for this alloy; period of heating can also be materially reduced. See also Metal Industry (Lond.), vol. 27, nos. 10 and 11, Sept. 4 and 11, 1925, pp. 213-215 and 238-241, 3 figs.

ALUMINUM BRONZE

Titanium. Titanium Aluminum Bronze. Foundry Trade Jl., vol. 32, no. 473, Sept. 10, 1925, p. 228. New alloy developed for parts requiring resistance to corrosion, or where non-magnetic properties are desired.

AMMONIA

Pressure-Total Heat Diagrams. Pressure-Total Heat Diagrams for Ammonia, G. A. Robertson. Power Plant Eng., vol. 29, no. 17, Sept. 1, 1925, pp. 910-913, 4 figs. Analysis of ammonia-compressor operation made by use of ammonia tables, indicator cards and simple data from gages and thermometers.

AMMONIA COMPRESSORS

Features of. Ammonia Compressors and Compression Systems. South. Engr., vol. 44, no. 1, Sept. 1925, pp. 42-61, 42 figs. Features of ammonia compressors and information regarding handling compression systems.

Trouble-Diagnosing. Diagnosing Ammonia Compressor Troubles, T. M. Gunn. Refrigeration, vol. 37, no. 2, Aug. 1925, pp. 40-42, 1 fig. Discussion of use of thermometers to detect compressor defects; proper suction and discharge conditions; chart showing correct discharge temperature for any suction pressure.

AMMONIA CONDENSERS

Operation. Operation of Ammonia Condensers, H. J. Halterman. Refrig. Wld., vol. 60, no. 9, Sept. 1925, pp. 21-23. Classification of condensers; care and operation; cooling ponds; non-condensable gases.

APPRENTICES, TRAINING OF

Boiler Inspectors. Training Boiler Inspectors and Foremen. Boiler Maker, vol. 24, no. 9, Sept. 1925, pp. 259-261, 1 fig. Committee report presented at annual conventiou of Master Boiler Makers Assn. Includes report on safe slope of crown sheet and reliable water registering device.

Foundry. Practical Training for Foundry Work, C. M. Morrin. Iron Age, vol. 116, no. 17, Oct. 22, 1925, pp. 1103-1105, 3 figs. How Brown & Sharpe make skilled molders in 3 years; examining candidates; system of payment.

Training Foundry Apprentices, L. A. Hartley. Iron Trade Rev., vol. 77, no. 14, Oct. 1, 1925, pp. 818-819. Discusses important points in methods for obtaining skilled workers; majority of employees given special instruction remain with companies who aided them. (Abstract.) Summary of Apprenticeship Practices in Foundries, published by Nat. Founders Assn.

ASH HANDLING

Methods and Equipment. Ash Disposal Methods Demand Attention. Power Plant Eng., vol. 29, no. 17, Sept. 1, 1925, pp. 884-888, 14 figs. Discussion of several types of modern ash-handling equipment, designed to improve operation and lower power costs.

ASPHALT

Asphalt. Its Technical and Commercial Aspect. Oil Eng. and Finance, vol. 6, no. 111, July 1925, pp. 335 and 337-340. Sources of supplies, distribution and utilization, and industrial and commercial applications.

AUTOMOBILE ENGINES

Reconditioning. Engine Reconditioning—Refinishing of Cylinders and Aligning of Shafts, Rob. C. McWane. Soc. Automotive Engrs.—Jl., vol. 17, no. 4, Oct. 1925, pp. 334-338. Cleaning and examination of parts; checking crankshaft and crankcase; methods of sizing and finishing cylinders; heavy cylinder-grinding machine corrects block warpage; cylinder grinding limits and piston clearances; alignment most important in fitting bearings; operation of inserting bearing halves; perfect alignment is secret of success.

AUTOMOBILE FUELS

Gasoline Substitutes. What Chemists Are Working On for Future Fuels, D. H. Killeffer. Automotive Mfr., vol. 67, no. 4, July 1925, pp. 23-25. How science is working to produce satisfactory substitute fuels for our gasoline, which will soon be exhausted; benefits of alcohol and others.

Values. Value of Liquid Fuels in Internal-Combustion Engines (Au sujet de l'utilisation des combustibles liquides), P. Dumanois. Académie des Sciences—Comptes Rendus, vol. 181, no. 1, July 6, 1925, pp. 26-28. Fuel consumption of automobile engine over long distances averaged 22 liters per 100 km. with methyl alcohol, 11.6 liters with mixture of 50 per cent of gasoline and 50 per cent of ethyl alcohol, 12.7 liters with mixture of 80 per cent gasoline and 20 per cent kerosene containing 2 per cent lead tetraethyl, and 11.7 liters with mixture of 70 per cent gasoline and 30 per cent kerosene as above; although consumption of methyl alcohol is twice that of gasoline, equivalent calorific power is less; addition of 5 per cent of water to methyl alcohol prevents back firing, which frequently occurs, without detonation, however, with pure alcohol.

AUTOMOBILE MANUFACTURING PLANTS

Drying Ovens. Heat Conservation a Prime Requisite in Drying Oven Design, P. M. Heldt. Automotive Industries, vol. 53, no. 13, Sept. 24, 1925, pp. 517-523, 12 figs. Labor-saving factor also should be considered as well as use of panel or unit construction to facilitate moving if necessitated by plant changes; kiln, intermittent and continuous conveyor types.

Engineering Department. A Modern Engineering Department, J. Younger, Am. Mach., vol. 63, no. 16, Oct. 15, 1925, pp. 615-617, 3 figs. Description of engineering building and equipment of White Motor Co.; use of machine tools; equipment for testing chassis parts; type of building for research.

Painting Equipment. Automatic Equipment Paints Ten Ford Frames a Minute. Automotive Mfr., vol. 67, no. 4, July 1925, pp. 19-20. Describes improved continuous arrangement which cleans, paints, dries, and delivers finished units to freight-car door at this rapid rate.

AUTOMOBILES

Front Axles. Production of Automobile Front Axles, R. L. Rolf. Forging—Stamping—Heat Treating, vol. 11, no. 9, Sept. 1925, pp. 293-300, 31 figs. Discusses important basic designs of automobile front axles; machinery and routine laboratory inspection.

Olympia Show, England. Olympia Show Opens with British Price Cuts Averaging 6 Per Cent, W. M. Bourdon. Automotive Industries, vol. 53, no. 16, Oct. 15, 1925, pp. 647-652, 10 figs. Outstanding features of exhibition; balloon tires fitted to light cars; details of exhibits.

Vibrations. The Free Vibrations of an Autocar, Jas. J. Guest. Engineering, vol. 120, no. 3116, Sept. 18, 1925, pp. 367-368, 3 figs. Investigation of main vibration of car and methods evolved show readily effects of changes in springs, of variations of tire pressure, and rearrangements of loading; they are suitable for graphical calculation and for use in design. Paper read before Brit. Assn.

B

BEACHES

Shore Erosion and Protection. New Jersey Engineers Study Shore Erosion and Protection. Eng. News-Rec., vol. 95, no. 15, Oct. 8, 1925, pp. 598-600. State Board of Commerce and Navigation in second report detail extensive studies and outline recommendations for shore protection.

BEAMS

Moments. Moments in Restrained and Continuous Beams by the Method of Conjugate Points. L. H. Nishkian and D. B. Steinman. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 8, Oct. 1925, pp. 1591-1639, 31 figs. Rapid and direct graphic solution of relation expressed by theorem of three moments, and application of this solution to number of problems of interest to structural engineers; shows how graphic solution can be applied to determination of bending moments, shears, and reactions for any given loading, and to construction of influence lines for moving loads.

BEARINGS

Journal, Lining. Temperature Control in Lining Journal Bearings, W. M. Corse. Am. Metal Market—Monthly Rev. Section, vol. 32, no. 183, Sept. 19, 1925 pp. 6 and 7, 8 figs. Relates different steps of usual lining operation and states briefly principles underlying them; description of laboratory experiments and results.

Shims for. Solid Shims and Sound Bearings. Oil Engine Power, vol. 3, no. 10, Oct. 1925, pp. 576-577, 3 figs. Rigid, accurate keying-up fostered by laminated solid-block shims.

BELTING

Leather. Determining the Quality of Leather Belting, L. W. Arny. Machy. (N. Y.), vol. 32, no. 2, Oct. 1925, pp. 95-96, 3 figs. See also Power Plant Eng., vol. 29, no. 19, Oct. 1, 1925, pp. 1010-1012, 5 figs. Standard tests for determining quality of leather belting; piping test; testing for cracking of leather; tensile strength test; stretch or elongation test; thickness of belting.

Standardization. Is Standardization of Leather Belting Practical, C. O. Streeter. Belting, vol. 27 no. 3, Sept. 1925, pp. 32 and 34. Well known mechanical engineer says it is essential if economy is to be accomplished and a uniform product manufactured.

BOILER FEEDWATER

Meters. Feed Water Meters for the Boiler House. Eng. and Boiler House Rev., vol. 39, no. 3, Sept. 1925, pp. 117-118 and 120, 4 figs. Review of different types available.

BOILER FURNACES

Grate Specification. Specification of Grates for Boiler Furnaces, V. E. Holyoke. Power, vol. 62, no. 15, Oct. 13, 1925, p. 566. Furnishes general and simple guide for specification of grates to meet various combinations of conditions that might exist in hand-fired steam-heating or power plant.

Pulverized-Coal. Radiant Heat Absorption in Pulverized Coal Furnaces, E. G. Ritchie. Elec. Times, vol. 68, nos. 1767 and 1768, Aug. and Sept. 1925, pp. 221-224 and 249, 7 figs. Deals with radiation in pulverized-coal furnaces and influence of water screen and water-cooled side walls on rate of radiant heat absorption-cooled side walls on rate of radiant-heat absorption. Discusses established figures for flame radiation in their relation to conditions obtaining in a pulverized-coal furnace and makes deductions regarding radiation constant for pulverized fuel. Effect of air preheating.

BOILER PLATE

Caustic Embrittlement of. Caustic Embrittlement of Boiler Plate. Boiler Maker, vol. 24, no. 9, Sept. 1925, pp. 253-255. Present status of investigation and research into this abnormal phenomenon of boiler operation. Paper read before Am. Boiler Mfrs. Assn.

BOILERS

Bent-Tube. Tests at Hudson Plant Show Interest Results. Power Plant Eng., vol. 29, no. 20, Oct. 15, 1925, pp. 1049-1051, 8 figs. Effects of bent-tube boiler design marked by draft and temperature conditions; results of series of tests on stoker-equipped Heine V-type boiler at plant of Hudson Motor Car Co. in Detroit.

Oil-Fired, Efficiency Determination. Efficiency of Oil-Fired Boilers, W. F. Schaphorst. Blast Furnace and Steel Plant, vol. 13, no. 9, Sept. 1925, p. 375, 1 fig. Presents chart which will quickly give approximate efficiency of any boiler that is oil fired, knowing heat value of oil and temperature of chimney gases.

BOMBING

Aerial. Bombing Accuracy, B. W. Simpson. Aviation, vol. 19, no. 13, Sept. 28, 1925, pp. 393-396, 13 figs. Bombing with 80-per cent hits is said to be too optimistic and not according to records; 23 per cent is average performance. Written in reply to letter from Capt. N. Carolin criticizing article by Secretary of Navy Wilbur on limitation of naval armament.

BORING MILLS

Heavy Turning and Boring. Heavy Modern Vertical Turning and Boring Mill. Machy. (Lond.), vol. 26, no. 676, Sept. 10, 1925, pp. 754-756, 3 figs. Describes mill which was one of exhibits of conspicuous interest at Leipzig spring fair; it was built by Schiess, Düsseldorf, and is capable of turning work up to 26-ft. 6-in. diam., with clear working height of 10 ft. 6 in.; designed for machining large flywheels, dynamo frames, armature castings, cylinders, turbine casings and rings.

BRAKING

Recuperative. Recuperative Braking on Direct-Current Traction (Freinage par récupération dans la traction à courant continu), E. Heldé. Revue Générale de l'Electricité, vol. 18, nos. 7 and 8, Aug. 15 and 22, 1925, pp. 275-286 and 311-318, 37 figs. Gives practical review of all those recuperative braking systems which have given satisfactory results on d.c. traction systems of French and foreign origin; presents impartial and valuable study of subject; diagrams of different motor connections.

BRASS FOUNDRIES

Gas Firing in. An All-Gas-Fired Brass Foundry. West. Machy. World, vol. 16, no. 9, Sept. 18, 1925, pp. 374-375, 5 figs. Equipment of Berkeley Brass Foundry Co. includes 1 crucible furnace, 2 single-burner and 1 double-burner Monarch direct-fired melting furnaces, 2 drawer-type core ovens, 1 large core oven; all brass-melting furnaces are equipped with surface-combustion firing, using high-pressure system; considerations which prompted decision to install gas-fired furnaces.

Nickel, Use in. Use of Nickel in the Brass Foundry, W. M. Corse. Brass World, vol. 21, no. 9, Sept. 1925, pp. 317-320. Use of nickel in production of white metal or nickel silver; nickel in bronze bearings; nickel in aluminum bronze. Abstracted from Am. Metal Market, Monthly Section.

BRIDGE DESIGN

Delaware River Bridge. Research and Experimental Tests in Connection with the Design of the Bridge over the Delaware River between Philadelphia and Camden, C. E. Chase. Franklin Inst.—Jl., vol. 200, no. 4, Oct. 1925, pp. 417-436, 14 figs. Strength of web plates in compression; tests for design of cables; wire splice; strength of wire throughout cross section; strength of wire under combined tension and lateral compression; strength of wire in strands; flexure of bridge cables; frictional resistance of cable bands; diameter of compacted cable.

The Towers, Cables and Stiffening Trusses of the Bridge over the Delaware River between Philadelphia and Camden, L. S. Moisseiff. Franklin Inst.—Jl., vol. 200, no. 4, Oct. 1925, pp. 436-466, 11 figs. Assumed live loads; selection of type and appearance; displacement of tower top; material and unit stresses; anchorage cable bents; floor system; stiffening trusses; evolution of stiffening-truss theory; deflection theory; comparison of deflection and elastic theories; material and unit stresses; unbraced top chords.

BRIDGES, CONCRETE

Box-Girder. Scotch Concrete Arch Bridge Built As Box Girder, W. L. Scott, Eng. News-Rec., vol. 95, no. 14, Oct. 1, 1925, pp. 536-539, 5 figs. Oswald St. bridge at Glasgow has novel form of frame due to peculiar conditions of use and location roller bearings distinctive feature of design.

Winter Construction. Building Bridge Masonry in Winter, A. M. Bouillon. Ry. Eng. and Maintenance, vol. 21, no. 10, Oct. 1925, pp. 383-386, 5 figs. Extended experience in northern latitudes demonstrates entire practicability of concreting in cold weather; comparative costs of summer and winter construction.

BRIDGES, HIGHWAY

Cantilever. Cantilever Highway Bridge Across Carquinez Straight, C. Derleth, Jr. Eng. News-Rec., vol. 95, no. 13, Sept. 24, 1925, pp. 504-507, 4 figs. 3350-ft. structure with two 1100-ft. main spans and two 500-ft. anchor spans constructed across strait in California; design selected has marked advantage over suspension type.

Castleton, Hudson River. Castleton Bridge Is Monumental Structure, H. T. Welty. Ry. Rev., vol. 77, no. 16, Oct. 17, 1925, pp. 583-588, 7 figs. Long spans over Hudson River and high piers combine to make erection difficult problem.

BUFFING

Automatic. Automatic Buffing Methods, Chas. O. Herb. Machy. (N. Y.), vol. 31, nos. 10, 11, 12 and vol. 32, no. 1, June, July, Aug. and Sept., 1925, pp. 761-764, 871-873, 960-963 and 15-16, 26 figs. Deals with problems encountered in automatic buffing operations; types of chucks employed to hold variety of work on rotary-head machine. July: Chucks with swinging jaws; chuck with cork grips. Aug.: Buffing of large parts, such as automatic headlight reflectors, cooking utensils, pails, etc., on reciprocating-type machine. Sept.: Buffing oval square and other irregular objects and few additional chuck designs, See also Machy, (Lond.), vol. 26, nos. 663, 672, 675 and 676, June 11, Aug. 13, Sept. 3 and 10. 1925, pp. 321-324, 619-621, 723-726 and 756-757, 28 figs.

BUILDING MATERIALS

Gypsum Plaster. Adhesion of Gypsum Plaster to Various Backings. Am. Architect, vol. 128, no. 2480, Sept. 9, 1925, pp. 227-234, 19 figs. Describes nature of the various backings commonly employed with wall plasters, and physical tests on adhesion of gypsum plaster to these backings to determine their effectiveness. Pub. by permission Bur. Standards.

BUSES

TROLLEY. The Garrett Railless Trolley Car. Tramway & Ry. Wld., vol. 58, no. 13, Sept. 10, 1925, pp. 150-152, 6 figs. Particulars of latest product of Richard Garrett & Sons, Ltd., providing seating accommodation for 37 persons, and weighing approximately, with body, 5 tons; overall length 26 ft., overall width 7 ft. 6 in., wheel base 15 ft. 6 in.

C

CABLEWAYS

CHEMICAL INDUSTRY, APPLICATION TO. Ropeways and Suspension Railways, Their Application to the Chemical and Allied Industries, H. Blyth. Chem. Age (Lond.), vol. 13, no. 324, Aug. 29, 1925, pp. 214-216, 6 figs. Draws attention to noticeable lack in chemical works of facilities for handling by mechanical means both raw materials and manufactured products; description of important systems which have been applied with success by some leading chemical undertakings.

CARS

BEARING LUBRICATION. Lubrication, L. R. Christy. Ry. Mech. Engr., vol. 99, no. 10, Oct. 1925, pp. 627-629. Selection of materials; renovation and saturation of packing. (Abstract.) Paper read before Chief Interchange Car Inspectors' & Car Foremen's Assn.

CARS, FREIGHT

REPAIR SYSTEM. Progressive System of Freight Car Repairs, F. A. Starr. Ry. Mech. Engr., vol. 99, no. 10, Oct. 1925, pp. 629-633, 1 fig. Scheduling and routing; advantages and possibilities of progressive system; materials; suggestions for repairs; manner of handling work; classified repairs of steel cars; classified repairs to box cars; requirements. Paper read before Chief Interchange Car Inspectors' & Car Foremen's Assn.

CARS, TANK

DOME IMPROVEMENTS. Improvements in Tank Car Dome Planned To Reduce Natural Gasoline Losses J. C. Chatfield. Nat. Petroleum News, vol. 17, no. 39, Sept. 30, 1925, pp. 47-48, 2 figs.

CAST IRON

DILATATION DURING HEATING AND COOLING. The Dilatation of Cast Irons During Repeated Heating and Cooling, J. H. Andrew and Rob. Higgins. Engineering, vol. 120, no. 3117, Sept. 25, 1925, pp. 399-402, 30 figs. Investigation to determine variations in length undergone during process of heating and cooling; description of apparatus used and results. Paper presented at Iron & Steel Inst. See also Foundry Trade Jl., vol. 32, no. 474, Sept. 17, 1925, pp. 235-243, 30 figs.

PEARLITIC. An Improved Cast Iron. Engineer, vol. 140, no. 3639, Sept. 25, 1925, p. 317. Process of manufacturing Perlit cast iron, invented by Lanz & Co., Mannheim, Germany, British patent rights for which have been purchased by A. Holt & Co., Liverpool.

RATE OF COOLING AND CASTING TEMPERATURE. The Influence of Rate of Cooling and Casting Temperature on Cast Iron. Foundry Trade Jl., vol. 32, no. 476, Oct. 1, 1925, pp. 275-279, 3 figs. Rate of cooling and graphitization; rate of cooling and dissolved gases; rate of cooling, crystallization, and mechanical strength; influence of casting temperature on cast iron; mechanism of influence of casting temperature; casting temperature and dissolved gases; undercooling; rate of cooling and diffusion.

WELDING. Welding Cast Iron in England, L. Tibbenham. Acetylene Jl., vol. 27, no. 2, Aug. 1925, pp. 117-120, 8 figs. Properties of cast iron; pig iron; gray iron; hard or white iron; chilled iron; malleable iron; eliminating scrap heap; preventing costly stoppages; preparation of casting; expansion and contraction; welding rods; method of welding; repairing cast iron spur wheel.

CASTING

CENTRIFUGAL. Innovations in Centrifugal Casting, C. Pardun. Foundry Trade Jl., vol. 32, no. 471, Aug. 27, 1925, pp. 175-176. Points out that most of innovations seek to undermine fundamental in question, which consists in producing liquid hand by rotary movement and longitudinal displacement; recent inventions cover auxiliaries, but do not introduce fundamental innovations. Translated from Stahl u. Eisen, vol. 45, July 9, 1925, p. 1178.

CAUSEWAYS

SAVANNAH RIVER DELTA. Coastal Highway Crossing of the Savannah River Delta, S. B. Slack. Eng. News-Rec., vol. 95, no. 15, Oct. 8, 1925, pp. 590-593, 6 figs. Describes 5-mi. causeway over marshes and channels composed of earth fills, concrete trestle bridges, and steel swing span; foundations of large precast concrete piles; construction difficulties.

CEMENT, PORTLAND

BRITISH SPECIFICATION. The British Standard Specification for Portland Cement. Engineering, vol. 120, no. 3119, Oct. 9, 1925, p. 452. Revision recently issued marks distinct step in improvement of product, brought about by introduction of fine grinding of well-burnt clinker as manufactured by modern rotary kiln.

CONSTITUTION AND BURNING. Constitution and Burning of Artificial Portland Cement, J. E. Duchez. Rock Products, vol. 28, nos. 8, 15, 16 and 20, Apr. 18, July 25, Aug. 8 and Oct. 3, 1925, pp. 45-47, 45-46, 48-49 and 51-53, 15 figs. Study of hydraulic cementing material other than artificial cement; causes of defection of mortars. Translated from Revue des Matériaux de Construction.

CENTRAL STATIONS

AUXILIARIES. Central-Station Auxiliaries, G. G. Bell. Elec. World, vol. 86, no. 13, Sept. 26, 1925, pp. 655-656, 1 fig. Reliability primary requirement; trend toward shaft-end generators; great improvements made in economy of steam auxiliaries.

BITUMINOUS COAL FOR. Results Obtained with a Southwest Coal. Power Plant Eng., vol. 29, no. 17, Sept. 1, 1925, pp. 889-890, 1 fig. Points out that it is often found economical to use coal, which may not be of best quality, from fields near place of consumption.

COLORADO. Valmont Steam Plant of the Public Service Company of Colorado. Jl. of Elec., vol. 55, no. 5, Sept. 1, 1925, pp. 160-166, 7 figs. Burns pulverized coal for fuel; located upon an artificial body of water which it utilizes for condensate; capacity 25,500 kva; constructed at cost of $4,500,000.

COMBUSTION CONTROL. Combustion Control at the Hudson Avenue Station, W. C. Holmes. Elec. World, vol. 86, no. 13, Sept. 26, 1925, pp. 628-632, 9 figs. Brooklyn Edison station maintains daily operating efficiencies within 2 per cent of test efficiencies; great improvement over hand control; details of system and operating methods.

EFFICIENCY VARIATION WITH OUTPUT. The Variation of Power Station Efficiency with Output, R. H. Parsons. Engineering, vol. 120, no. 3106, July 10, 1925, pp. 33-35, 10 figs. Discusses operating records of Bow station of Charing Cross Elec. Supply Co., whose average efficiency is remarkably high.

INTERCONNECTION. Operating a Fully Interconnected System, A. M. Perry. Elec. World, vol. 86, no. 14, Oct. 3, 1925, pp. 693-696, 2 figs. How Consumers Power Co. prearranges each day's operation, adjusts its schedule for contingencies and anticipates disturbances and sectionalizing therefor.

ISOLATED PLANTS VS. Purchased Power vs. Private Plant, E. F. Wilson. Elec. World, vol. 86, no. 15, Oct. 10, 1925, pp. 755-757. Factors that make installation of isolated power plants a costly and unprofitable investment and their operation uneconomical in comparison with use of central-station service.

LOW-TEMPERATURE DISTILLATION AND. Low-Temperature Distillation and the Central Station, Geo. A. Orrok. Elec. World, vol. 86, no. 13, Sept. 26, 1925, pp. 620-622. By-product saving in power production offers little to central stations; survey of processes and accomplishments; fields of application.

OIL-ENGINED. A Model Oil Engined Power Station, C. C. Beck. Oil Engine Power, vol. 3, no. 8, Aug. 1925, pp. 445-447, 5 figs. City of La Crosse, Kansas, has exemplary installation ably operated and administered; description of installation.

Diesel Municipal Plant Shows Profits. Power Plant Eng., vol. 29, no. 18, Sept. 1, 1925, pp. 899-900, 3 figs. Old steam-operated units and gas-fired boilers discarded when high price and shortage of fuel became serious problems at plant of Neodesha, Kansas.

SIOUX CITY, IA. Features of the New Sioux City Station, K. M. Irwin. Elec. World, vol. 86, no. 14, Oct. 3, 1925, pp. 685-689, 3 figs. Big Sioux plant of Sioux City Gas & Elec. Co., designed to operate at 17,000 B.t.u. with minimum investment; will carry load of city and surrounding territory; coal-handling and firing equipment.

UNITED STATES. Notes on a Visit to America, Wm. H. Patchell. Instn. Mech. Engrs.—Proc., vol. 1, no. 3, Mar. 1925, pp. 689-705, 12 figs. Notes on Trenton Channel station on Detroit River; Lakeside, Milwaukee; Windsor, W. Va.; Philo, Zanesville, O.; Hell Gate, New York; Weymouth, Boston; Lakeshore, Cleveland, O.; Brooklyn, N. Y.

CIRCUIT BREAKERS

OIL TYPE. Selection and Maintenance of Circuit Breakers. Power Plant Eng., vol. 29, no. 20, Oct. 15, 1925, pp. 1056-1059, 6 figs. Analysis of forces acting in oil circuit breaker together with discussion of fundamentals of construction.

CLUTCHES

AUTOMOBILE. History of Automotive-Clutch Development, E. E. Wemp. Soc. Automotive Engrs.—Jl., vol. 17, no. 4, Oct. 1925, pp. 361-367 and (discussion) 367-371, 3 figs.

FRICTION. The Application of Friction Clutches to Machine Tool Drives, S. H. Simon. Machy, (N. Y.), vol. 32, no. 2, Oct. 1925, pp. 111-113, 8 figs.

COAL

CARBONIZATION. Economic Features of the Low Temperature Carbonization Process, M. J. Stephan. Oil Eng. & Finance, vol. 6, no. 115, Sept. 1925, pp. 438-440. Gives short description of principal British processes for low-temperature carbonization which have overcome initial difficulties and could be successfully used for production of one or more particular products from suitable raw material.

The Rationale of Coal Carbonization, Wm. E. Davies. Gas Wld., vol. 83, nos. 2144, 2145, 2146 and 2147, Aug. 22, Sept. 5 and 12, 1925, pp. 157-162, 176-179, 205-207 and 221-226, 17 figs. Discusses rationale of carbonization in its various industrial applications, bearing in mind main factors such as: constitution of coal and knowledge thereon, composition for different fuels, temperature of heating and carbonizing, rate of heating, utilities of external heating, utilities of internal heating, flue design, refractories, size and form of carbonizing vessels, physical conditions of raw material, preparation of raw material considered technically and economically, convection of reducing gases, other than those obtained direct from volatiles through change, etc.

DRYING. Coal Drying in the Carpenter Centrifuge. Iron & Coal Trades Rev., vol. 111, no. 3001, Sept. 4, 1925, pp. 359-360. 2 figs. Describes installation at Nunnery Colliery Co.'s Pit at Sheffield, England, known as Carpenter Centrifuge, which comprises a stepped truncated cone, driven by a vertical shaft and enclosed in a circular casing.

PURCHASING. Coal Buying, H. D. Fisher. Combustion, vol. 13, no. 13, Sept. 1925, pp. 161-163. Author finds in articles by D. Henderson in July and August issues of this journal, omission of a definite method of securing desirable results described, and offers this article as a suggestion.

COAL MINING

LONG-PANEL RECLAIMING. Modern Concentration Mining Succeeds Where Past Methods Failed in Old Detmold Mine, E. Read. Coal Age, vol. 28, no. 12, Sept. 17, 1925, pp. 385-390, 10 figs. Abandoned big vein coal in Georges Creek region is reclaimed by long panels, half advancing and half retreating; continuous side track assists haulage.

"V" SYSTEM. Easily Installed Power Lines and Controls Aid Work of Equipment in "V" System, C. O. Gallaher and G. B. Wouthward. Coal Age, vol. 28, no. 10, Sept. 3, 1925, pp. 316-318, 6 figs. Conveyors are driven by 220-volt induction motors with high-resistance rotors in mining system originated and developed in Norton mine of West Virginia Coal & Coke Co.

COKE MANUFACTURE

BY-PRODUCT. Progress and Prospects of the By-Product Coking Industry, M. Etherton. Gas Wld., vol. 83, no. 2146, Sept. 5, 1925, pp. 15-17 (Coking Sec.). Beginnings of recovery oven; developments; waste-heat ovens; by-product beehive; washeries; charging ovens; recovery of benzol; surplus gas; tar distillation; bigger ovens; Wilputte coking plant at Fell Coke Works of Consett Iron Co., Ltd.; Koppers' regenerative ovens; speed of coking. Paper read before Coke Oven Mgrs.' Assn.

COLD STORAGE

ROOMS, TEMPERATURE AND VENTILATION IN. Temperature, Humidity and Ventilation in Storage Rooms. Refrigeration, vol. 37, no. 3, Sept. 1925, pp. 34-37, 4 figs. Temperature, humidity, air circulation, ventilation and equipment for their application and control. Extracts from paper by M. R. Carpenter presented before Nat. Assn. Practical Refrig. Engrs.

COLUMNS

BRIDGE, DESIGN OF. Details Design of Large Bridge Columns, C. L. Christensen. Eng. News-Rec., vol. 95, no. 14, Oct. 1, 1925, pp. 546-548. Points to be considered in designing built-up columns for full efficiency of material; percentage of angle area; lacing, battens and stitch-riveting.

COMBUSTION

CONTROL. Automatic Combustion Control. Eng. & Boiler House Rev., vol. 39, no. 3, Sept. 1925, pp. 113-114, 1 fig. Describes smooth control as installed at Sherman Creek Station of United Electric Light & Power Co., New York City; it is mechanical regulator of fuel quantities and air volumes to produce most efficient combustion.

CONCRETE

CONSISTENCY TESTS. A New Test for Consistency of Concrete Applicable to Dry Paving Mixtures, F. H. Jackson and G. Werner. Pub. Roads, vol. 6, no. 6, Aug. 1925, pp. 121-123 and 136, 4 figs. Describes new test developed by Division of Tests, U. S. Bur. Roads, which may be used for controlling water content and therefore strength of any given concrete mixture; designed as a substitute for slump test and is proposed for use primarily as a method of field control; description of apparatus.

STRENGTH. Fine Grinding of Cement Increases Strength of Concrete, M. Temin and W. H. Sligh. Concrete, vol. 27, no. 3, Sept. 1925, pp. 47-49, 2 figs. Results of investigation of effect of fine grinding of cement on strength in concrete, and changes in strength of test specimens during a period of ten years. Pub. by permission U. S. Bur. Standards.

TESTING MATERIALS FOR. Testing Materials for Concrete, M. C. Badder. Roads & Road Construction, vol. 3, no. 32, Aug. 1, 1925, pp. 232-233, 3 figs. Discusses soundness of cement, percentage of water for cement and mortar, decantation test for silt, organic impurities in sand, and slump test for consistency of concrete.

CONCRETE CONSTRUCTION, REINFORCED

PREDETERMINING CONCRETE STRENGTH ON BRIDGES. Predetermining Concrete Strength on Park Bridges, W. F. Welsch. Eng. News-Rec., vol. 95, no. 16, Oct. 15, 1925, pp. 630-631. By using fineness modulus method of Abrams, concretes of required strengths were produced for Bronx Parkway structures.

CONDENSERS, STEAM

DEFECTS. Faults in Operation and Trouble with Condensers (Défauts de fonctionnement et dérangements des condenseurs), V. Kammerer. Associations Françaises de Propriétaires d'Appareils à Vapeur—Bul., vol. 6, no. 21, July 1925, pp. 152-163, 3 figs. Discusses partial steam and air pressure, vacuum and effect of atmospheric pressure, proper vacuum, poor vacuum due to too high temperature or too high air pressure.

LAKE WATERS FOR. Lake Waters for Condensers, A. G. Christie. Mech. Eng., vol. 47, no. 10, Oct. 1925, pp. 809-810, 2 figs. Persistence of stratification of warm- and cold-water layers in Northern Lakes; savings from increased vacuum obtained by use of cold bottom layers in condensers.

SURFACE. Surface-Condenser Operation, P. H. Jeynes. Power, vol. 62, no. 14, Oct. 6, 1925, pp. 514-517 5 figs. Deals with three factors which present opportunities for effecting economies, namely, regulation of circulating water, period between cleanings, and refrigeration of condensate.

CONNECTING RODS

MACHINING. Machining of Connecting-rods for Gas and Oil Engines, R. P. Lock. Mech. Wld., vol. 78, no. 2019, Sept. 11, 1925, p. 201, 5 figs. Description of a method of machining connecting-rods for gas and oil engines whereby economic compromise between a maximum output on one hand and a minimum of capital outlay on other was aimed at, and a reduction of 50 per cent effected in machining times.

CONVERTERS

ROTARY. Notes on the Armature Heating of a Rotary Converter, S. Neville. World Power, vol. 4, no. 21, Sept. 1925, pp. 158-159, 2 figs. Shows that by replacing irregular current waves occurring in armature of rotary converter by series of harmonics, it is possible to obtain complete solution of this well-known problem in very simple manner.

CONVEYORS

TYPES. Mechanical Conveying and Transport Appliances. Chem. Age (Lond.), vol. 13, no. 324, Aug. 29, 1925, pp. 216-220, 9 figs. Describes Carboy elevating trucks, hydraulic valves for elevators, motor transport, new cask-lifting appliance, gravity or lip-bucket conveyors, scientific methods in rop-driving, electric trucks, nailless strapping for packing cases, band conveyors, etc.

COPPER MINES

POWER GENERATION AND UTILIZATION. The Generation and Utilization of Power in Copper Mining, H. H. Pratt. Min. Congress Jl., vol. 11, no. 10, Oct. 1925, pp. 481-482, 1 fig. Much attention is given to obtaining maximum efficiency and low cost in generating electric power; large lodded may be avoided by use of proper equipment and distribution; developments in power station equipment outlined.

CORES

BINDERS FOR. Pastes and Gums as Core Binders. West. Machy. World, vol. 16, no. 9, Sept. 1925, pp. 371-373, 4 figs. Cores made from paste binders dry very readily and fairly thoroughly, and if sand is properly mixed combination forms workable mixture; clay, when used in quantities small enough to prevent loss in venting power, is a core binder and can be used to advantage in connection with flour; gives examples of core sand mixtures using flour or manufactured flour compounds as binder; rosin as core binder; pitch compounds; water-soluble binders.

CORONA

LOSSES. On the Nature of Corona Loss, C. T. Hesselmeyer and J. K. Kostko. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 10, Oct. 1925, pp. 1068-1075, 17 figs. A number of diagrams of corona loss have been taken and results are presented; they lead to certain conclusions regarding nature of corona loss which are discussed.

CORROSION

CARBON TETRACHLORIDE. The Corrosion of Certain Metals by Carbon Tetrachloride, F. H. Rhodes and J. T. Carty. Indus. & Eng. Chem., vol. 17, no. 9, Sept. 1925, pp. 909-911, 4 figs. Of various metals tested, nickel is most resistant to cold carbon tetra chloride, either wet or dry, and to dry vapor of carbon tetrachloride; tin is most resistant to action of wet vapor; interesting phenomena in connection with corrosion of aluminum and brass are observed.

FUNDAMENTAL FACTORS. Fundamental Factors in Corrosion, Geo. M. Enos. Indus. & Eng. Chem., vol. 17, no. 8, Aug. 1925, pp. 793-797, 1 fig. Factors affecting nature and rate of corrosion; it is shown that variation in carbon content of series of steels, thus varying factor of chemical composition, did not materially alter corrosion rate in atmosphere and in distilled water; curves showing change in rate of corrosion with length of time exposed in air and in distilled water are given for mild steel; investigation dealt only with early stages of corrosion.

TESTING DEVICE. A Device for Estimating Corrosion, W. R. Fetzer. Indus. & Eng. Chem., vol. 17, no. 8, Aug. 1925, p. 788, 2 figs. Apparatus and method for making comparative corrosion tests of metals and alloys under conditions ranging from temperature of brine tanks to that of steam sterilization.

COST ACCOUNTING

INVENTORY CONTROL. The Control of Inventory through the Scientific Determination of Lot Sizes, H. S. Owen. Indus. Mgmt. (N. Y.), vol. 70, no. 4, Oct. 1925, pp. 235-239. Correct determining of order quantities.

MACHINE-HOUR RATE. Machine-Hour Rate the Ideal Foundation for Gear Estimates and Costs, E. A. Kebler. Am. Mach., vol. 63, no. 16, Oct. 15, 1925, pp. 612-613. Summary of advantages obtained by uniform cost accounting. (Abstract.) Paper read before Am. Gear Mfrs.' Assn.

RAILWAY DISBURSEMENT. Suggested Short Cuts in Disbursement Accounting, J. C. McNeil. Ry. Rev., vol. 77, no. 16, Oct. 17, 1925, pp. 595-597, 6 figs. Illustrated possible method of handling and classifying operating expenses in three operations.

CRANES

PONTOON, DIESEL-ELECTRIC. A Diesel-Electric Pontoon Crane. Oil Engine Power, vol. 3, no. 9, Sept. 1925, pp. 516-517, 2 figs. Particulars of crane for harbor of city of Stockholm, Sweden.

D

DAMS

ARCH. Full-Scale Tests of Arched Dams. Engineering, vol. 120, no. 3116, Sept. 18, 1925, p. 343, 2 figs. Details of full-scale experimental dam to be built on Stevenson Creek in California, and tested to destruction.

ORADELL, N. J. The Oradell Dam of the Hackensack Water Company, N. S. Hill, Jr. Am. Soc. Civ. Engrs. — Proc., vol. 51, no. 8, Oct. 1925, pp. 1569-1590, 12 figs. Describes unique type of dam of considerable size designed by writer in 1911 and built in 1920-22; design of sluice-gate section and of spillway section; unit stresses; construction methods; dam creates storage reservoir of 3,023,000,000-gal. capacity.

STAVE FALLS HYDRO-ELECTRIC DEVELOPMENT, B. C. The Stave Falls Development, British Columbia. Engineering, vol. 120, nos. 3114 and 3116, Sept. 4 and 18, 1925, pp. 279-282, and 348-351 and 358, 55 figs, partly on supp. plate. Reconstruction of main dam and intakes at Stave Falls; construction of dam which enlarged scheme has necessitated across main channel of river, about of quarter of mile from power-house site; this structure is known as Blind Slough dam.

WILSON, MUSCLE SHOALS. Wilson Dam—Its Cost and Value, M. C. Tyler. Elec. World, vol. 86, no. 15, Oct. 10, 1925, pp. 739-743, 1 fig. Accurate data on power development and study of costs and markets; diversified industry in South can absorb much Shoals power.

DIE CASTING

ZINC-BASE ALLOYS. Growth in Zinc Base Die Castings, W. G. Johnson. Metal Industry (N. Y.), vol. 23, nos. 8 and 9, Aug. and Sept. 1925, pp. 322-323 and 362-363, 9 figs. Notes on die-casting alloy composed of zinc, 92; aluminum, 5; and copper 3 parts.

DIESEL ENGINES

COMBUSTION IN CYLINDERS, EQUALIZING. Equalizing Combustion in Diesel Cylinders, Rob. Melrose. Power, vol. 62, no. 12, Sept. 29, 1925, p. 490. Suggestions for balancing power in cylinders.

DE LA VERGNE. Simplicity Marks Vertical Diesel Oil Engine, M. A. Hall. Automotive Mfr., vol. 67, no. 4, July 1925, pp. 5-7, 7 figs. Description of type SI units produced by De La Vergne Machine Co., New York, which have many distinct advantages, including simplicity, reliability and economy insuring low-cost power.

DEVELOPMENTS. Recent Diesel-Engine Developments, P. L. Scott. Soc. Automotive Engrs.—Jl., vol. 17, no. 4, Oct. 1925, pp. 339-346 and (discussion) 346-349, 14 figs. What Diesel engine has done, its possibilities of development and future application to automotive service; when modified for automotive usage, author asserts that Diesel engine would not only allow use of cheaper fuel and provide greater fuel economy, but would give immediate opportunity to use 2-stroke cycle, advantages of which are enumerated; Diesel-engine principle affords possibility of 2-stroke-cycle double-acting engine in which, theoretically, four times power of present gasoline engine would be available.

POLAR HEAVY-OIL. Polar Heavy-Oil Engines. Mech. Wld., vol. 78, no. 2013, July 31, 1925, p. 79, 2 figs. Notes on H-type two-stroke Polar heavy-oil engines introduced by Atlas Diesel Co., Ltd., London, England; they are listed in sizes from 35 to 100 hp.; operate on Diesel cycle, but employ solid injection and crankcase scavenging by means of a stepped piston, transfer of scavenge air and exhausting of burnt gases being obtained by ports cut in cylinder walls.

DILATOMETERS

ROCKWELL. Rockwell Dilatometer, S. P. Rockwell. Machy. (N. Y.), vol. 32, no. 2, Oct. 1925, pp. 147-149, 6 figs. Apparatus for determining correct hardening temperature of steel by indicating and recording dimensional changes during decalescence period.

DUST

EXPLOSION PREVENTION. Dust Explosions in Industrial Plants, H. R. Brown. Indus. & Eng. Chem., vol. 17, no. 9, Sept. 1925, pp. 902-904, 3 figs. Deals with plants handling dust material in packages and in loose form, plants producing dusty material; methods suggested for reducing dust-explosion hazard in dusty industries.

E

EJECTORS

STEAM. Steam Ejectors in Condensers for High Vacua, N. A. Lamb. World Power, vol. 4, no. 22, Oct. 1925, pp. 200-205, 4 figs. Review of development and improvements; basis of calculation of jets and diffusers; means of calculating amount of steam required to operate jets.

ELECTRIC DISTRIBUTION

DEVELOPMENTS. Present State of Transmission and Distribution Developments. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 10, Oct. 1925, pp. 1075-1076. Report submitted by Committee on Power Transmission and Distribution.

ELECTRIC DISTRIBUTION SYSTEMS

HIGH-VOLTAGE. A High-Voltage Distributing System, Glen H. Smith. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 10, Oct. 1925, pp. 1104-1105. In 26,000-volt system of Seattle municipal light and power plant idea is being developed of carrying high-voltage lines as close as possible to consumer's premises, making primary feeders correspondingly short.

ELECTRIC FURNACES

RESISTANCE. 60-K.V.A. Electric Resistance Furnace. Foundry Trade Jl., vol. 32, no. 476, Oct. 1, 1925, pp. 280-281, 2 figs. Furnace for carburizing process, built under Wild-Barfield patents.

ELECTRIC FUSES

ACCESSIBLE SERVICE. Experience with Accessible Service Fuses, P. H. Bartlett. Elec. World, vol. 86, no. 15, Oct. 10, 1925, pp. 747-748, 1 fig. Using switches embodying design and construction wherein no live parts are exposed when inspecting or replacing fuses.

ELECTRIC GENERATORS

AIR-GAP MAGNETIC FIELD IN. The Air-Gap Magnetic Field in Non-Salient Pole Machinery, B. Hague. World Power, vol. 4, no. 22, Oct. 1925, pp. 188-199, 4 figs. Theory of field due to currents in uniform air gap with plane iron boundaries.

WATER-WHEEL, ERECTING. Erecting Vertical Waterwheel Generators, N. L. Rea. Power, vol. 62, no. 15, Oct. 13, 1925, pp. 561-564, 8 figs. Suggestions on how to avoid erection difficulties; describes number of useful methods for checking location of different parts of machine.

ELECTRIC LAMPS

ULTRA-VIOLET. A Chemical Method for the Standardization of Ultra-Violet Light, J. E. Moss and A. W. Knapp. Chem. & Industry, vol. 44, no. 37, Sept. 11, 1925, pp. 453T-456T, 2 figs. Test for accurately measuring relative strengths of various lamps, any change which may occur in strength of particular lamp due to use or other cause, relative intensity in light of shorter wavelength of lamp, and of solar radiation under various meteorological conditions.

ELECTRIC LOCOMOTIVES

DIESEL-ELECTRIC. Baldwin Builds Diesel-Electric Locomotive. Ry. Age, vol. 79, no. 15, Oct. 10, 1925, pp. 645-648, 5 figs. Considered to be largest of its type; engine develops 1000 hp; rated maximum tractive force is 25,200 lb.

The Diesel Oil-Electric Locomotive and Its Performance in Service. Ry. & Locomotive Eng., vol. 38, no. 9, Sept. 1925, pp. 249-252, 3 figs. Details of its design and operation in service with economies effected.

The 1000-Hp. Baldwin Oil-Electric Locomotive. Oil Engine Power, vol. 3, no. 9, Sept. 1925, pp. 522-527, 11 figs. Particulars of internal-combustion oil-burning locomotive built by Baldwin Locomotive Works of Philadelphia, Pa., for Philadelphia & Reading R. R.; motive power originates in a 12-cylinder Knudsen double crankshaft engine driving a Westinghouse d.c. generator; length over couplers 52 ft. 1¾ in., capacity of fuel tank 750 gal., voltage 750, total weight 275,000 lb., maximum tractive force 14 ft. 7 in.

FORD MOTOR-GENERATOR. Ford Motor-Generator Locomotive on Test. Elec. Ry. Jl., vol. 66, no. 10, Sept. 5, 1925, pp. 352-355, 5 figs. Preliminary tests on first locomotive constructed for use on electrified lines of Henry Ford's Detroit, Toledo & Ironton R. R. indicate that it will have an excellent performance; designed to take current from an a.c. trolley at either 11,000 or 22,000 volts single phase, 25 cycles; this current is stepped down by means of a.c. transformers to 1250 volts which is fed into a synchronous motor-generator set and converted into d.c. at variable voltage for driving eight series-wound traction motors.

HYDRO-PLANETARY TRANSMISSION. Hydro-Planetary Locomotive Transmission. Oil Engine Power, vol. 3, no. 10, Oct. 1925, pp. 572-575, 6 figs. Notes on application which is being made by Heinrich Schneider in collaboration with Swiss Locomotive and machine works of Winterthur, Switzerland, to a Diesel locomotive of 500 hp.; designs for 2000 hp. completed.

SAFETY DEVICE FOR. One-Man Control for Electric Locomotives. Ry. Gaz., vol. 43, no. 9, Aug. 28, 1925, pp. 280-281, 2 figs. New Brown-Boveri safety device to meet special conditions.

ELECTRIC MEASURING INSTRUMENTS

KLYDONOGRAPH. The Klydonograph and Its Application to Surge Investigation, J. H. Cox and J. W. Legg. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 10, Oct. 1925, pp. 1094-1103 and (discussion), 1144-1146, 40 figs. Discusses principle of instrument and practical connections to line; results obtained in field from four investigations; commercial type of klydonograph uses daylight-loading roll film of sufficient length to last 7 days.

ELECTRIC MOTORS

CONTACTORS FOR CONTROL. Contactors for Industrial Motor Control, W. Wilson. World Power, vol. 4, no. 21, Sept. 1925, pp. 127-134, 2 figs. Operating coils; contacts; off-stops; general notes on design.

STARTERS. The Design of Squirrel-Cage Motor Starters, J. O. Knowles, Elec. Rev., vol. 97, no. 2494, Sept. 11, 1925, pp. 404-406, 2 figs. Suggestions for alterations necessary to meet heavier load conditions.

ELECTRIC MOTORS, A.C.

SYNCHRONOUS. Automatic Starting of Synchronous Motors, R. M. Matson and R. E. R. Parry. Gen. Elec. Rev., vol. 28, no. 10, Oct. 1925, pp. 703-706, 6 figs. Increasing application of this type of motor has called for refinements in method of starting, so that automatic starters are built that are rugged, inexpensive, and foolproof; in addition they afford protection to motor from sources of possible damage, such as overload, single-phase operation and failure of excitation.

ELECTRIC TRANSMISSION LINES

MISSISSIPPI RIVER CROSSING. Mississippi River Crossing of Crystal City Transmission Line, H. W. Eales and E. Ettlinger. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 10, Oct. 1925, pp. 1106-1115, 18 figs. Description of overhead wire crossing of Mississippi of double circuit, 132,000-volt, 3-phase, 60-cycle transmission line in process of construction.

POWER LIMITS. Fundamental Considerations of Power Limits of Transmission Systems, R. E. Doherty and H. H. Dewey. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 10, Oct. 1925, pp. 1045-1057, 12 figs. Points out essential features to be considered in study of problem, and calls attention to outstanding results of experimental investigation of subject with view to clarifying points that have been under discussion in past 2 years; problem of possible future increase in power limits is analyzed in terms of various factors which determine present limits, and possible solutions are suggested. Bibliography.

RELAY PROTECTION OF. Relay Protection of Transmission Lines, C. A. Anderson. Power Plant Eng., vol. 29, no. 19, Oct. 1, 1925 pp. 1002-1004, 3 figs. Protective relays play important role in guarding power systems against shutdown.

ELECTRICAL MACHINERY

D. C., COMMUTATION IN. Experimental and Theoretical Study of Commutation in D. C. Machines (Contribution à l'étude expérimentale et théorique de la commutation dans les machines à courant continu), C. P. Antoni. Revue Générale de l'Electricité, vol. 18, nos. 9, 10 and 11, Aug. 29, Sept. 5 and 12, 1925, pp. 343-359, 393-406 and 439-445, 39 figs. Discusses field and dynamo in static and dynamic state; brushes of various types and their properties; shows that formulas used for calculating ampere turns generally give too small values; commutation without auxiliary poles; criterion of a good commutation; commutation with auxiliary poles, their regulation and calculation.

ELECTRICITY SUPPLY

ONTARIO RURAL SERVICE. Rural Service in Ontario, L. W. W. Morrow. Elec. Wld., vol. 86, no. 16, Oct. 17, 1925, pp. 790-794, 7 figs. Hydro-Electric Power Commission delivers energy directly to rural consumers only; service and rates classified; engineering and operating details; contractual relations established.

ELECTROMAGNETS

SOLELOID. The Design of Solenoid Electromagnets, P. J. Higgs. Jl. Sci. Instruments, vol. 2, nos. 10 and 11, July and Aug. 1925, pp. 305-312 and 337-341, 8 figs. Results of investigation of magnetic circuit in Barr type of saving of material.

ELEVATORS

FAULT LOCATION. Locating Faults in Electric Elevators—Direct-Current Motors. Chas. A. Armstrong. Power, vol. 62, nos. 14 and 16, Oct. 6 and 20, 1925, pp. 530-532, 5 figs., and 604-607, 7 figs. Oct. 6: Effects of conditions in power system on motor operation; troubles in elevator operation and faults in motor that may cause these troubles. Oct. 20: Types of a.c. motors used in elevator applications; effect of voltage and frequency changes on motor operation; causes of various troubles that may occur in operation of motors.

EMPLOYEES, TRAINING OF

PRODUCTION WORK. Training Employees in Production Work, Lillian M. Gilbreth. Soc. Automotive Engrs.—Jl., vol. 17, no. 4, Oct. 1925, pp. 399-408, 12 figs. Author evaluates training in terms of production; aim of training; factors of successful production; factors of teaching; who is to teach and when and where teaching is to be done; how it should be done, and results.

ENGINEERING

MUSEUM OF. The Museum of Science and Engineering, E. Cramer, Eng. Progress, vol. 6, no. 7, July 1925, pp. 235-237, 7 figs. Description of German Museum, recently opened in Munich; details of department of geology and mining, metallurgy, metal working, power machines, transportation, shipbuilding, aeronautics, road and railway building, etc.

EXHAUST STEAM

ECONOMICAL USE. Economical Use of Exhaust Steam, A. F. Sheehan. Power Plant Eng., vol. 29, no. 20, Oct. 15, 1925, pp. 1048-1049. Study of types of prime movers necessary for best results.

F

FANS

APPLICATION OF. Fan Engineering and the General Application of Fans, V. Matthews. Domestic Eng. Heat. & Vent., vol. 45, nos. 6 and 7, June and July, 1925, pp. 119-126 and 141-143, 12 figs. Brief explanation of laws which govern movement of gases; theory of centrifugal fan; applications of fans, including heating and ventilating, dust removal, blowing Smiths' fires, cupola blowing, forced and induced draft, and drying.

FIRE EXTINGUISHERS

FOAM. Safoam Fire-Fighting Appliance. Engineering, vol. 120, no. 3113, Aug. 28, 1925, p. 276, 1 fig. Apparatus is intended to be used in conjunction with ordinary fire engine, hydrant, or other source of water under pressure; consistency of foam can also be varied to suit working conditions in dealing with any particular fire.

FIRE PROTECTION

STANDPIPES, PRESSURE REGULATION FOR. Regulating Pressure for Standpipe Systems, A. W. Claussen. Fire & Water Eng., vol. 78, no. 13, Sept. 23, 1925, pp. 693-694, 1 fig. Can be best accomplished by insertion of restriction orifices in hose valve or coupling; effective head on orifice for various size nozzles.

FLOW OF FLUIDS

VISCOUS. The Flow of Viscous Fluids Around an Obstacle (Sur l'écoulement des fluides visqueux autour d'un obstacle), C. Camichel, L. Escande and M. Ricaud: Académie des Sciences—Comptes Rendus, vol. 180, no. 21, May 25, 1925, pp. 1557-1559, 4 figs. on supp. plates. Describes phenomena produced by body immersed in incompressible fluid.

FLOW OF LIQUIDS

TURBINE BLADES, APPLICATION TO. The Flow of Liquids with and without Velocity Potential—Application to Turbine Blades (Sur les écoulements des fluides avec et sans potentiel de vitesse. Application au tracé des aubes des turbines), Eydoux. Académie des Sciences—Comptes Rendus, vol. 180, no. 21, May 25, 1925, pp. 1575-1577. Bauersfeld and Lorentz have shown that for energy exchange between liquid and blade, permanent motion of liquid in turbine should be rotational; author discusses this energy exchange, taking account of existence of rotational vector in every movement giving rise to it; reason for free space between distributer and blade which exists in modern rapid turbines; mathematical treatment of gyratory motion.

FLOW OF WATER

STREAMS, COMPUTING BACKWATER CURVES. Combuting Backwater Curves for Surface Slopes in Streams, J. C. Stevens. Eng. News-Rec., vol. 95, no. 14, Oct. 1, 1925, pp. 550-552, 3 figs. Method suited to irregular channels; change in velocity channel friction and energy losses are considered.

FLUMES

METAL, SEMI-CIRCULAR. The Semi-circular Metal Flume. Engineer, vol. 140, no. 3639, Sept. 25, 1925, pp. 326-327, 8 figs. Circumstances in which metal flume is particularly useful; it is mainly formed of thin sheets of galvanized iron which should be commercially pure; notes on flow, general construction, joints, curves, transition and supports.

FLYING BOATS

DESIGN. Recent Progress in Flying-Boat Design, O. E. Simmonds. Engineering, vol. 120, no. 3118, Oct. 2, 1925, pp. 429-431, 5 figs. Points which must be given very careful consideration in design of hull are: (1) static trim; (2) hump resistance; (3) steady running; (4) cleanliness. Airfoil characteristics; parasitic drag; future prospects.

FOREMEN

TRAINING. Training the Foremen of a Manufacturing Organization, L. Ruthenburg. Soc. Automotive Engrs.—Jl., vol. 17, no. 4, Oct. 1925, pp. 350-353; also (abstract) in Machy. (N. Y.), vol. 32, no. 2, Oct. 1925, pp. 97-98. Foreman's environment and responsibility; departmental management; economic and human elements; need for systematic training; feasibility of foreman training; test and lecture material; squad idea of foreman development and promotion; foreman rating.

FOUNDRIES

ACCIDENT PREVENTION. Preventing Accidents in Foundries, H. A. Rowlands. Safety Eng., vol. 50, no. 3, Sept. 1925, pp. 135-139. Minor compensable accidents; protection against burns; cause of lacerations; careless storage; contributors to accidents; drop-hammer guards; protecting sheave blocks.

Reducing Foundry Accidents, E. H. Ballard. Iron Trade Rev., vol. 77, no. 15, Oct. 8, 1925, pp. 895 and 900. Describes methods that have proved effective in plant employing 600; all workers pledged to observe safety rules; education and mechanical safeguards important. (Abstract.) Paper presented before Nat. Safety Council.

COSTING IN NON-FERROUS. Standard Costing Applied to Non-Ferrous Foundries, H. E. Kearsey. Foundry Trade Jl., vol. 32, no. 471, Aug. 27, 1925, pp. 177-178. Outlines scheme which aims at dividing cost of production into number of well defined parts, and making each of these subject of periodic account, where in value of output or services rendered at standard rates, calculated on predetermined basis, are offset against actual charges over concurrent period; varying rates for different alloys; finding cost of fettled casting.

FOUNDRY EQUIPMENT

EXHIBITION, SYRACUSE, N. Y. Exhibition One of the Largest Since the War. Iron Age, vol. 116, no. 16, Oct. 15, 1925, pp. 1045-1047, 1 fig. Account of exhibition of American Foundrymen's Association at Syracuse, N. Y., as a whole, with emphasis on few of the features; new sand-preparing equipment; sand-blast machines; materials-handling equipment and pneumatic tools; furnaces for melting; miscellaneous exhibits.

FUELS. *See Coal; Oil Fuel.*

FURNACES, HEAT-TREATING

CONTINUOUS PUSHER TYPE. Heat Treating Automobile Axle Shafts, I. S. Wishoski. Fuels & Furnaces, vol. 3, no. 9, Sept. 1925, pp. 985-988, 5 figs. Particulars of continuous pusher-type annealing, hardening, and tempering furnaces employed at plant of Hudson Motor Car Co., having capacities of 120 shafts per hour each.

GAS-FIRED. Gas Fired Furnaces Used for Heat Treating Small Parts, E. C. Cook. Fuels & Furnaces, vol. 3, no. 9, Sept. 1925, pp. 1015-1018, 4 figs. Notes on carbonizing, hardening and tempering practice in making small parts for Monroe calculating machines; ingeuious conveyor used in hardening furnaces proves highly efficient.

FURNACES, HEATING

PRACTICE. Furnace Heating, R. J. Sarjant. Fuel, vol. 4, no. 9, Sept. 1925, pp. 385-395, 3 figs. Furnace atmospheres; refractory materials; melting furuaces; open-hearth furnaces; regenerators; valves; construction of furnace; heat balance.

FURNACES, INDUSTRIAL

ATMOSPHERE CONTROL. Control of Furnace Atmosphere, W. Trinks. Fuels & Furnaces, vol. 3, no. 8, Aug. 1925, pp. 793-796. Effect of furnace atmosphere on material being heated and means of controlling furnace atmosphere for gaseous, liquid and solid fuels. Abstract of a study for second volume of Prof. Trinks' treatise on "Industrial Furnaces."

RADIATION. New Radiation Furnace. Fuels and Furnaces, vol. 3, no. 8, Aug. 1925, pp. 833-834, 1 fig. Notes on a gas-fired furnace of radiation type for temperatures up to 2900 deg. Fahr. developed in Krupp plant in Essen, Germany; charge does not come in contact with flame; uniform heat distribution and short heating up time; ease of temperature regulation and high temperatures possible.

FURNACES, METALLURGICAL

HEAT BALANCE. Heat Balance and Efficiency of Electric Furnaces (Le bilan thermique et le rendement du four électrique), Coutagne. Technique Moderne, vol. 17, no. 18, Sept. 15, 1925, pp. 545-551. Compares electric and other furnaces from standpoint of calorific efficiency for fusion, reduction and refining in iron and steel works and gives heat balances for each type.

G

GALVANIZING

TESTS. Galvanizing and Its Tests, C. S. Trewin. Brass World, vol. 21, no. 9, Sept. 1925, pp. 295-299, 3 figs. Methods of galvanizing; hot-dip process; hand-dip galvanizing; wire galvanizing; sheet galvanizing; atmospheric tests of zinc coating; weight of coating.

GALVANOMETERS

VIBRATION. A New Vibration Galvanometer, W. J. H. Moll. Jl. Sci. Instruments, vol. 2, no. 11, Aug. 1925, pp. 361-363, 1 fig. Moving system of new galvanometer is a string, damping of which has been artificially reduced; vibrations of string are converted into rotations of mirror; damping of system may be varied over wide range.

GASES

KINETIC THEORY. The Elements of the Kinetic Theory of Gases. Engineering, vol. 120, nos. 3105, 3107, 3109, 3111 and 3113, July 3, 17, 31, Aug. 14 and 28, 1925, pp. 1-3, 63-64, 125-127, 190-192 and 251-252, 5 figs. Explanation of elements of theory. Formulas and calculations.

GASKETS

MATERIALS AND JOINTS. Solving Some Gasket Problems, A. B. Newell. Oil Engine Power, vol. 3, no. 9, Sept. 1925, pp. 520-521, 3 figs. Hints on proper materials to use and methods of securing durable joints.

GEAR CUTTING

SHAPER CUTTERS. The Design and Application of Gear-shaper Cutters. H. Walker. Machy. (Lond.), vol. 26, no. 677, Sept. 17, 1925, pp. 789-791, 7 figs. Cutting special shapes; helical gear-shaper cutter; manufacture of helical cutter.

GEARS

DIFFERENTIAL, MACHINING. Machining Differential Side Gears, O. S. Marshall. Machy. (N. Y.), vol. 32, no. 2, Oct. 1925, pp. 118-119, 3 figs. Method of supporting work and arrangement of tooling equipment.

INTERNAL. A New Development of Internal Gearing, H. Walker. Machy. (Lond.), vol. 25, no. 678, Sept. 24, 1925, pp. 822-826, 11 figs. Describes gear of enveloping type, since teeth envelop each other closely; combines advantage of extensible center distance with zero pressure angle, facility in generation, and other advantages; method of cutting.

TEETH, MEASUREMENT OF. Measuring Gear Teeth, J. L. Williamson. Am. Mach., vol. 63, no. 16, Oct. 15, 1925, pp. 609-612, 7 figs. Points out that to check eccentricity points of contact should be as near as possible to ends of teeth; to check spacing, points of contact should be near pitch circle; comparative readings cannot be obtained on different testing fixtures unless diameter of ball is same on both machines; comparative readings cannot be obtained on different testing fixtures unless pressure angle of rack tooth is same on both machines. Paper presented before Am. Gear Mfrs.' Assn.

TOOTH-FRICTION EFFICIENCY. Some Recent Developments in Gear Research, E. W. Ham and J. W. Huckert. Am. Mach., vol. 63, no. 16, Oct. 15, 1925, pp. 613-614. Summary of authors' conclusions on tooth-friction efficiency of gears. (Abstract.) Paper read before Am. Gear Mfrs.' Assn.

GIRDERS

LATTICED. Rapid Calculation of Metal Framework (Abaques pour le calcul rapide des charpentes métalliques), C. Jarrett-Knott. Revue Générale de l'Electricité, vol. 18, no. 13, Sept. 26, 1925, pp. 519-525, Develops formulas and charts for calculating poles for transmission lines and gives practical examples of application.

GRINDING

METHODS. Some Interesting Grinding-Machine Work, W. H. Rhodes. Mech. Wld., vols. 77 and 78, nos. 1996, 1999, 2002, 2004, 2008 and 2013, Apr. 3, 24, May 15, 29, June 26 and July 31, 1925, pp. 210-211, 258-259, 306, 339-340, 403 and 82-83, 26 figs. Author gives a few examples of work, along with latest methods which he has found of exceptional interest. Apr. 24 and May 15: Grinding concentric rings. May 29: Methods of inspection, routine and apparatus. June 26: Face and cylindrical grinding at one setting. July 31: Centerless grinding.

GRINDING MACHINES

SURFACE. Wide Range of Sizes are Handled on New Surface Grinder. Automotive Industries, vol. 53, no. 14, Oct. 1, 1925, pp. 588-589, 5 figs. Accurate machining of large pieces by surface grinding is made possible by giant vertical-spindle machine developed by Blanchard Co.

H

HAMMERS

DROP. Drop-hammer Foundations, Mech. Wld., vol. 78, no. 2013, July 31, 1925, p. 85, 2 figs. Methods, which have been found satisfactory, of arranging foundations for each machine, in installation of drop hammers for stamping and drop-forging work. Comparison of foundations.

Four Roll Type of Board Drop Hammer. Forging—Stamping—Heat Treating, vol. 11, no. 9, Sept. 1925, pp. 329-332, 3 figs. Board drop hammers provided with two sets of rolls instead of one have been designed to meet demand for board hammers of large capacity.

HARBOURS

VANCOUVER, B. C. Vancouver Harbour, A. D. Swan. Eng. Jl., vol. 8, no. 10, Oct. 1925, pp. 405-417, 8 figs. Description of harbour, early investigations and reports, and construction of present works.

HARDNESS

TESTS RESEARCH. Hardness Tests Research, G. A. Hankins. Instn. Mech. Engrs.—Proc., vol. 1, no. 3, Mar. 1925, pp. 611-645, 11 figs. Report on effects of adhesion between indenting tool and material in ball and cone indentation hardness tests.

Hardness Tests Research, G. A. Shires. Instn. Mech. Engrs.—Proc., vol. 1, no. 3, Mar. 1925, pp. 647-660 and (discussion) 661-687, 16 figs. Practical aspects of scratch test for hardness; construction and use of practical sclerometer. Bibliography.

HEAT TRANSMISSION

HEAT TRANSFER AND TEMPERATURE VARIATION. The Heating and Cooling of Bodies of Simple Geometrical Shapes. Fuels and Furnaces, vol. 3, no. 8, Aug. 1925, pp. 807-812, 8 figs. Method of calculation of heat transfer and temperature variation with time simplified by use of charts and tables; supplemented by several examples.

HEATING

UNIT HEATERS FOR INDUSTRIAL PLANT. Unit Heaters for Industrial Heating, H. B. Hedges. Am. Soc. Heat. & Vent. Engrs.—Jl., vol. 31, no. 9, Sept. 1925, pp. 437-446, 6 figs. Discussion of the different types of direct-fired and heating-coil types of unit heaters.

HEATING, STEAM

CENTRAL. Lansing Improves District Heating Service, J. E. Woodwell. Power Plant Eng., vol. 29, no. 19, Oct. 1, 1925, pp. 984-988, 8 figs. Extensive paving program gave opportunity to make distribution system large enough for growth during 10-yr. period.

HUMIDITY

CONTROL IN RESIDENCES. Humidity Control in Residences, P. Drinker. Am. Jl. Pub. Health, vol. 15, no. 8, Aug. 1925, pp. 689-695, 6 figs. Draws attention to difficulties encountered in humidity control in average residence, and suggests methods by which unduly dry air conditions can be remedied. References.

HYDRAULIC TURBINES

OPERATION AND DESIGN. Inter-Relation of Operation and Design of Hydraulic Turbines, F. H. Rogers and L. F. Moody. Engrs. & Eng., vol. 42, no. 7, July 1925, pp. 169-187, 25 figs. Paper deals with important relations between operation and design under three principal headings: Selection of type of runner, division of load, and selection of type of turbine to avoid conditions conducive to pitting or corrosion.

TESTING. Tests Made on Largest Hydraulic Turbine at Holtwood, Rob. E. Turner. Power, vol. 62, no. 16, Oct. 20, 1925, pp. 608-610, 7 figs. Allen salt-velocity method used to test 20,000-hp. 24-ft. head turbine, connected to short penstock on river where water has high electrical conductivity.

HYDRO-ELECTRIC DEVELOPMENTS

LA GABELLE, QUEBEC, CAN. Climax of Engineering Skill Exemplified in La Gabelle Power Plant, S. Sevenningson and J. A. McCrory. Elec. News, vol. 34, no. 15, Aug. 1, 1925, pp. 31-35, 8 figs. Particulars regarding development at La Gabelle Rapids on St. Maurice River Quebec; first unit operating 11 months after construction commenced; generator room 368 ft. long, containing four 33,000-kva. Westinghouse units.

PALESTINE SCHEME. Hydro-Electric Scheme for Palestine. Engineer, vol. 140, no. 3638, Sept. 18, 1925, p. 301, 1 fig. Suggestion from M. Imbeaux for production of electrical energy by allowing water from Mediterranean to flow into Dead Sea; proposal is to form enlarged port at Haifa, which could be entered by sea-going vessels, and to construct series of eight locks between sea level and reservoir, at each of which would be electrically operated pumps, so that sea water might be lifted into reservoir and be used for production of electrical energy and also for providing navigable waterway for distance of 64 km. Abstracted translation from Génie Civil.

HYDRO-ELECTRIC PLANTS

AUTOMATIC ELIMINATORS FOR ALLUVIAL MATTER. Automatic Eliminators for Alluvial Matter in Water-Turbine Supplies, H. Dufour. Engineering, vol. 120, nos. 3113, 3115 and 3117, Aug. 28, Sept. 11 and 25, 1925, pp. 247-249, 313-316 and 379-381, 42 figs. Gives actual examples of water turbine wear due to use of water heavily charged with solid matter, and explains conditions under which automatic eliminators were evolved; describes modern installations and results obtained with them; principles of eliminator, which are patented, are same in all cases, but special constructions which have been worked out have been necessary in various cases.

MECHANICAL FEATURES AFFECTING ECONOMY. Mechanical Features Affecting the Reliable and Economical Operation of Hydro-electric Plants, E. A. Dow. Mech. Eng., vol. 47, no. 10, Oct. 1925, pp. 825-831, 9 figs. Deals with subjects of flashboards, trashracks, rack rakes, sluice and headgates, penstock valves, air vents, and discharge-measuring devices from standpoint of economy and reliability of operation, based almost entirely on New England Power Co.'s practice; stresses importance of reducing head losses and leakage and adhering to strength and simplicity in design of hydraulic equipment. (Abridged.)

I

ICE MANUFACTURE

RAW-WATER ICE. Recent Developments in Raw-Water Ice Making, T. Mitchell. South. Engr., vol. 44, no. 1, Sept. 1925, pp. 68-71, 7 figs. Handling air agitating pressure for ice cans; use of ice-can baskets; importance of air-tube location in can.

ICE PLANTS

ELECTRIFICATION. Manufactured Ice—An Opportunity, A. J. Authenreith. Elec. World, vol. 86, no. 16, Oct. 17, 1925, pp. 797-800, 10 figs. Potential market for 3,072,200,000 kw-hr.; economies of electrified plants; distilled water no longer necessary; financing of electrification often greatest problem.

OIL-ENGINE-DRIVEN. Modern Oil-Engine Driven Raw Water Ice Plant, K. Van de Cop. Ice and Refrigeration, vol. 69, no. 4, Oct. 1925, pp. 191-194, 7 figs. Description of 200-ton ice plant of Christian Feigenspan Corp., East Orange, N. J.; compressors driven by oil engines; auxiliaries driven by electric motors; description of ice-making system, air system, ammonia condensers, etc.; operation record.

PERFORMANCE. Performance of an Ice Plant, N. C. Wells. Ice and Refrigeration, vol. 69, no. 4, Oct. 1925, pp. 212-215. Interesting study presented as a thesis to Faculty Dept. of Mechanics at Univ. of Cal., Berkeley, Calif., for Bachelor of Science degree; study was to devise some means, mathematical or graphical, by which it would be possible to determine with a fair degree of accuracy efficiency of an ice or cold-storage plant with reference to best performance of that plant under ideal conditions as a basis, also, to performance of other plants, taking into consideration at least major variables. Extensive table of data and results.

IMPACT TESTING

PENDULUM MACHINE. Pendulum Impact Testing Machine. Machy. (Lond.), vol. 26, no. 677, Sept. 17, 1925, pp. 793-794, 3 figs. New type of machine for transverse and tensile shock tests, introduced by A. J. Amsler & Co. of Switzerland.

INDUSTRIAL MANAGEMENT

DEPARTMENT-HEAD REPORTS. Getting the Facts Across, J. Eigelberner. Indus. Mgmt. (N. Y.), vol. 70, no. 4, Oct. 1925, pp. 214-217. Essentials of effective reports from department heads; why reports fail; reader's viewpoint; unity; coherence, proportion and style in report.

INEFFICIENCY AND WASTE IN INDUSTRY. Inefficiency and Waste in American Industry, B. P. Chass. Indus. Mgmt. (N. Y.), vol. 70, no. 4, Oct. 1925, pp. 239-241. Deals with factors that make for industrial waste, such as over-production super-variety of modes and styles, overcrowded business, unemployment, restricted production and physical disability.

OPERATING EFFICIENCY, AUDIT OF. Audit of Process, F. A. Schmidt. Taylor Soc.—Bul., vol. 10, no. 5, Oct. 1925, pp. 210-219, 6 figs. Ingenious and stimulating discussion of lines of approach in auditing operating efficiency; balance between organization and business problem; balance between length and frequency of path; balance between static and dynamic elements; balance between development and status quo.

SMALL FACTORIES. Factory Methods for the Small Manufacturing Plant, J. E. Dykstra. Am. Mach., vol. 63, no. 15, Oct. 8, 1925, pp. 569-572, 3 figs. Control of stores and routing; production and cost systems; determining amount of premium allowance; recording sequence of operations.

INDUSTRIAL ORGANIZATION

RUSSIA. Present-day Russia from the Economic and Industrial Standpoint (La Russie actuelle au point de vue économique et industriel), A. Nicolaïeff. Technique Moderne, vol. 17, no. 18, Sept. 15, 1925, pp. 557-564. Reviews organization and condition of industries and commerce; nationalized industry; production and consumption; transportation on land and sea, concluding that Soviet regime prevents Russia from again taking its place among nations.

INDUSTRIAL PLANTS

BRANCH PLANTS. Do Branch Plants Pay? A. G. Anderson. Mgmt. & Admin., vol. 10, no. 4, Oct. 1925, pp. 187-190. Two manufacturers analyze problem and find different answers; one suggests consolidation of two plants, other suggests continuation of established branch plant.

MAINTENANCE. Adequate and Economical Plant Maintenance, N. L. Sammis. Indus. Mgt. (N. Y.), vol. 70, no. 4, Oct. 1925, pp. 194-197. Prevention of excessive depreciation on factory properties; deals with exterior and interior of buildings, and fixed equipment of both.

RELOCATION. The Why and How of Industrial Relocation, J. A. Piquet. Indus. Mgmt. (N. Y.), vol. 70, no. 4, Oct. 1925, pp. 242-247, 7 figs. Advantages of proper plant location.

INSULATING MATERIALS, ELECTRIC

DIELECTRIC-LOSS MEASUREMENTS. Dielectric Loss Measurements on Commercial Insulating Materials, C. Dannatt. World Power, vol. 4, no. 21, Sept. 1925, pp. 141-146, 4 figs. Deals with complete testing equipment designed for laboratory tests on dielectric losses of insulating materials at power frequencies and working stresses and temperatures; design, calibration, and performance of oil-immersed electrostatic wattmeter are described, and further matters relating to auxiliary apparatus are discussed.

INSULATORS, ELECTRIC

DISRUPTIVE STRENGTH. Determining Disruptive Strength of Glass and Ceramic Material (Die Bestimmung der elektrischen Durchschlagsfestigkeit von Gläsern und Keramischen Stoffen), M. Pirani and H. Schönborn. Zeit. für Technische Physik, vol. 6, no. 7a, 1925, pp. 351-354, 3 figs. Discusses a method for determining temperature of disruptive strength which also gives a measure of electric conductivity of glass and ceramic materials.

INTERNAL-COMBUSTION ENGINES

HIGH-SPEED. The High-Speed Internal-Combustion Engine, H. R. Ricardo. Automobile Engr., vol. 15, nos. 202, 203 and 204, May, June and July, 1925, pp. 135-138, 166-168 and 206-210, 17 figs. General introduction to thermodynamics of subject. May: Detonation. June: Turbulence. July: Lubrication.

THERMAL EFFICIENCY OF IDEAL. The Determination of the Thermal Efficiency and Performance of Ideal Internal Combustion Engines, R. W. Bailey. Engineering, vol. 120, no. 3118, Oct. 2, 1925, pp. 403-405, 1 fig. Refers to method employed by author and derives algebraic relations upon which method is based; presents graphs and tables necessary for graphical and arithmetical methods of solution; indicates how by use of specially divided scales, slide rule may be used to yield results in few seconds; gives several examples which are sufficient to make clear utility of proposal.

[*See also Airplane Engines; Automobile Engines; Diesel Engines; Oil Engines; Semi-Diesel Engines.*]

INVERTERS

The Inverter, D. C. Prince. Gen. Elec. Rev., vol. 28, no. 10, Oct. 1925, pp. 576-681, 12 figs. Author has taken rectifier circuit and inverted it, turning in direct current at one end and drawing out alternating current at other; new apparatus, consisting of pliotron tubes, transformers, reactances, etc., is known as "Inverter" and offers a means of converting direct current into alternating without use of any rotating machines.

IRRIGATION

COLUMBIA BASIN PROJECT. Report Against Columbia Basin Irrigation Project. Eng. News-Rec., vol. 95, no. 13, Sept. 24, 1925, pp. 502-503. Study by Mead and Edwards based on four previous investigations indicates development not now warranted.

IRON AND STEEL

CORROSION. An Electrochemical Method for Estimating the Corrosion of Iron and Steel, H. Beeny. Am. Electrochem. Soc.—advance paper, no. 14, for mtg. Sept. 24-26, 1925, pp. 135-149, 11 figs. Tests were undertaken to determine influence of manganese on corrosion of large number of hypoeutectoid steel samples; it appears probable that form of test described will prove of value in determining susceptibility of metals to atmospheric corrosion.

IRON CASTINGS

FREMONT TESTS. Some Frémont Tests on a Varying Section of Grey Iron. Foundry Trade Jl., vol. 32, no. 471, Aug. 27, 1925, p. 182, 2 figs. Experiments with Frémont machine show necessity of making test pieces correspond so far as is practically possible with average thickness of casting.

SAND BLASTING. Sandblasting Castings Prepares Surface for Finishing Process, H. Orr. Foundry, vol. 53, no. 18, Sept. 15, 1925, pp. 747-749 and 751. Sand-blasting is accomplished by discharging abrasive through nozzle at high velocity by compressed air; compressed air is harnessed to discarge the abrasive by three general methods; direct-pressure, suction and gravity systems; types of blasting machines; and kinds of abrasives.

L

LABORATORIES

HYDRAULIC. Hydraulic Testing and Research Laboratory of Société Hydrotechnique de France [Le laboratoire d'essais et de recherches hydrauliques de la Société hydrotechnique de France à Beauvert (Grenoble)], P. Leroux. Revue Générale de l'Electricité, vol. 18, no. 6, Aug. 8, 1925, pp. 233-240, 5 figs. Discusses equipment of laboratory and services being rendered to manufacturers by publishing results of research and carrying out experiments desired to give an impartial opinion of industrial value of new machinery.

LOCOMOTIVES

ELECTRIC. *See Electric Locomotives.*

LOGGING

ELECTRIC. Electric Logging, P. A. Wickes. Mech. Eng., vol. 47, no. 10, Oct. 1925, pp. 820-822, 3 figs. Review of progress; types of machines; advantages of electric logging.

STEAM. Steam Logging, Jos. W. Gill. Mech. Eng., vol. 47, no. 10, Oct. 1925, pp. 815-820, 12 figs. Development of steam logging engine and its use on Pacific Coast; methods of logging in general use, and types of engines applied to them. (Abridged.)

M

MACHINE-TOOL INDUSTRY

AMERICAN EXPORT MARKET. The Foreign Trade Outlook in the Machine Tool Field, W. H. Rastall. Machy. (N. Y.), vol. 32, no. 2, Oct. 1925, pp. 109-110, 2 figs. Machinery exports to Asia; European machine-tool markets; what may be expected in Japan, India and China; review of German market prospects; exports to Great Britain. (Abstract.) Paper presented before Machine Shop Practice Division of Am. Soc. Mech. Engrs.

MACHINE TOOLS

AUTOMOTIVE INDUSTRY. Machine-Tool Needs of the Automotive Industry, R. M. Hidey. Soc. Automotive Engrs.—Jl., vol. 17, no. 4, Oct. 1925, pp. 359-360. Relative merits of single- and multi-purpose machine tools; matters relating to safeguarding of such tools; benefits attendant upon better co-operative effort and necessity of making greater expenditures for development of machine-tool industry; author makes five specific recommendations to machine-tool builders.

INDIVIDUAL DRIVE. Individual Drive of Machine Tools, K. Meller. Eng. Progress, vol. 6, no. 7, July 1925, pp. 223-226, 11 figs. Fundamental features of correct individual drive of machine tools; objections made to individual motor drive are not justified, if latter is correctly designed.

MACHINERY

AUTOMOBILE PARTS FOR. Using Automobile Parts in Machine Construction, D. A. Hampson. Machy. (N. Y.), vol. 32, no. 2, Oct. 1925, pp. 127-129, 4 figs. Gives examples of use of automotive parts; silent belt drive for milling machines; exhaust blower made from radiator fan; brake for stopping lineshaft; tapping machine made from automobile parts; etc.

MAGNESIUM ALLOYS

CASTING. Magnesium and Its Alloys, S. Daniels. Mech. Eng., vol. 47, no. 10, Oct. 1925; pp. 796-799, 5 figs. Manufacture of magnesium ingot; wrought magnesium and its uses; mechanical properties of pure magnesium; alloys of magnesium; melting practice; pouring temperature and rationale; cleaning of pots; patterns and molding sand; green and dry-sand molding; as to casting of magnesium or its alloys, foundry difficulties may be largely eliminated by attention to inherent characteristics of material.

MALLEABLE CASTINGS

HEAT TREATING. Heat Treating Malleable Castings Prior to Galvanizing. Foundry vol. 53, no. 18, Sept. 15, 1925, pp. 741-742, 2 figs. Heat-treating process evolved from experiments carried out by U. S. Bureau of Standards; malleable castings which are to be galvanized are heated to 1200 deg. fahr. and quenched in water; these are then galvanized in regular manner; specimens treated in this way show impact value of about 140 per cent of original value.

PNEUMATIC. Handling Materials by Air in Industry, C. L. Hubbard. Indus. Engr., vol. 83, no. 9, Sept. 1925, pp. 427-431 and 454-456, 17 figs. Deals with quantity of air required, materials that may be handled, and equipment used for this purpose.

MATTER

COMPOSITION OF. Matter—Is There Anything in It? W. R. Whitney. Indus. & Eng. Chem., vol. 17, no. 9, Sept. 1925, pp. 885-890, 3 figs. Experiments have shown that matter is electrical and that it is separable into its electrical charges; moreover, electrical charge is spotted, that is, it is localized in finite units at points in space.

MEASURING INSTRUMENTS

TORSION METER. A Distant Indicating Torsion-meter and some Problems of Shaft Oscillations, E. B. Moullin. World Power, vol. 4, no. 22, Oct. 1925, pp. 206-217, 15 figs. Deals with mounting and measuring problems in torsion meter design; electrical method of measuring movement; photographic records of torque pulsations; torsional oscillations of shafts and resonance.

METALS

ENDURANCE. On the Effect of Fillet on the Endurance of Metals, C. Shiba and K. Yuasa. Jl. Faculty of Eng., Tokyo Imper. Univ., vol. 15, no. 10, Feb. 1925, pp. 317-338, 51 figs. on supp. plates. Details of and results obtained from experiments carried out as follows: six groups of test pieces having different radii of fillet were cut out from one block of mild steel, and first general properties of material were observed, secondly endurance of metal was tested by means of repeated bending and thirdly, in order to clarify state of stress distribution caused by bending and also due to different fillets, photoelastic method was used.

IMPURITIES IN. Metallography for Engineers, W. Rosenhain. Metallurgist (Supp. to Engineer, vol. 140, no. 3639), Sept. 25, 1925, pp. 136-139, 4 figs. Deals with impurities; determination of nature and amount; types of impurities; action and effect on mechanical properties of metal; non-metallic impurities in steel.

INTERNAL STRESSES. Internal Stresses. Metallurgist (Supp. to Engineer, vol. 140, no. 3639), Sept. 25, 1925, pp. 143-144. Points out that while improper cold working is main source of internal stress, another is question of thermal expansion and of volume changes which accompany hardening and tempering.

PLASTIC DEFORMATION. The Nature of Plastic Deformation, (Veber das Wesen der plastischeu Verformung), H. Hencky. Zeit. des Vereines deutscher Ingenieure, vol. 69, nos. 20 and 39, May 16 and Sept. 26, 1925, pp. 695-696 and 1253-1254, May 16: Equilibrial conditions with small deformations. Sept. 26: Flow of plastic masses and working loss in forging and rolling process.

MILLING MACHINES

VERTICAL. Large Vertical Milling Machine. Mech. Wld., vol. 78, no. 2019, Sept. 11, 1925, p. 200, 1 fig. Particulars of machine manufactured by Alfred Herbert Ltd., Coventry, England, which takes work up to 62 in. by 38 in. by 28½ in., and should prove particularly suitable for railway, marine, and similar shops.

MINES

SURVEYING. Mine Surveying at Canadian Collieries, A. L. Hay. Colliery Guardian, vol. 130, no. 3375, Sept. 4, 1925, pp. 450-451, 1 fig. Description of survey methods in vogue on surface and in mines of Dominion Coal Co. From paper read before Min. Soc. Nova Scotia.

MOLDS

FORMED WITH CORES. Making Moulds with Cores. Metal Industry (Lond.), vol. 27, nos. 10 and 13, Sept. 4 and 25, 1925, pp. 217-219, 4 figs.; and 289-290, 10 figs. Sept. 4: Method of casting planing machine table; in this example is shown advantage of complete use of cores for making of molds for castings that, while of similar design, are required in various lengths; especially is this beneficial with long castings for which camber has to be allowed. Sept. 25: Gear wheels, considering both spur and worm wheels.

PERMANENT. Hold Uniform Temperature in Permanent Molds, P. Dwyer. Foundry, vol. 53, no. 19, Oct. 1, 1925, pp. 787-790 and 798, 7 figs. Discusses permanent-mold process; success of present process is based on many factors all of which hinge on fundamental fact that mold must be maintained at reasonably uniform temperature; oil-cooled molds; mold temperature; predetermined temperatures.

Permanent Mold Aluminum Castings and Their Field of Usefulness, J. B. Chaffe, Jr. Am. Metal Market—Monthly Rev. Section, vol. 32, no. 202, Oct. 17, 1925, pp. 11-12 and 14, 6 figs. Comparison of permanent-mold practice with sand casting; pressure-die castings and permanent-mold castings; field of application of three types of aluminum-alloy castings.

SEMI-PERMANENT TOP PART. Using a Semi-Permanent Top Part, A. J. Richman Metal Industry (Lond.), vol. 27, no. 11, Sept. 11, 1925, pp. 243-245, 4 figs. Describes molding and casting of large base-plate castings, using semi-permanent top part; same top part was used for whole order of 12 castings, after which it was still in good condition for many more.

MOLYBDENIUM

CANADIAN-ORE CONCENTRATION. The Concentration of Canadian Molybdenite Ores, W. B. Timm and C. S. Parsons. Min. Jl., vol. 55, no. 4699, Sept. 12, 1925, pp. 713-714, 1 fig. Character and types of molybdenite ores, concentration best suited, general flow-sheet, flotation, market requirements, market quotations, present outlook, and limitations to workable deposits.

MOTOR BUSES

Gasoline-Electric. New Development in Gas-Electric Coaches. Railroad Herald. vol. 29, no. 10, Sept. 1925, pp. 20-23, 4 figs. Versare-Westinghouse 8-wheel, 2-truck design seats 44 passengers, weighs 18,000 lb., and can turn around in practically its own length. See also Ry. & Locomotive Eng., vol. 38, no. 9, Sept. 1925, pp. 270-272, 3 figs.

Tillings-Stevens Gas-Electric Bus Introduced in America. Automotive Industries, vol. 53, no. 15, Oct. 8, 1925, pp. 615-617, 5 figs. Four chassis with English electric units and mechanical parts of United States make are shown at Atlantic City; Waukesha engine used; single and double-deck bodies.

Low-Loading. Low-Loading Passenger Chassis. Motor Transport (Lond.), vol. 41, no. 1071, Sept. 7, 1925, pp. 279-282, 7 figs. Development of special low-pitched vehicle and its advantages for coach and omnibus work in England.

Operation. Functions of the Motor Bus, P. Shoup. Elec. Ry. Jl., vol. 66, no. 13, Sept. 26, 1925, pp. 494-496, 4 figs. As a feeder to electric railway lines and in development of new territory where traffic is light, bus has a definite place in transportation scheme; its operation is more expensive than that of cars but public, through familiarity with cost of operating private automobiles, is becoming more and more willing to grant adequate fares to bus carriers.

Unified Railway and Bus System. Organization and Operation of a Unified System, C. W. Stocks. Elec. Ry. Jl., vol. 66, no. 13, Sept. 26, 1925, pp. 520-524, 5 figs. Notes on subject of local transportation; considers problems of operating a unified railway and bus system.

MOTOR-TRUCK TRANSPORTATION

Commodity Transportation. Commodity Transportation by Motor Truck, J. G. McKay. Pub. Roads, vol. 6, no. 6, Aug. 1925, pp. 124-126. Summary of results of transportation surveys conducted by U. S. Bur. Pub. Roads.

MOTOR TRUCKS

Demountable-Body Type. Economics of the Demountable Type of Truck Body, T. D. Parsons. Power Wagon, vol. 35, no. 249, Aug. 1925, pp. 5-9, 6 figs. Description of demountable type of body, its advantages, and how it operates; eliminates two trucks; savings in operation.

N

NICKEL

Manufacture and Applications. The Manufacture and Applications of Nickel, M. Cook. Chem. Age (Lond.), vol. 13, no. 320, Aug. 1, 1925, pp. 9-11. Discusses modern processes employed in manufacture of nickel, methods of working metal, and effects of impurities commonly present; properties of metal which have permitted its application to a number of different purposes.

O

OIL ENGINES

Dynamometers for Testing. Fluid Friction Dynamometer for Testing. Oil Engine Power, vol. 3, no. 9, Sept. 1925, pp. 529-530, 2 figs. Smooth-disk brake type of hydraulic dynamometer for high-speed work, such as steam-turbine testing, has long been in use; this type of brake has recently been arranged for low-speed machines of relatively large power such as oil engines, by introduction of an increasing gear between prime movers and dynamometer; manufactured by Standard Turbine Corp. of Scio, N. Y.

Fuel Injection. Fuel Injection Without the Use of an Air Blast, Johnstone-Taylor. Gas & Oil Power, vol. 20, nos. 239 and 240, Aug. 6 and Sept. 3, 1925, pp. 229-231 and 255-256, 10 figs. Discusses airless injection, including main requirements, working cycle, combustion, spray; pumps cam-driven with by-pass; new systems of injection and combustion; Arschaouloff system.

Valve-Efficiency Maintenance. Maintaining Valve Efficiency, A. B. Newell. Oil Engine Power, vol. 3, no. 8, Aug. 1925, pp. 464 and 469, 5 figs. Some ideas on grinding and keeping in shape four-cycle engine valves.

Whaley. Whaley Constant-Pressure Oil Engine, Oil Engine Power, vol. 3, no. 9, Sept. 1925, p. 509. Particulars of new single-acting four-cylinder two-cycle engine rated at 750 hp. by Sun Shipbldg. Co., and invented by W. B. Smith Whaley; cylinder is kept floating on a pressure reservoir both by an overflow valve and by a piston valve as long as fuel is being injected and burnt; usual form of port scavenging is supplemented by high-pressure scavenging, and after-charging, pressure at which two latter processes are carried out being around 45 lb. per sq. in.

OIL FUEL

Burners. Practical Handling of Fuel Oil Burning Equipment—Burners, A. F. Brewer. Combustion, vol. 13, no. 3, Sept. 1925, pp. 153-157, 6 figs. Requirements of an effective burner, the various types and principles upon which they are based, advantages and disadvantages of various means of atomization, operation and care of burners.

OXY-ACETYLENE WELDING

Copper. Oxy-Acetylene Welding of Copper, Cyril S. Smith. Metal Industry (N. Y.), vol. 23, no. 9, Sept. 1925, pp. 360-361, 5 figs. Experiments showing that copper can be welded without oxidation.

Storage Tanks. Procedure Control in Welding a Storage Tank. Boiler Maker, vol. 24, no. 9, Sept. 1925, pp. 249-252, 13 figs. Considerations involved in fabricating a tank of 3-16-in. plate, to hold 1500 gal. of fuel oil under gravity pressure.

Welding with Tobin Bronze. Welding with Tobin Bronze, W. C. Swift. Am. Welding Soc.—Jl., vol. 4, no. 7, July 1925, pp. 26-28. Describes process of welding with Tobin bronze, which is phrase that has been adopted by welders to describe process of joining by oxyacetylene welding with Tobin bronze.

P

PAPER MANUFACTURE

Pulp Manufacture. Chemistry of the Sulfite Process, R. N. Miller and W. H. Swanson. Indus. & Eng. Chem., vol. 17, no. 8, Aug. 1925, pp. 843-847, 3 figs. Studies of acid hydrolysis of wood.

PATENTS

Ownership. Common Pitfalls of Patent Ownership, H. A. Toulmin, Jr. Am. Mach., vol. 63, no. 17, Oct. 22, 1925, pp. 653-654. Points out that all persons engaged in manufacturing, whether they be employers or employees, should know something about patent law; employees who make inventions should have written contracts with their employers regarding ownership of patents, and stating what remuneration, if any, should be received by inventors for right to use them; decisions by Supreme Court.

PATTERNS

Shaping of. The Proper Shaping of Patterns (Beitrag zur Frage der formgerechten Modelle), F. Brobeck. Praktischer Maschinen-Konstrukteur, vol. 58, no. 35, Sept. 1, 1925, pp. 558-560, 7 figs. Discusses spoiled castings and causes which can be traced to improper shaping of patterns; gives examples of proper and improper pattern forms.

PAVEMENTS

Reinforcement. Designing Pavement Reinforcement. Pub. Wks., vol. 56, no. 9, Sept. 1925, pp. 329-330. Rational formula for determining amount of steel and spacing of joints and relation between the two, as developed by Bur. Pub. Roads.

PHOTOGRAPHY

Colour. Instantaneous Colour-Photography Process (Procédé de photographie instantanée des couleurs), G. A. Rousseau. Académie des Sciences— Comptes Rendus, vol. 181, no. 3, July 20, 1925, pp. 110-112. Describes process which is said to give excellent results with exposure of 1-25 sec. in good light, without use of external screens; application of process to color cinematography.

PLANERS

Open-Side. Open-Side Planer with New Features. Iron Age, vol. 116, no. 14, Oct. 1, 1925, pp. 889-890, 4 figs. Rigid construction provided, and convenience secured by simplifying locking and unlocking of rail, setting feed and other operations; produced by G. A. Gray Co., Cincinnati.

POLES

Steel-Concrete. Steel-Concrete Poles for Transmission Lines. Elec. Rev., vol. 97, no. 2495, Sept. 18, 1925, pp. 453-455, 5 figs. Manufacture and installation of "Stobie" pole, invented by J. C. Stobie, of Adelaide Elec. Supply Co., Australia.

POTASH

Sea Water, Extraction from. Potash from Sea Water (Le acque marine e il problema del potassio), E. Niccoli. Ciornale di chimica industriale & Applicata, vol. 7, no. 4, Apr. 1925, pp. 187-194, 9 figs. Method of removing of potash salts from sea water; process described is used in Tripoli on the Mediterranean and sun is used to furnish part of heat for evaporation.

POWER FACTOR

Measurement at Radio Frequencies. A Useful Circuit for Dielectric Constant, Power Factor, and Conductivity Measurements at High Frequencies, P. A. Cooper. Jl. Sci. Instruments, vol. 2, no. 11, Aug. 1925, pp. 342-347, 4 figs. Standard method of measuring power factor at radio frequencies is described and its limitations discussed; expressions are developed which can be applied to measurement of power factor, dielectric constant, and conductivity.

PULVERIZED COAL

Boiler Firing. Pulverized Fuel for Boiler Firing in a Paper Mill. Engineer, vol. 140, no. 3638, Sept. 18, 1925, pp. 292-293, 4 figs. Unit pulverizer installation at works of T. Taid & Sons, paper makers, of Inverurie, Aberdeenshire; plant consists of two 5-drum Stirling boilers, erected side by side, each fitted with superheater, gases passing from boilers to standard Green's economizer; pulverizing plant consists of two No. 10 Atritors, each having normal capacity of 2000lb. of coal per hr.

Tests of a Large Boiler Fired With Powdered Coal, H. Kreisinger, J. Blizard, C. E. Augustine and B. J. Cross. U. S. Bur. Mines, Bul. 237, 1925, 74 pp., pp. 16 figs. partly on supp. plates. Results of 26 tests of a four-pass Edgemoor boiler fired with powdered coal at Lakeside station of Milwaukee Elec. Ry. & Light Co., to determine thermal efficiencies and capacities obtainable by burning powdered coal under large central-station boilers and possibility of operating such boilers continuously at high efficiency and capacity without destructive effect on furnaces and without difficulties in refuse removal.

PUMPING ENGINES

Vertical Triple-Expansion. Duty Tests of Vertical Triple-Expansion Pumping Engines, Milwaukee, Wis., Chas. A. Cahill. Mech. Eng., vol. 47, no. 10, Oct. 1925, pp. 841-844 (including discussion), 4 figs. Summary of official tests of pumps A and B at Riverside pumping station of Milwaukee water works; advantages of this type of pumping engine are extreme reliability, high economy, low maintenance cost.

PUMPS, CENTRIFUGAL

Uniflow-Engine-Driven. Installation Problems of a Uniflow-Engine-Driven Centrifugal Pump. Power, vol. 62, no. 14, Oct. 6, 1925, pp. 519-521, 2 figs. Single-cylinder reciprocating uniflow engine preferred to triple-expansion; foundation was installed without layout drawing after set was aligned.

R

RADIOACTIVITY

Origin of. Origin of Radioactivity (Remarques sur l'origine de la radioactivité), E. Briner. Académie des Sciences—Comptes Rendus, vol. 180, no. 21, May 25, 1925, pp. 1586-1589. Remarks on classical theory of atomic disintegration of radioactive elements, considered mainly from viewpoint of emission of thermal energy.

RADIOTELEGRAPHY

Wave Propagation. On Recent Advances in Wireless Propagation Both in Theory and in Practice. A. S. Eve. Franklin Inst.—Jl., vol. 200, no. 3, Sept. 1925, pp. 327-333, 4 figs. Advances in theory; atmospherics; extinction of signals; wandering waves.

RADIOTELEPHONY

Interference Problem. The Radio Interference Problem and the Power Company, L. U. Corbett. Am. Inst. Elec. Engrs. — Jl., vol. 44, no. 10, Oct. 1925, pp. 1057-1063. Summarizes growth in number of complaints of radio interference, and outlines typical causes in various fields of utilization of electricity with aim of indicating relative part chargeable to power companies; discusses radio industry itself, movable or extraneous sources, signal lines and equipment, power lines, connected power-company equipment, connected commercial loads, household circuits and appliances, and describes location methods.

RAILS

Prolonging Life of. Means of Prolonging the Life of Rail. Ry. Eng. & Maintenance, vol. 21, no. 10, Oct. 1925, pp. 410-414, 2 figs. Quality of rail when new; handling of rails; correct laying of rails; remedies for damaged and defective rails; sawing off rail ends; rerolling rails; rust; worn joints. Committee report before Roadmasters' & Maintenance of Way Assn. See Railroad Herald, vol. 29, no. 11, Oct. 1925, pp. 21-23.

Prolonging Life of. Report on Means of Prolonging the Life of Rail. Ry. Age, vol. 79, no. 13, Sept. 26, 1925, pp. 568-570. Quality of rail when new; correct laying of rails; chipped and battered ends and defective and damaged rails; remedies for damaged and defective rails; sawing off rail ends; rerolling of rail; worn joints. (Abstract.) Report before Road masters' & Maintenance of Way Assn.

RAILWAY ELECTRIFICATION

CHICAGO, ILL. Power Supply Facilities for Illinois Central Railroad Electrification. Elec. Ry. Jl., vol. 66, nos. 8 and 10, Aug. 22 and Sept. 5, 1925, pp. 269-272 and 357-360, 5 figs. Principal features of power supply facilities and distribution system design for electrification of Illinois Central Railroad terminal at Chicago; design features of four-wire catenary distribution system; operation will be at 1500 volts d.c.; mercury-arc rectifiers to be used in some stations.

TRUNK LINES. Electrifying the Trunk Lines, W. S. Murray. Elec. Ry. Jl., vol. 66, no. 13, Sept. 26, 1925, pp. 517-519, 2 figs. A program that will make it possible for railroads to increase their capacity and give better service with a minimum capital expenditure.

UNITED STATES. Railway Electrification in the United States, A. L. Stead. Ry. Gaz., vol. 43, no. 7, Aug. 14, 1925, pp. 228-231, 5 figs. Describes 30 years' progress on New York, New Haven & Hartford Ry., first line in United States to develop electrical operation.

VIRGINIA. Virginian Railway Electrification Opened. Elec. Ry. Jl., vol. 66, no. 14, Oct. 3, 1925, pp. 539-541, 5 figs. Service officially inaugurated on Sept. 21 marks new era on this heavy coal road; by hauling 6000-ton trains up 2 per cent grade, capacity of entire system is increased; radio communication between locomotives being tried experimentally.

RAILWAY MANAGEMENT

MATERIALS CONTROL. The Control of Material in Railroad Operation, A. Lazarus. Indus. Mgmt. (N. Y.), vol. 70, no. 4, Oct. 1925, pp. 198-204. Modern management produces dividends from neglected source; effective handling of stores department; material-control forms of Pennsylvania railroad system; ordering material.

MATERIAL STORES ACCOUNTS. Procedure for Material Stores Accounts Payable, J. C. McNeil. Ry. Rev., vol. 77, no. 12, Sept. 19, 1925, pp. 429-433, 6 figs. Suggestions offered for simplified method of handling receipts and disbursements of supplies.

RAILWAY MOTOR CARS

GASOLINE-ELECTRIC. Rock Island Converts McKeen Cars to Gas Electric Drive, E. Wanamaker. Ry. Age, vol. 79, no. 12, Sept. 19, 1925, pp. 507-511, 7 figs. Three are equipped with electromotive power units at Horton shop; conversion cost $70,000.

The Vesare-Westinghouse Petrol-Electric Omnibus. Engineering, vol. 120, no. 3115, Sept. 11, 1925, pp. 320-325, 4 figs. Constructed by Vesare Corp., Albany, N. Y., for conveyance of passengers.

RAILWAY OPERATION

TRAIN CONTROL. Train Control on the Norfolk & Western. Ry. Elec. Engr., vol. 16, no. 9, Sept. 1925, pp. 269-272, 3 figs. Three-speed continuous inductive system makes good record on single-track division.

Continuous Train Control with Cab Signals, E. Von Bergen. Railroad Herald, vol. 20, no. 11, Oct. 1925, pp. 18-21. Advantages of continuous cab signal; recommends automatic stop of continuous induction type, incorporating certain features which are enumerated.

RAILWAY SWITCHES

PRINCIPLES OF SWITCH WORK. The Fundamental Principles of Switch Work, Rob. White. Ry. Rev., vol. 77, nos. 10, 11, 14 and 15, Sept. 5, 12, Oct. 3 and 10, 1925, pp. 347-348, 1 fig.; 383-384; 518-519; and 557-558. Basic details of track construction and maintenance through turnouts which are sometimes imperfectly attended to or neglected.

RAILWAY TIES

METAL. Metal Railway Ties (Les Traverses métalliques de Chemins de Fer), M. Duplaix. Industrie des Voies Ferrées et des Transports Automobiles, vol. 19, no. 224, Aug. 1925, pp. 364-366. Discusses increased use of metal ties and continued reduction in cost of production by steel works; form of ties; ballasting; resistance; joints of rails and ties; describes Levaire tie weighing 80 kg.

RAILWAYS

FUNICULAR. Cable Conveyors (Transporteurs à cables), câbles), F. Crestin. Génie Civil, vol. 87, no. 11, Sept. 12, 1925, pp. 224-227. Discusses Italian regulations on funicular passenger lines, nature and composition of cables, minimum profile of load cables, method of calculation.

OIL ENGINES ON, FUTURE OF. Future of Oil Engines on Our Railroads, J. R. Wilson. Oil Engine Power, vol. 3, no. 10, Oct. 1925, pp. 570-571. Rich possibilities are offered by development of Diesel power applied with electric or other forms of transmission.

RECTIFIERS

TYPES. Rectifiers. Engineer, vol. 140, nos. 3630, 3631, 3632, 3633, 3634, 3635, 3636, 3637, 3638, 3639, 3640 and 3641, July 24, 31, Aug. 7, 14, 21, 28, Sept. 4, 11, 18, 25, Oct. 2 and 9, 1925, pp. 84-85, 107-108, 138-140, 161-162, 185-187, 220-221, 223-235, 264-266, 287-289, 318-320, 346-347 and 368-370, 127 figs. Advantages; discussion of different types. July 31: glass-bulb construction; back firing; Aug. 7 and 14: Mercury-vapor rectifiers. Aug. 21: Tungar rectifiers for charging small accumulators. Aug. 28: and Sept. 4: Electrolytic rectifiers. Sept. 11: Vibrating, reed rectifiers. Sept. 18, 25 and Oct. 2: Thermionic valves. Oct. 9: Delon apparatus for testing cables with high-pressure direct current; neon-tube rectifier.

REDUCTION GEARS

WORM-GEAR. Data for Selection of Worm Gear Speed Reducers, F. A. Emmens. Belting, vol. 27, no. 3, Sept. 1925, pp. 26, 28, 30 and 32, 5 figs. Relation of horsepower, load and torque; calculating capacity of reducer to meet certain operating conditions.

REFRIGERATING MACHINES

ROTARY PISTON COMPRESSORS. Small Refrigerating Machines with Rotary Piston Compressors, R. Plank, M. Krause and W. Tamm. Eng. Progress, vol. 6, no. 8, Aug. 1925, pp. 257-261, 6 figs. General remarks on rotary piston machines; M. Güttner's small ammonia refrigerating compressor.

REFRIGERATION

BRINE, CHEMICAL TREATMENT OF. Chemical Treatment of Refrigeration Brine to Prevent Corrosion, E. P. Poste. Refrigeration, vol. 37, no. 3, Sept. 1925, pp. 44-46, 1 fig. Alkaline brine; methods of producing alkalinity; interpretation of curves; experimental brine treatment; commercial brine treatment.

RESEARCH

INDUSTRIAL. The Scientific and Industrial Research Council of Alberta, E. Stansfield. Eng. Jl., vol. 8, no. 10, Oct. 1925, pp. 419-422, 8 figs. Its early history and extent of its activities.

RESERVOIRS

ROOFED CIRCULAR. Roofed Reservoir and Pipe Tunnel for Small Water System. Eng. News-Rec., vol. 95, no. 14, Oct. 1, 1925, pp. 540-542, 5 figs. Circular flat-roof concrete structure; river tunnel for 24-in. main construction methods and rapid progress.

WATERWEED IN. Troubles with Waterweed in Open Shallow Reservoir, E. G. Ritchie. Eng. News-Rec., vol. 95, no. 16, Oct. 15, 1925, pp. 638-639, 1 fig. Bulbous growth spread rapidly when lake was drained at seeding time; harvest with submarine saw and huge boom rake.

RETAINING WALLS

EARTH PRESSURE AGAINST. Earth Pressure Against Abutment Walls Measured With Soil Pressure Cells. Pub. Roads, vol. 6, no. 5, July 1925, pp. 102-106, 8 figs. Describes tests made with soil pressure cell developed by Bur. Pub. Roads, at Sixteenth Street Bridge, Washington, and Skellit Fork bridge, near Wayne City, Ill.

ROAD CONSTRUCTION

TIME DISTRIBUTION IN. Some Records of Time Distribution in Road Building. Eng. News-Rec., vol. 95, no. 14, Oct. 1, 1925, pp. 555-556. Contains article by A. A. Mahon on time analysis for asphalt on concrete, and one by C. Tappan on records for straight concrete paving.

ROADS

ECONOMICS OF ENGINEERING. Economics of Highway Engineering, H. T. Tudsbery. Engineering vol. 120, nos. 3114 and 3115, Sept. 4 and 11, 1925, pp. 287-288 and 339-340. Deals with traffic matters and design, construction and maintenance of roads.

MAINTENANCE. Problems of State-Wide Highway Maintenance, F. T. Sheets. Good Roads, vol. 68, no. 6, July 1925, pp. 143-148, 5 figs. Deals with survey of work to be done, organization, field methods and equipment, cost accounting, snow removal, highway marking, highway policing, and costs.

SUBGRADE SURVEYS. Field Methods Used in Subgrade Surveys, A. C. Rose. Pub. Roads, vol. 6, no. 5, July 1925, pp. 93-101 and 115-116, 4 figs. U. S. Bur. of Soils surveys valuable to highway engineer; sense of feeling a valuable aid in detecting soil types; clay content a vital factor; results of field investigations; short cuts possible on reconnaissance subgrade surveys; recommendations.

ROADS, ASPHALT

ASPHALTIC MIXTURES. A Deformation Test for Asphaltic Mixtures, H. M. Milburn. Pub. Roads, vol. 6, no. 6, Aug. 1925, pp. 131-133, 6 figs. Describes test developed by U. S. Bur. Pub. Roads making use of new apparatus which determines effect of varying percentage of asphalt in a mixture by subjecting compressed specimens to a constant temperature for a definite time and measuring deformation.

ROADS, CONCRETE

DESIGN. The Design, Construction and Maintenance of Reinforced Concrete Pavement, H. E. Breed. Goods Roads, vol. 68, no. 6, July 1925, pp. 149-152 and 170. Discusses sources of weakness in pavement, viz., faulty materials, improper proportioning, low density, poor mixing and working, too much water, disregard of temperature conditions, inadequate curing, and high porosity permeability and absorption; Arlington and Columbia Pike test; Bates tests.

HEXAGONAL SLAB. Hexagonal Slab Concrete Paving at Longview, Wash., L. A. Perry. Eng. News-Rec., vol. 95, no. 15, Oct. 8, 1925, pp. 580-583, 8 figs. Design, theory, laboratory tests and actual construction experience with new type of concrete pavement.

ROADS, GRAVEL

MAINTENANCE. Wisconsin Methods of Maintenance of Gravel Roads, J. T. Donaghey. Good Roads, vol. 68, no. 6, July 1925, pp. 157-161. Time to do work, time to use grader or planer, scarifying and reshaping, surface treatments, calcium chloride, light asphaltic oils, light tar, etc.

ROLLING MILLS

BLOOMING MILLS. Blooming Mill Has Heavy Drive, R. A. Fiske. Iron Age, vol. 116, nos. 16, Oct. 15, 1925, pp. 1019-1023, 7 figs. Largest single-unit reversing motor now in service at Wisconsin steel works; new mill replaces steam-operated unit.

DEFORMATION IN ROLLING PROCESS. Forces and Flow of Material in Connection with Plastic Deformation (Kräfte und Materialfluss bei der bildsamen Formänderung), E. Sievel. Stahl u. Eisen, vol. 45, no. 37, Sept. 10, 1925, pp. 1563-1564, 10 figs. By use of smooth fields of force, taking effects of friction through additional stresses into consideration, a simple method of representing plastic deformation is developed which is well adapted to investigation of technical phenomena; in many cases it can be used for determination of flow of material; this is discussed in connection with "pushing" in rolling process.

S

SAFETY

ORGANIZATION. Organizing for Safety Work, Geo. Hodge. Iron Trade Rev., vol. 77, no. 16, Oct. 15, 1925, pp. 961-962. Committee is best medium of interchange of ideas and policies between employees and management; department should function as service division to assist foreman.

SAWS

CIRCULAR. Multiple Blade Circular Saws, A. Bahls. Eng. Progress, vol. 6, no. 7, July 1925, pp. 233-234, 3 figs. With these machines it is possible to simultaneously saw off at both ends and exactly square large number of planed laths, frame parts, boards, etc., even when machine is only equipped with two blades.

SEMI-DIESEL ENGINES

FLYWHEEL CRACKING. Cause of a Cracked Flywheel on a Semi-Diesel Engine, D. L. Fagnan. South. Engr., vol. 43, no. 8, Oct. 1925, pp. 59-60. Engine suddenly speeded up above normal and high voltage burned out lamps, although fuel-oil supply was shut off.

SEWAGE DISPOSAL

ACTIVATED SLUDGE. The Activated-Sludge Sewage-Disposal Plant at Milwaukee, J. A. Wilson. Mech. Eng., vol. 47, no. 10, Oct. 1925, pp. 837-841, 5 figs. Describes general operation of plant and fundamental principles involved; removal of coarse material, and of finely divided material; mechanism of aeration; sludge problem; relative filtering efficiency; effect of adding acid; effect of temperature; seasonal changes; dewatering sludge; preparation as fertilizer; analysis of sludge.

IMHOFF TANKS. The More Unusual Gases Occuring in Imhoff Tanks, F. L. Campbell and W. Rudolfs. Eng. News-Rec., vol. 95, no. 14, Oct. 1, 1925, pp. 552-553. Hydrogen absent at Plainfield, N.J., and hydrogen sulphide found in but one tank; hydrogen absorbed by sludge in experiments.

PLANTS. Up-to-Date Sewage Disposal Plant at Dinuba, R. C. R. Morser. Compressed Air Mag., vol. 30, no. 9, Sept. 1925, pp. 1381-1385, 10 figs. Describes modern sewage disposal plant which has recently been constructed by City of Dinuba, Cal.; designed for population of 10,000, but by installation of additional units can readily be increased to take care of 20,000; machinery works automatically.

SEWERS

CRUSHING TESTS ON PIPE. Inexpensive Device for Making Crushing Tests on Sewer Pipe, A. Wells. Eng. News-Rec., vol. 95, no. 13, Sept. 24, 1925, pp. 516-517, 1 fig. Describes home-made pipe-testing machine designed by author.

SHEARS

Hand Shearing and Bending Machine. Hand Shearing and Bending Machines for Concrete-Reinforcing Bars. Engineering, vol. 120, no. 3116, Sept. 18, 1925, p. 335, 2 figs. Portable hand machine introduced primarily for shearing and bending round bars for use in connection with reinforced concrete; it can, however, readily be adapted to crop flats, angles or tees and should prove useful in erection of any class of structural steelwork.

SHERARDIZING

Electric. Electro Sherardizing Large Parts, C. H. Purdy. Fuels and Furnaces, vol. 3, no. 10, Oct. 1925, pp. 1131-1135, 3 figs. Theory and development of electro-sherardizing process; furnace and its operation, power input and temperature control; characteristics of coating and application.

SILICA

Fused. The Mechanical, Thermal and Optical Properties of Fused Silica, E. Thomson. Franklin Inst.—Jl., vol. 200, no. 3, Sept. 1925, pp. 313-325. Discussion of properties.

STANDARDIZATION

Industrial. Standardization in Industry, C. le Maistre. Engineering, vol. 120, no. 3117, Sept. 25, 1925, pp. 397-399. Standardization and simplification with special reference to saving of waste in industry. Paper read before Brit. Assn.

STANDARDS

German N. D. I. Reports. Report of the German Industrial Standards Committee (NDI-Mitteilungen). Maschinenbau, vol. 4, no. 16, Aug. 20, 1925, pp. 815-818, 1 fig. Proposed standards for edges for large-scale balances.

Report of the German Industrial Standards Committee (NDI-Mitteilungen). Maschinenbau, vol. 4, no. 18, Sept. 3, 1925, pp. 911-921, 6 figs. Proposed standards for quadrilateral and triangular profile plates for welding on, wedges for binding, round nuts with four grooves, round nuts with cross holes, technical gases, keyed shaft profiles.

STEAM

Specific Heat at High Pressures. Graphic Presentation of Specific Heat of Steam at High Pressures (Die zeichnerische Darstellung der spezifischen Wärme des Wasserdampfes bei hohen Drücken), Schmolke. Wärme, vol. 48, no. 34, Aug. 21, 1925, pp. 427-429, 1 fig. Discusses entropy diagrams obtained in recent years through extrapolation.

STEAM ENGINES

Uniflow. Useful Uniflow Engine Calculations, F. Wm. Bosch. Power Plant Eng., vol. 29, no. 19, Oct. 1, 1925 pp. 997-998, 4 figs. Methods of calculating clearance and relation of mean efficiency pressure to cutoff and steam consumption.

STEAM PIPES

Covering. The Rational Design of Covering for Pipes Carrying Steam up to 800 Deg. Fahr., W. A. Carter and E. T. Cope. Mech. Eng., vol. 47, no. 10, Oct. 1925, pp. 805-808, 8 figs. Analysis of problem of determining most economical thickness of pipe covering for steam pipes, based on work of Heilman, Eberle, and others; curves showing method of determining most economical thickness of covering for 6-in. pipe carrying steam at 500 deg. fahr. and 700 deg. fahr. are included; equations for calculations involved and procedure of making calculations. (Abridged.)

STEAM POWER PLANTS

Small Manufacturing Plant. Power and Heating for the Small Manufacturing Plant, D. M. Myers. Power, vol. 62, no. 14, Oct. 6, 1925, pp. 524-526, 4 figs. When heating demand for low-pressure steam is large and reasonably steady, it will pay to install engine, using exhaust steam for heating; combined cost will be less because generation of low-pressure steam costs almost as much as generation of high-pressure steam.

STEAM TURBINES

Developments. A Review of Steam-Turbine Development, H. Dahlstrand. Mech. Eng., vol. 47, no. 10, Oct. 1925, pp. 800-804, 13 figs. Deals chiefly with effects which use of steam at higher pressures and temperatures has had upon efficiencies of steam turbines and upon materials used in construction of their parts; use of high-back-pressure turbines to be installed in connection with boilers of higher pressure in such way as to exhaust into steam mains and turbines of existing plants, is carefully analyzed for units of 10,000-and 30,000-kw. capacity, and effects on efficiency are graphically presented; discusses materials for use with higher pressures and temperatures; comments on corrosion and erosion of turbine blades. (Abridged.)

High-Speed Rotation. High-Speed Rotation (Sur la réalisation de très grandes vitesses de rotation), E. Henriot and E. Huguenard. Académie des Sciences—Comptes Rendus, vol. 180, no. 19, May 11, 1925, pp. 1389-1392, 1 fig. Authors obtain very high speeds by avoiding all solid and liquid contact and by turning conical body with vertical axis within conical cup by means of jets of compressed air or CO_2 issuing from tubes so disposed in stator as to produce rising vortex; cone is truncated near apex and provided with meridional furrows.

Improvements. Saving Fuel and Improving Steam Turbines and Boilers (De l'économie de combustible et des améliorations à apporter aux turbines à vapeur et aux chaudières), V. Stark. Annales des Mines de Roumanie, vol. 8, no. 12, July 10-25, 1925, pp. 447-475, 47 figs. Reviews present stage of art; elimination of fuel waste; turbine efficiency in Roumania; superheating; mercury-vapor turbines; high-pressure turbines of Laval and Loesel type; high-pressure boilers, atmos boilers; pulverized-coal firing. (In Roumanian and French).

Steam Connection, Designing. Calculating Expansion and Aligning Steam Pipes to Large Turbines. Power, vol. 62, no. 16, Oct. 20. 1925, pp. 594-597, 5 figs. Instructions of Westinghouse Elec. & Mfg. Co., which has for many years strongly advocated careful adjustment of steam connection to throttle valve.

Thrust Bearing. Thrust Bearing on Turbine Changed, R. H. Morris. Power Plant Eng., vol. 29, no. 19, Oct. 1, 1925, pp. 995-996, 5 figs. Clearance at top should exceed that at bottom since vacuum causes sagging of cylinder.

STEEL

Alloy. *See Alloy Steels.*

Defects in. Defective Materials and Processes, H. Brearley. Metallurgist, (Supp. to Engineer, vol. 140, no. 3639), Sept. 25, 1925, pp. 130-132, 6 figs. Account of various defects which may occur in materials and processes, outlining their causes and results arising from them; author distinguishes defect from blemish by three consequences: it makes material (1) more costly, (2) less reliable, (3) less durable. (Abstract.) Lecture to Coventry Eng. Soc.

Magnetic Properties. Magnetic Properties of Irons and Steels With Strong and Weak Field (Comparaison des propriétés magnétiques de divers fers et aciers aux champs forts et aux champs faibles), H. Tscherning. Revue Générale de l'Electricité, vol. 18, no. 6, Aug. 8, 1925, pp. 223-231, 18 figs. Discusses tests with steels produced by Imphy and Firminy works, and Western Electric permalloy, to enable proper choice of metal for given purpose, using Grassot's fluxmeter and analyzing resulting curves.

Tests under Combined Stresses. Tests of Mild Steel under Combined Stresses (Essais d'acier doux par efforts combinés), J. Seigle. Académie des Sciences — Comptes Rendus, vol. 181, no. 3, July 20, 1925, pp. 98-99. Torsion tests were made on mild steel bars which were simultaneously under constant tension or compression; equivalent results were obtained with annealed and with cold-worked mild steel; maximum elastic moment towards torsion is lowered as force of either tension or compression increases, and is practically the same equal values of these forces; moment of rupture by torsion decreases greatly as tensile force is increased, and increases with compression; rupture occurs always at right angles to length of bar.

STEEL CASTINGS

Gears. Recommended Practice for Steel Castings for Gears. Am. Mach., vol. 63, no. 17, Oct. 22, 1925, p. 646. Recommendations reported by Metallurgical Committee before Am. Gear Mfrs.' Assn.

Manganese-Steel. The Production of Manganese-Steel Castings in the Electric-Furnace (Erzeugung von Manganstahlguss aus dem Elektroofen), K. v. Kerpely. Giesserei-Zietung, vol. 22, no. 15, Aug. 1, 1925, pp. 445-449. General properties, chemical nature, and use of manganese-steel castings; points to be considered in its production in electric furnace; production method and sampling; practical examples.

Oxyacetylene Cutting of Risers. Cutting Heavy Gates and Risers. Foundry, vol. 53, no. 19, Oct. 1, 1925, pp. 802-803, 4 figs. Cleaning large steel castings accomplished easily by oxyacetylene cutting.

STEEL MANUFACTURE

Direct form Ore. New Direct Process for the Manufacture of Steel, H. Flodin. Foundry Trade, Jl., vol. 32, no. 476, Oct. 1, 1925, pp. 284-285, 2 figs.; also Engineering, vol. 120, no. 3118, Oct. 2, 1925, p. 432; and Metal Industry (Lond.), vol. 28, no. 12, Sept. 18, 1925, pp. 269-271, 2 figs. Describes series of experiments in direct smelting of ore by electric means, carried out at Roy. Technical High School at Stockholm, object of which was to ascertain whether malleable iron and steel can be extracted direct and continuously from iron ore, and at same time to reduce percentage of phosphorus and sulphur content in ore and coal; physical and mechanical properties of iron and steel produced. Paper read before Iron & Steel Inst.

Electric-Furnace. Steel Production in the Electric Furnace (Fabrication de l'acier au four électrique), Mathieu and Sutter. Journal du Four Electrique et des Industries Electrochimiques, vol. 34, no. 12, Sept. 1, 1925, pp. 174-177. Discusses construction of furnaces, methods of production of iron and steel and quality of product obtained, induction furnaces, arc furnaces, Soderberg electrodes, power consumption, etc.

STELLITE

Manufacture and Uses. The Manufacture and Uses of Stellite, W. H. Losese. Chem. and Industry, vol. 44, no. 36, Sept. 4, 1925, pp. 451T-452T. Stellite can be made in gas-fired crucibles, but best results are obtained by use of electric furnace, and practically all stellite, in Canada at least, is made by this means.

STOKERS

Arch Design. Recent Developments in Arch Design for Traveling Grate Stokers, H. S. Colby. Steam Power, vol. 4, no. 5, July 1925, pp. 7 and 12, 2 figs. Analyzes furnace conditions with both front and rear type arches to show why results are improved by their use.

Developments. Developments in Mechanical Stokers. Ry. Rev., vol. 77, no. 13, Sept. 26, 1925, pp. 477-479. Abstract of committee report presented before Traveling Engrs.' Assn.

Sprinkler. The New Cass Patent Sprinkler Stoker. Eng. & Boiler House Rev., vol. 39, no. 4, Oct. 1925, pp. 178 and 181-182, 3 figs. New stoker is of sprinkler type and fitted with cast-iron hoppers of 3-cwt. capacity, coal being delivered to feed box by adjustable rams.

STREETS

Double-Deck, Chicago. Design and Structure of Double-Deck Street, Chicago. Eng. News-Rec., vol. 95, no. 16, Oct. 15, 1925, pp. 632-635, 6 figs. River and South Water Streets, Chicago's congested loop-district river front, being transformed into 2-level concrete boulevard with marginal dock.

STROBOSCOPES

Rotoscope. The Rotoscope. Engineer, vol. 140, no. 3637, Sept. 11, 1925, pp. 272-273, 6 figs. New form of stroboscope distinguished by simple yet ingenious shutter which results in two main objections to slotted disk type of shutter being completely overcome; it is extremely portable and easy to operate, and is applicable over very large range of speeds.

STRUCTURAL STEEL

Steelwork Designing. Errors More or Less Common in Steelwork Designing, R. Fleming. Eng. News-Rec., vol. 95, no. 13, Sept. 24, 1925, p. 501. Experience notes on faults of oversight and misconception producing weak or wasteful construction.

SUBSTATIONS

Automatic. Automatic Substations in Germany, Jos. Roubicek. Elec. World, vol. 86, no. 16, Oct. 17, 1925, pp. 801-802, 1 fig. First automatic railway converter station has been placed in operation by German General Electric Co. (A.E.G.) in Berlin; interesting feature of a.c. self-starting converter is that no brush-lifting device is required as starting of set has been improved to such extent that brushes and commutator will not suffer from sparking even under most severe conditions.

The Reliability and Economy of Automatic Substations, A. E. Pell. Elec. Engr., vol. 2, no. 13, June 15, 1925, pp. 111-113, 1 fig. Use of automatic substations has enabled many electric railway undertakings to effect considerable reductions in running costs; discusses features which produce this economy, taking as examples automatic substation incorporated in Melbourne railway electrification; describes layout and operation of machinery, discusses its reliability, touching on points where trouble has been found in practice, and quotes figures comparing running and maintenance costs of automatic substations with those of manually operated stations of similar capacity. Extract of paper read before Instn. of Engrs., Australia.

Railway. Automatic Substations for Railway Signaling and Train Control, H. M. Jacobs. Gen. Elec. Rev., vol. 38, no. 9, Sept. 1925, pp. 640-649, 17 figs. Describes type of equipment used and shows how automatic operation can bring to this class of service same dependability and rapidity of action as is to be found in other automatic applications.

Ventilation. Ventilation of Automatic Substations, L. N. Van Hook. Elec. Traction, vol. 21, no. 9, Sept. 1925, pp. 485-488, 4 figs. A consideration of subject in general, including results of tests conducted on St. Louis stations.

T

TELEPHONY

Inductive Interference. Induction from Street Lighting Circuits, R. G. McCurdy. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 10, Oct. 1925, pp. 1088-1094, 7 figs. Effects on telephone circuits, and measures for reducing interference from these circuits.

STATIONS. Modern Telephone Repeater Stations, A. B. Hart. Electrician, vol. 95, nos. 2469 and 2470 Sept., 11 and 18 1925, pp. 292-293, and 318-320, 7 figs. New feature in British national telephone network; problems of location; a standardized design; full details of equipment; some power plant problems; factors determining final choice of prime mover.

TESTING METHODS. Testing Methods in Telephony, P. K. Higgins. Telephone Engr., vol. 29, no. 9, Sept. 1925, pp. 17-21, 8 figs. Fault location and messurement methods and instruments simply explained; wheatstone bridge simplified; galvanometer operation and employment is explained.

TETRAETHYL LEAD

POISON HAZARDS. Tetrsethyl Lead Poison Hazards, Thos. Midgley, Jr. Indus. & Eng. Chem., vol. 17, no. 8, Aug. 1925, pp. 827-828. Deals with hazards in manufacture, handling and mixing with gasoline, handling of treated gasoline, use of treated gasoline in engines, improper uses of ethyl gasoline.

TEXTILE MACHINERY

INDIVIDUALLY DRIVEN. Some Notes on Individually-Driven Textile Machinery, A. Haigh. Elec. Rev., vol. 97, no. 2494, Sept. 11, 1925, pp. 409-410. Importance of low rating and high starting torque.

TRAFFIC

CO-ORDINATION OF MOVEMENTS. Co-ordinating Traffic Movement in Existing Streets, R. F. Kelker, Jr. Elec. Ry. Jl., vol. 66, no. 13, Sept. 26, 1925, pp. 483-486, 4 figs. Several simple remedies will do much to relieve present congestion; entire roadway should be available for moving vehicles; elimination of left-hand turns and provision of good paving on all streets will improve conditions; synchronized signals do not increase traffic speed.

SIGNALS. Colors and Forms of Traffic Signals. Pub. Roads, vol. 6, no. 6, Aug. 1925, pp. 134-136, 1 fig. Code proposed by sectional committee of Am. Eng.

TRANSFORMERS

CONNECTION. New Two- to Six-Phase Transformer Connection. Power Plant Eng., vol. 29, no. 17, Sept. 1, 1925, pp. 905-906, 3 figs. New transformer connection of 100-per cent apparatus economy; comparison of its merits with those of Scott and Woodbridge connections.

TRANSPORTATION

STREET-CAR. Surface Car Transportation in Large Cities of Growing Importance, G. A. Richardson. Elec. Ry. Jl., vol. 66, no. 13, Sept. 26, 1925, pp. 489-493, 6 figs. Co-ordination of all transportation facilities in a community is essential to insure maximum public service at minimum cost; statistics indicate that surface cars are efficiently handling increasing volumes of traffic in large cities; traffic regulation should be based on principle of expediting movement of vehicles carrying greatest number of passengers.

TUNNELING

SURVEY CONTROL. Survey Control in Driving 3-Mile Water-Supply Tunnel, R. R. Bradbury. Eng. News-Rec., vol. 95, no. 15, Oct. 8, 1925, pp. 594-598, 6 figs. Detailed explanation of instrumental control of alignment and grade in hard-rock bore in Rhode Island; careful methods lead to small variations when headings meet.

TUNNELS

RELINING. Enlarge Section in Relining Tunnels on The Union Pacific. Ry. Eng. & Maintenance, vol. 21, no. 10, Oct. 1925, pp. 381-382, 3 figs. Extensive project now in progress on Los Angeles & Salt Lake unit of this system.

V

VALVE GEARS

ECCENTRIC. The Calculation of Eccentric Valve Gears (Die Berechnung der Exzenterschiebersteuerungen), F. A. Brix. Schiffbau, vol. 26, no. 17, Sept. 9, 1925, pp. 573-579, 3 figs. Author develops some of his earlier work on steam-engine valve diagrams and valve-setting calculations generally; he reconsiders approximate methods of determining influence of length of piston and eccentric rods upon valve motion; case of quadruple expansion engine is considered, and detailed attention is given to optimum steam speeds, valve, linear, and angular lead and lag, necessary amount of eccentricity and valve lap; discusses question of precise eccentricity to be adopted in any given case and gives tables showing its variation with increasing degree of cut-off.

VARNISHES

ABRASIVE RESISTANCE OF. The Abrasion Resistance of Varnishes, W. C. Arsem. Paint Mfrs.' Assn. of U. S., Sci. Circular No. 244, Aug. 1925, pp. 45-50, 1 fig. A testing device called an "abrasionometer" for measuring abrasion resistance of varnish films has been devised, which yields numerical values, reproducible to 10 per cent or less; it is possible with this device to follow progress of drying and hardening of a varnish, to compare different varnishes and show effect of varying proportions and treatment; it has been shown that a great increase in abrasion resistance results when more than 75 per cent of gel-forming substance is present in varnish film; an attempt has been made to explain this phenomenon as a result of proximity and particular arrangement of molecular units of gel. Paper read before Am. Chem. Soc.

VENTILATION

FACTORS. Deciding Factors of Adequate Ventilation, W. J. McConnell. Am. Soc. Heat. & Vent. Engrs.—Jl., vol. 31, no. 7, July 1925, pp. 367-370, Need for an instrument to determine factors of ventilation; effective temperature; factors affecting desired temperatures; suitable temperature for all classes.

VIADUCTS

MASONRY. Reconstruction of Paudeze Viaduct (Reconstruction du viaduc de la Paudeze), C. Jambe. Bul. Technique de la Suisse Romande, vol. 51, nos. 18 and 20 Aug. 29, and Sept. 26 1925, pp. 217-221 and 241-246 figs. Design and construction of new double-track viaduct at Paudèze on Lausanne-Simplon line in Switzerland; length 179 m.; eight full-centered arches of 16 m; organization and extension of work.

VOCATIONAL TRAINING

VOCATIONAL GUIDANCE. Vocational Guidance for College Students. Nat. Research Council—Reprint and Circular Series, No. 62, 1925. Reports of two conferences at National Research Council, Washington, D. C., by L. L. Thurstone and C. R. Mann; the first charted areas that investigators of future must explore, and drew up a series of suggestions, later put together in one comprehensive program by Dr. Thurstone; second limited itself to immediate objectives; medicine and business were selected as the two professions on which personnel research might well be focussed now, and specific recommendations were made looking toward establishment of a central office for co-ordinating student personnel research.

VOLTAGE REGULATION

THREE-PHASE LINES, ON. Calculation and Regulation of Voltage on Three-Phase Lines (Bestimmung und Regelung der Spannung in Drehstromnetzen), Burger. Elektrotechnische Zeit., vol. 46, no. 35, Aug. 27, 1925, pp. 1289-1296, 17 figs. Develops vector diagrams for three main classes of transmissions, viz., short lines, where only ohmic and inductive resistance has to be considered; medium-length lines, where capacity and imperfect insulation must be added; and very long lines, which require exact evaluation of all factors; examples for each of these cases serve to explain simple vectorial solutions.

W

WAGES

INCENTIVE SYSTEMS. Wage Incentives That Fit the Job. Iron Age, vol. 116, no. 9, Aug. 27, 1925, pp. 534-535. Method of compensation should be selected with due regard to type of work, intelligence of employee and simplicity of record keeping; group plan; Westinghouse Electric plan; individual incentive plans; individual premium plan.

PIECE-WORK SYSTEM. After All, Is Piece-Work the Best? E. P. Teel. Factory, vol. 35, no. 3, Sept. 1925, pp. 387, 398 and 400. Points out that in maze of complicated and technical payment systems, piece work remains unique in its simplicity; its unpopularity in many factories may be due to shortcomings of management itself.

WASTE ELIMINATION

METHODS. The Six Ways to Eliminate Waste, R. M. Hudson. Mgmt. & Admin., vol. 10, no. 2, Aug. 1925, pp. 71-74. Methods commonly used are (1) direct reduction of wastes, (2) better utilization of by-products, (3) greater use of existing facilities, (4) revision of existing facilities, (5) simplification and standardization, and (6) better control of production resources; each of these methods are discussed and examples given of their respective application.

WASTE STEAM

UTILIZATION. Factory Heating with Exhaust Steam (Exemple de chauffage de locaux industriels par la vapeur d'échappement), Mouchelet. Associations Françaises de Propriétaires d'Appareils à Vapeur—Bul., vol. 6, no. 20, Apr. 1925, pp. 65-73, 4 figs. Details of air-condenser heating plant of a textile works using live and exhaust steam from a 500-hp. compound engine, starting, operation, and results of tests.

Utilization of Exhaust and Mixed Steam (Abdampfund Zwischendampfverwertung), Ernst Blau. Brennstoff- und Wärmewirtschaft, vol. 7, no. 13, July 1, 1925, pp. 256-260. Discusses applications of Rateau and Ladewig steam accumulators; live-steam exhaust-steam turbines and their use; combined heating and power-steam operation.

WATER MAINS

TWO-MAIN SYSTEM. Why Not Two Water Mains in Wide Streets, Thos. F. Wolfe. Eng. News-Rec., vol. 95, no. 8, Aug. 20, 1925, pp. 332-333, 1 fig. Brief for revision of common practice. See also comments pro and con from 26 waterworks engineers and superintendents, pp. 333-335.

WATER METERS

WATER LOSSES. Reducing Water Losses, Especially in Large Water Meters (Die Einschränkung der Wasserverluste insbesondere bei grossen Wassermessern), Vollmar and Baese. Gas- und Wasserfach, vol. 68, no. 23, June 6, 1925, pp. 355-360, 7 figs. Construction and operation of the Woltmann recording meter in which main and secondary meters are connected in series, resulting in reducing water losses in Dresden from 30 per cent before its use to 13.7 per cent after its adoption.

WATER PIPES

IRON BACTERIA AND INCRUSTATIONS. Iron Bacteria and Pipe Incrustation, D. Ellis. Engineering, vol. 120, no. 3116, Sept. 18, 1925, pp. 371-372. Investigation to ascertain responsibility of iron bacteria and other organisms for formation of iron incrustations in water pipes. Paper read before Brit. Assn.

WATER SUPPLY

FIRE PROTECTION FOR. Water Supply for Fire Protection, V. Bernard Siems. Can. Engr., vol. 49, no. 2, July 14, 1925, pp. 133-136. Problems involved in maintenance of continuous and ample supply of water; effect of fire protection provisions design of on-water supply system.

ATLANTA, GA. Municipal Water Supply Problems of Atlanta, Georgia, P. H. Norcross. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 6, Aug. 1925, pp. 969-998, 13 figs. Supply works consist of 48-in. intake conduit, steam-operated river pumping station with capacity of 106,000,000 gal. per day, pumping against maximum head of 275 ft., through 3 parallel conduits each approximately 18,500 ft. long, into 2 raw-water or settling basins, having combined capacity of 393,000,000 gal.

GRAVITY. New Gravity Water Supply for Whitehall, N.Y., Jas. P. Wells. Eng. News-Rec., vol. 95, no. 9, Aug. 27, 1925, pp. 344-345, 3 figs. Two drainage areas united by diversion of water through pipe line exposed on rock to low winter temperatures.

IODIDES IN, USE OF. Use of Iodides in Water Supplies to Prevent Simple Goiter, A. F. Mellen. Eng. News-Rec., vol. 95, no. 9, Aug. 27, 1925, pp. 352-354. Case presented, professional criticisms reviewed, plan for Minneapolis outlined and local objections analyzed.

WATER TOWERS

COMBINED WITH PUMPING STATION. New Tower for Water Tank Houses Pumps at Rochester, Minn. Eng. News-Rec., vol. 95, no. 9, Aug. 27, 1925, pp. 338-339, 2 figs. Booster pump takes water from main leading to standpipe built in 1887 and delivers it to high-service tank.

WATER TREATMENT

SETTLING BASINS. Control of Sludge Level in Sedimentation Basins, L. B. Mangun. Am. Water Works Assn.—Jl., vol. 13, no. 4, Apr. 1925, pp. 459-465, 2 figs. Discusses turbidity of Missouri River water, and added purification facilities to relieve it; flushing and its effect on removing sludge.

SOFTENING. Modern British Practice in Water Softening, D. Brownlie. Indus. Chemist, vol. 1, no. 6, July 1925, pp. 303-305. Theoretical considerations of lime and soda-ash methods.

Recent Experience with Doucil as a Water-Softening Material, T. P. Hilditch and H. J. Wheaton. Chem. & Industry, vol. 44, no. 36, Sept. 4, 1925, pp. 885-887. Doucil is complex synthetic alumino-silicate containing fixed but exchangeable alkali or alkaline-earth bases, but possessing physical form of rigid homogeneous gel; outstanding properties and applications. Paper read at joint mtg. of Instn. Chem. Engrs. and Am. Inst. Chem. Engrs.

The Preparation and Comparative Performance of Base-Exchange Water-Softening Materials, E. B. Higgins and J. P. O'Callaghan. Chem. & Industry, vol. 44, no. 36, Sept. 4, 1925, pp. 882-885. Advantages as compared with precipitation processes; methods of manufacture and percentage composition of both synthetic and natural base-exchange materials. Paper read at joint mtg. of Inst. Chem. Engrs. and Am. Inst. Chem. Engrs.

WATERWAYS

St. Lawrence. The St. Lawrence Waterway to the Sea, F. C. Shenehon. Am. Soc. Civ. Engrs.—Proc., vol. 51, no. 7, Sept. 1925, pp. 1237-1309, 16 figs. Describes Port of Duluth and the various navigable ways through Lake Superior St. Marys River, Lake Huron, St. Clair and Detroit Rivers, Lake Erie, through Welland Canal descending over Niagara Escarpment 326 ft. to level of Lake Ontario, and then through Ontario and Upper St. Lawrence to Rapids section of this river; suggests general principles involved in best co-ordination of navigation and water power.

WATT-HOUR METERS

Precision. Precision Watthour Meters and High-Frequency Measurements. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 9, Sept. 1925, pp. 967-968. Report by Committee on Instruments and Measurements.

WATTMETERS

High-Voltage. Some Features and Improvements on the High-Voltage Wattmeter, Jos. S. Carroll. Am. Inst. Elec. Engrs.—Jl., vol. 44, no. 9, Sept. 1925, pp. 943-948, 3 figs. Describes wattmeter which is results of three years of study and experimental work carried on at Stanford University; describes also high-voltage voltmeter and crest voltmeter.

WEIRS

Falling-Shutter. Ashford Falling Shutters for Barrages. Engineering, vol. 120, no. 3119, Oct. 9, 1925, pp. 442-444, 9 figs. Describes form of drop shutters devised by J. Ashford, and installation of this type of weir at Mockes Dam of Bloemfontein Corp. Water Works, South Africa.

WELDING

Aluminum. *See Aluminum, Welding.*

Fusion of Unfired Pressure Vessels. The Rationale of Safe Welded, Unfired Pressure Vessels, S. W. Miller. Am. Welding Soc.—Jl., vol. 4, no. 7, July 1925, pp. 34-45. Discusses materials, design of welded joint, preparation of piece for welding, organization, welding technique, training of welders, and methods of proof test.

Oxyacetylene. *See Oxyacetylene Welding.*

Rail Joints. Inspection of Work and Checking Skill of Operators in Rail Joint Welding, A. P. Way. Am. Welding Soc.—Jl., vol. 4, no. 7, July 1925, pp. 14-18. Different types of welded rail joints now in use; methods of inspecting welding work.

Supervision of Rail Joint Welders, R. B. Fehr. Am. Welding Soc.—Jl., vol. 4, no. 7, July 1925, pp. 6-14, 2 fig. Decarbonizing action of carbon arc process; training of operators for rail-joint welding; inspection of job prior to welding, and inspection of finished job.

Test Bars, Shape and Testing of. Shape and Testing of Autogenous and Electrically Welded Test Bars (Ueber Form und Prüfung autogen und elektrisch geschweisster Probestäbe). E. Höhn, Zeit. des Vereines deutscher Ingenieure, vol. 69, no. 36, Sept. 5, 1925, pp. 1168-1171, 35 figs. Results of tensile, cold bending, notched-bar and torsion tests.

Oxyacetylene. *See Oxyacetylene Welding.*

Railway Shops. Welding in Railroad Shop Practice. Ry. Mech. Engr., vol. 99, no. 9, Sept. 1925, pp. 580-583, 7 figs. Equipment and methods used in Santa Fe shops at Albuquerque, N. M., insure dependable work.

WIND TUNNELS

Full-Scale. Full Scale Wind Tunnel, E. R. Dawley. Aviation, vol. 19, no. 8, Aug. 24, 1925, p. 212, 1 fig. Wind tunnel of Kansas State Agricultural College designed primarily for determining aerodynamic resistance of automobile, but has several features in it of interest to aeronautical engineers.

WIRE

Steel. Effect of Wear on the Magnetic Properties and Tensile Strength of Steel Wire, R. L. Sanford, W. L. Cheney and Jas. M. Barry. U. S. Bur. Standards—Sci. Papers, vol. 20, no. 510, July 24, 1925, pp. 339-344, 4 figs. Part of investigation on non-destructive methods of testing wire rope; it was found that wear increases magnetic permeability for low values of magnetizing force and decreases it for higher forces; effect is similar to effect of stress, though much less in magnitude, and is attributed to redistribution of internal stress; change in magnetic properties is accompanied by increase in tensile strength.

WIRE ROPE

Problems. A Discussion of Present Day Wire Rope Problems, Jas. F. Howe. Iron & Steel Engr., vol. 2, no. 8, Aug. 1925, pp. 311-318 and (discussion) 338-341, 4 figs. Notes on elevator safety factors, safety factors on cranes and on blast-furnace sk p hoist; mine hoists and inclines; car dumpers; ore-handling machinery; locomotive and wrecking cranes; number of rope parts; overhead travelling cranes; inspection and testing of rope; wire-rope efficiency; flexibility for rope service; improvements in rope manufacture; etc.

WOOD

Liquefaction. The Liquefaction of Wood and Cellulose and Some General Remarks on the Liquefaction of Coal, H. E. Fierz-David. Chem. and Industry, vol. 44, no. 39, Sept. 25, 1925, pp. 942-944. Account of author's experiments with cellulose, wood lignin and starch, from which it concluded that it is possible to transform cellulose and wood almost quantitatively into liquid and gaseous distillates with yield of 26-32 per cent of tar of 9250 calories, whereas solid rewidue is so small that it may be neglected. Paper read before Brit. Assn.

WOODWORKING PLANTS

Exhaust Systems. Exhaust Systems for Wood Working. Sheet Metal Worker, vol. 16, no. 12, July 17, 1925, pp. 437-439 and 471, 4 figs. Suggestions for proper construction and design of systems for removal of sawdust and shavings in planing mills.

Power Service Layout. Practical Details of the Power Service Layout for a Woodworking Plant, F. A. Westbrook. Indus. Engr., vol. 83, no. 7, July 1925, pp. 316-319, 7 figs. Discusses features of electrical distribution system in factory of Albano & Co., New York City, together with types of motors, control and drives that were used and tells of special provisions made to eliminate possible causes of fire from these sources.

Production Control. Production Control in Wood-Working Plants, C. F. Scribner. Wood-Worker, vol. 44, no. 5, July 1925, pp. 39-42, 9 figs. Production control may be defined as those principles and methods which, over a period of time, control order of movement of elements of a production program, in relation to each other and to the whole.

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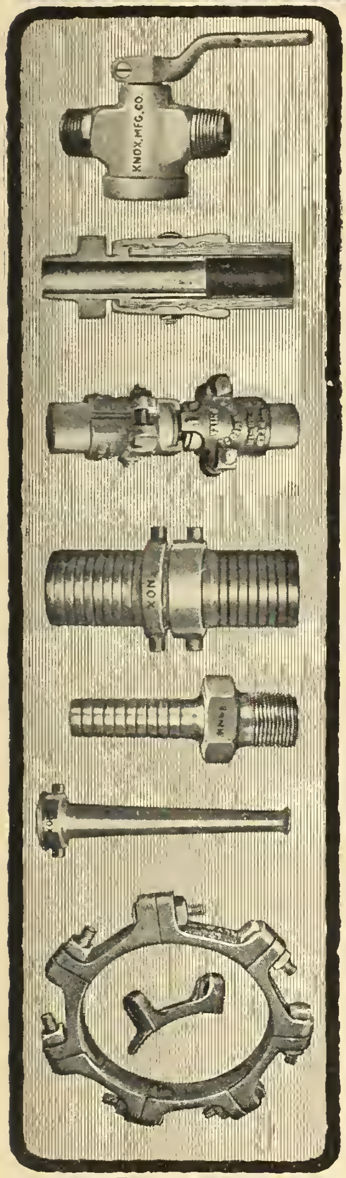

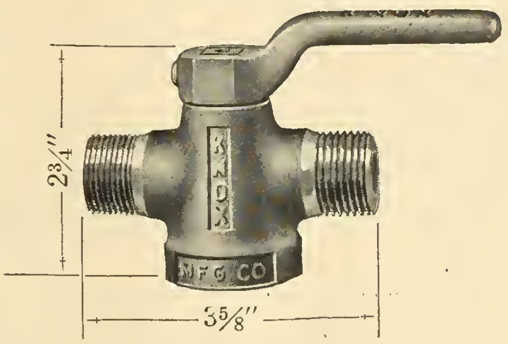

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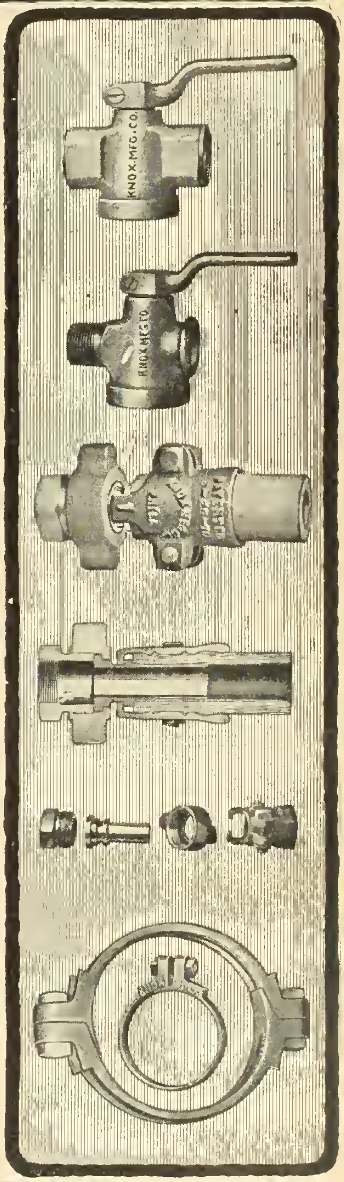

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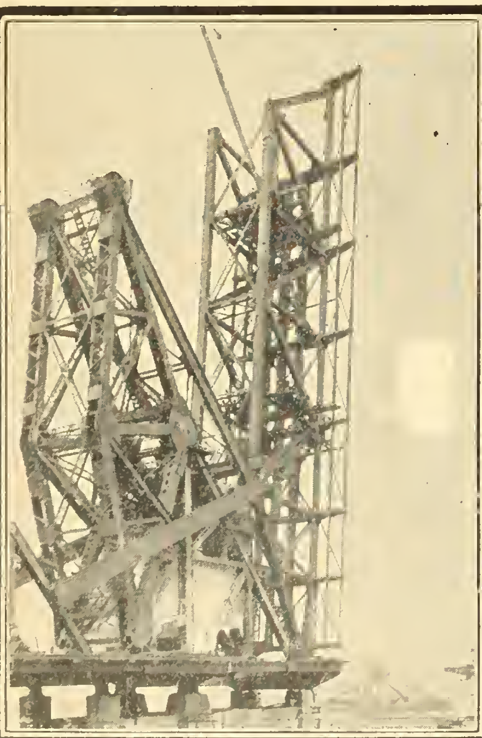

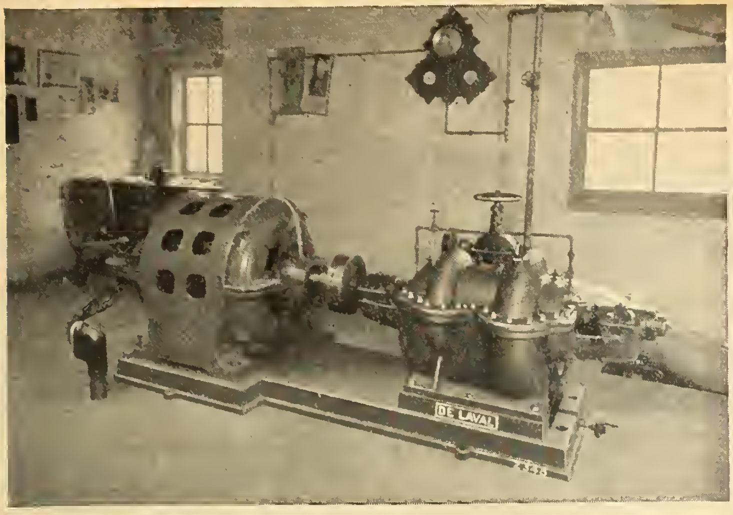

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As shown in the photograph, this pump is of the two stage, series type and is designed to deliver 2,160 gallons per minute against 285 feet head at 1,750 r.p.m. The De Laval series pump realizes the high efficiency and self balancing qualities of the double suction, single stage pump in a multistage design and is of compact and simple construction. The casing is divided horizontally in the plane of the shaft, and the cover can be lifted to give access to internal parts without disturbing the suction and discharge connections.

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Total head	Gal. per min.	Pump eff. %
348	1270	72.4
335	1479	77.5
319	1648	79.7
310	1730	80.3
311	1751	79.7

State your pumping conditions and ask for special publication B-103.

463

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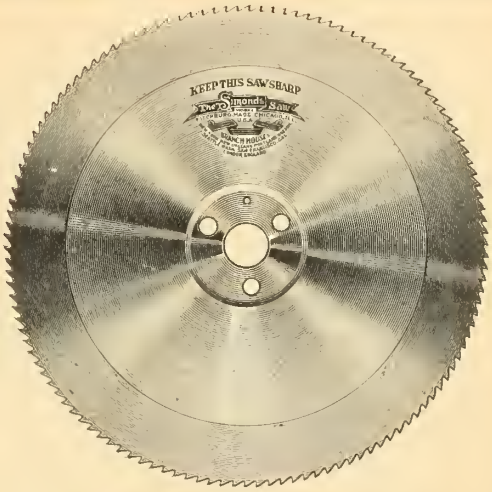

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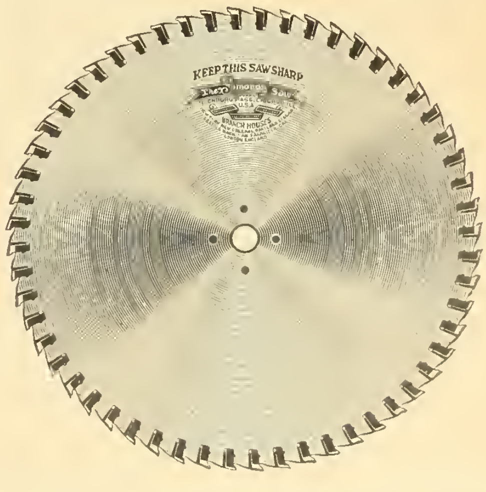

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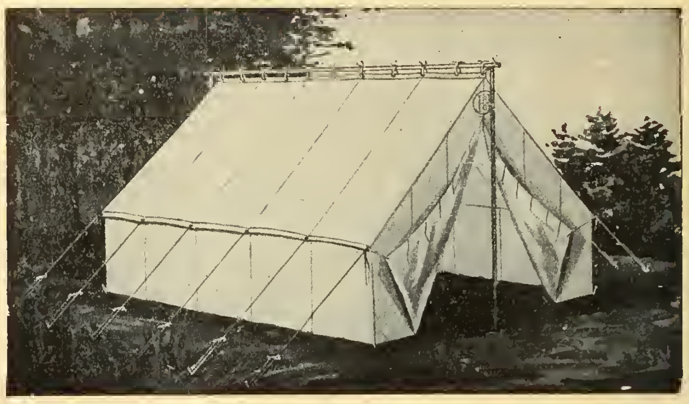

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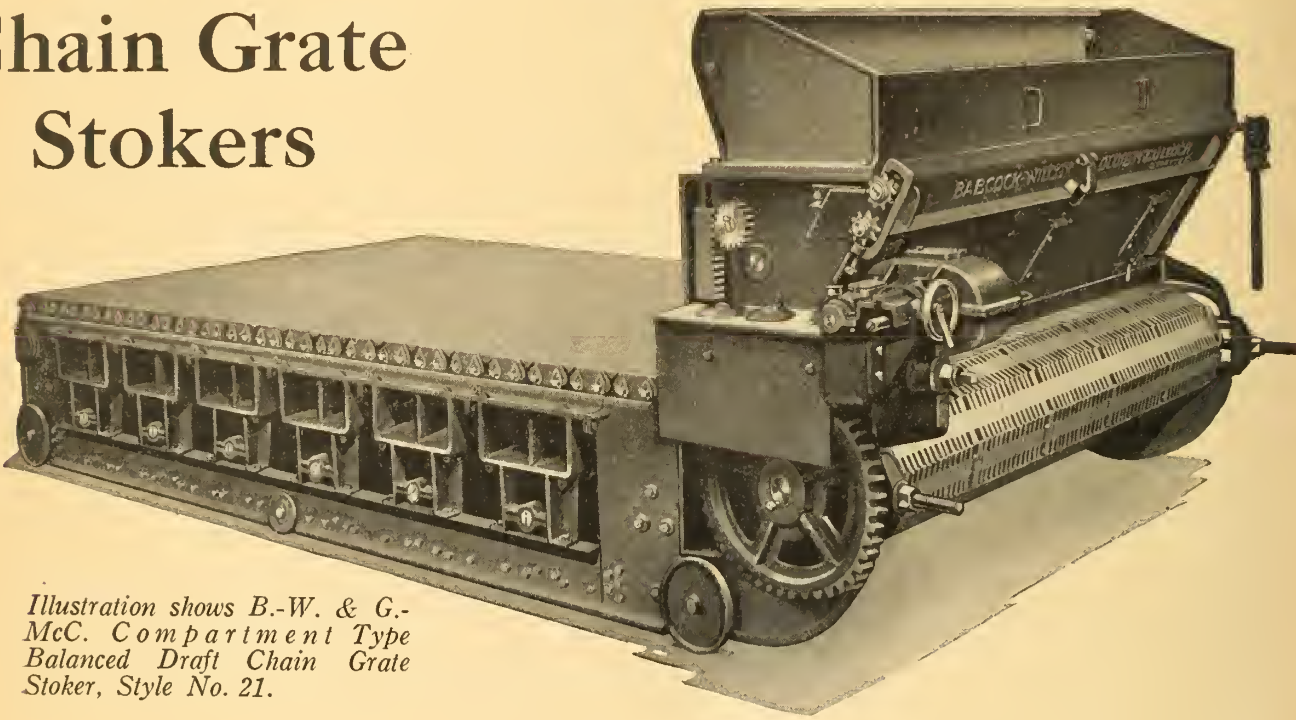

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